Unit 4.2.5 - Food Processing and Manufacturing, Retailing and Consumption & the Environment

Key Knowledge 4.2.5

The environmental effects of food processing and manufacturing, retailing and consumption in Australia, including food packaging, food transportation, marketing, retailing, food service, and consumption and disposal or recycling and repurposing of food.

Key Skills 4.2.2

Evaluate contributions of innovations and technologies to food security in terms of ethics and sustainability.

Key Skills 4.2.6

Examine an array of issues and evaluate pathways to improve environmental sustainability within the food systems.

Key Skills 4.2.8

Apply a range of practical food skills to demonstrate understanding of sociocultural, sustainable and ethical food choices and preparation.

Terms and Definitions

Biodegradable substances can be broken down by bacteria or other living organisms.

Compostable substances will only break down in an environment when moisture, heat, and oxygen are present.

Consumption refers to eating food.

Environmental footprint refers to the impact of a person, activity, or business on the entire environment.

Food disposal refers to the action or process of getting rid of food.

Food miles refers to the total distance food travels from a farm to the consumer.

The **food processing and manufacturing industry** turns agricultural and other substances into foods.

Food retail is a business that sells food intended to be eaten off-site.

Food repurposing refers to using food differently from how it was initially intended.

Food service refers to the making, transporting, and provision of prepared foods. Examples include restaurants and cafes.

Land degradation is the deterioration of land quality through erosion, deforestation, mining of fossil fuels and pollution.

A person who tries to eat only locally grown food is called a **locavore.**

Recycling occurs when an item is turned into something reusable.

Sustainability means maintaining something at a specific level.

Food Processing and Manufacturing, Retailing and Consumption & the Environment

In this area of study, we will explore various stages of the food system in Australia, from food processing and manufacturing to retailing and consumption. Energy and water use play vital roles throughout the entire food supply chain. Therefore, we will pay special attention to their impact and potential for improvement. We will also delve into different aspects such as food packaging, transportation, marketing, retailing, food service, and the practices of consumption, disposal, recycling, or repurposing of food. The primary goal is to understand how each stage contributes to environmental impacts and what practices can be implemented to reduce these effects.

Food processing and manufacturing involve changing raw materials into food products. This includes methods like canning, freezing, dehydration, and more.

Food Retailing and Consumption focus on the activities and processes related to the sale, purchase, and consumption of food. It involves aspects such as grocery shopping, food service, dining out, meal delivery services, and home food preparation.

Energy Consumption

Energy consumption plays a significant role in the food system. Various forms of energy, such as electricity, gas and fuel, are used throughout different stages of food production and distribution. Using energy unwisely can have significant negative impacts. Relying on non-renewable energy sources for electricity contributes to increased greenhouse gas emissions and increases the impact of climate change. Similarly, using up fossil fuels for transportation and other processes results increased carbon emissions and air pollution. Besides the environmental consequences, inefficient energy usage leads to higher energy costs for businesses and consumers.

To address the challenges of energy consumption in the food processing and manufacturing sector, as well as in other stages of the food system, several innovative approaches have emerged. These initiatives aim to reduce reliance on conventional energy sources, optimise energy consumption, and use renewable energy.

Here are examples of companies implementing these innovative solutions in Australia:

Use of Renewable Energy - Some food-related companies have invested in renewable energy by installing large-scale solar power systems. This significantly reduces their dependence on non-renewable energy.

Energy-Efficient Technologies - Some businesses have implemented energy-efficient lighting, motors, and refrigeration systems. These measures have led to substantial energy savings and reduced environmental impact.

Waste-to-Energy Solutions - The use of technology to convert organic waste into renewable energy is increasing. The generated biogas is used to generate electricity and heat, effectively reducing waste and energy consumption.

Water Consumption

Water consumption is another thing that plays a significant role in the food system. Using water unwisely can have serious consequences.

To conserve water, technological and innovative practices are being adopted:

Water Recycling and Reuse - Food processing companies are implementing water recycling and reuse systems to reduce their freshwater intake. Lion Pty Ltd, a major beverage company, has implemented water recycling and reuse systems in their production facilities. Through advanced treatment processes, they recycle and reuse water, significantly reducing their freshwater intake and minimising wastewater discharge.

Water-Efficient Equipment and Processes: Food processing facilities are increasingly utilising water-efficient equipment and processes. Inghams, a leading poultry producer, has implemented water-efficient equipment and processes in their processing facilities. They use low-flow nozzles, high-pressure cleaning systems, and advanced process designs to minimise water consumption while maintaining high hygiene standards.

Watch this video about how a food-related business is conserving resources: https://youtu.be/6v9E7ljzJP8

Watch this video to find out how waste can be made into a source of energy: https://youtu.be/IN_cwD0sp64

Food Packaging: Pathways to Environmental Sustainability

Nearly every food item consumed today comes in some form of packaging. This packaging, while essential for modern living, also has a substantial environmental impact. Packaging does have a purpose; it facilitates transportation, preparation, and consumption of food, and acts as a barrier against bacterial damage, insect infestation, moisture, and potential tampering. However, it's crucial to consider the environmental ramifications related to its use:

- The extraction and processing of fossil fuels, such as crude oil, that is used to create packaging materials, contribute to the release of significant greenhouse gases. This process plays a part in the rise of global warming.
- The production of packaging materials is energy-intensive, further contributing to global warming. Energy consumption during the manufacturing phase mainly comes from non-renewable sources, which also contributes to our carbon footprint.
- Packaging materials, particularly plastics and polystyrene, produce hazardous gases and chemicals when degrading in landfill sites. These toxic emissions can contribute to the greenhouse effect, potentially contaminating groundwater and polluting the soil, posing health risks to ecosystems and humans.
- Burning of waste packaging (burning waste at high temperatures) can lead to the release of greenhouse gases and other toxic pollutants into the atmosphere. This causes land degradation but can also instigate severe health issues for both humans and wildlife.
- Discarded food packaging often finds its way into oceans and waterways, posing a significant threat to marine life and promoting the growth of harmful algae blooms. This pollution diminishes water quality and disrupts the balance of aquatic ecosystems.
- The production of packaging materials requires significant amounts of water, a precious resource in a country like Australia, where water scarcity is a significant concern. The water used in packaging production could further deplete the nation's limited water supplies.
- Recyclable plastic dinnerware, due to its light weight and small size, often ends up in landfill. The sorting process at recycling facilities, typically designed for larger items, finds it challenging to effectively separate these materials, thereby reducing the overall efficiency of recycling efforts.
- Through understanding these challenges, we can identify the urgent need for improvements in packaging design, materials, disposal methods, and recycling processes to reduce the detrimental environmental impacts associated with food packaging.

Watch this video to learn more about the environmental impact of food packaging: https://youtu.be/_6xlNyWPpB8

Food Processing and Manufacturing

The food processing and manufacturing industry is responsible for turning agricultural and other substances into foods. This industry could impact the type of food packaging used in Australia by developing and promoting the use of environmentally sustainable food packaging.

Bioplastic Packaging

Biodegradable plastics have been developed as alternatives to conventional plastics. While they can be broken down by microbes, they are still made from crude oil and emit greenhouse gases during production. However, bioplastics, made from renewable resources like tapioca or cornstarch, are compostable, energy-efficient, and have lower carbon emissions compared to biodegradable and conventional plastics.

Watch this video to learn how bioplastics contribute to environmental sustainability: https://youtu.be/acluFG0kNLg

Edible Packaging

Edible packaging, as the name suggests, refers to packaging materials that are safe for consumption. Made from edible substances like plant fibres or seaweed, this innovative packaging can be consumed along with the food it holds. By eliminating the need for traditional single-use plastics, edible packaging offers a sustainable solution to reduce waste and minimize environmental impacts. It promotes a circular economy and contributes to a more eco-friendly approach to packaging.

It is made from edible materials, such as plant fibres or seaweed, and can be consumed along with the food it holds. Edible packaging reduces the need for single-use plastics and provides a more eco-friendly alternative. It

has the potential to decrease packaging waste and promote a circular economy by minimising environmental impacts.

A Melbourne-based company has introduced an edible coffee cup made from coconut oil, flour, oats, sugar, water, and wheat. The cup remains firm for about 40 minutes when filled with coffee and can break down in a garden or home compost system if not consumed within 2 weeks.

Watch this video about the Edicup: https://youtu.be/rvudOCYFO84

Insulated Packaging from Low-Grade Wool

Instead of using polystyrene, Australian food processing and manufacturing companies could use a product developed by an Australian manufacturing company. This company has developed packaging using low-grade wool to insulate and protect food, such as meat and seafood, during transport. This sustainable alternative offers both thermal insulation and protection during delivery.

Watch this video to learn the benefits of using low-grade wool as insulated packaging: https://youtu.be/acLb3sLJhOY

Plant-Based Packaging

Plant-based packaging refers to packaging materials derived from renewable plant sources like sugarcane, cornflour, or bamboo. These materials offer an eco-friendly alternative to traditional packaging made from fossil fuels. Plant-based packaging is recyclable, biodegradable, and helps reduce the environmental impact of packaging waste. While plant-based packaging may seem like a positive environmental solution, it can have implications for food security. The increased use of plant resources for packaging materials could result in less food being available to feed people.

Brownes Dairy, a West Australian Dairy Processor, has created milk cartons using a plant-based material that is 100% recyclable and renewable. These unbleached cartons reduce the environmental impact by 16% compared to regular milk cartons made from fossil fuels.

Watch this video to learn about Brownes dairy and its sustainable milk cartons: https://youtu.be/QRsEkiyS-Is

Food Retail and Service

The food retail and service industries include businesses where people acquire food. Many food retailers are beginning to use more sustainable packaging to reduce the environmental impact of food packaging.

Plastic Cutlery, Cups, and Plates Made with Recycled and Certified Sustainable Fibre

In February 2023, Victoria's food retail and service shops will be legally prohibited from providing customers with plastic cutlery, plates, and straws or polystyrene food packages. The new regulations do not apply to coffee cups or lids at this stage. The ban will apply to dinnerware made from biodegradable, compostable, conventional, and degradable plastic.

Many food retail and service providers such as McDonalds are working towards achieving this goal by the 2023 deadline. McDonalds have removed the plastic lid from the McFlurry sundae and stopped providing plastic straws and cutlery to their customers. Instead, they have started using fibre from renewable sources for their food packaging.

The major supermarket Coles has replaced all its plastic dinnerware with wooden bowls, cups, cutlery, and plates made from renewable sugarcane pulp.

Home Compostable Food Packaging

Compostable packaging is designed to break down in an industrial compost centre, not people's compost systems in their backyards. 'We Bar None' is a food manufacturing and retail company that uses food product packaging that decomposes in a home compost system. This means that if the wrapper ends up as litter, it will decompose. Because it is made from natural plants, it will not release any toxic residue.

Watch this video about Cole's steps towards environmental sustainability: https://youtu.be/2umKQTZMQns

Watch this video about how 'We Bar None' packages its food sustainably: https://youtu.be/8aDmLQ6xBwY

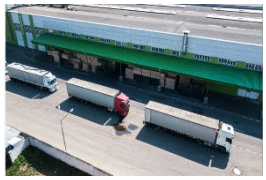
Food Transportation: Pathways to Environmental Sustainability

Transportation plays a significant role in global environmental degradation. It contributes to climate change through the emission of greenhouse gases, particularly carbon dioxide (CO2), from burning fossil fuels. Additionally, transportation infrastructure such as roads and airports can lead to habitat destruction and wildlife displacement. Noise and air pollution from vehicles impact both human health and local ecosystems. Water resources also suffer from oil spills and waste from ships. Electric vehicles and renewable fuel sources offer potential solutions, but they also present environmental challenges related to energy production and battery disposal. Transitioning to sustainable transportation requires careful planning and policy implementation. The environmental impact of transport is a complex issue.

Transporting food involves moving it from where it was produced to where it will be consumed. Food from farms is often transported to various factories, where it is made into new food products and packaged. It then moves to distribution centres and retail outlets before being transported by the consumer to their home.

The images below identify the possible journey of food sold at supermarkets.




Professor of Food Policy, Tim Lang, at City University, London created the term 'food miles' in the early 1990s. Food miles refers to the total distance food travels from where it was first produced to the consumer. Lang's theory suggested that the further a food is transported, the more carbon emissions are released, therefore, increasing the environmental impact of food. However, others argue that the distance food travels is one of many factors that contribute to a food's environmental footprint. Regardless of this, food transportation still negatively impacts the environment.

Various environmental issues are associated with food transportation:

- Crude oil used in the production of fuel is extracted from the Earth and underground supplies at sea. Drilling these areas to obtain oil can destroy natural ecosystems.
- Diesel and petrol are derived from fossil fuels and non-renewable resources such as crude oil. These fuels emit carbon dioxide and pollution into the atmosphere, which increases global warming.
- Food is usually transported in massive vehicles; the bigger and heavier the transport vehicle, the more emissions are released.
- Ships that spill crude oil at sea can impact the health of marine life by poisoning and suffocating animals and affecting their buoyancy and waterproofing abilities.
- Oil spills at sea can also release toxic chemicals into the ocean that impact the quality of food and poison the ecosystems in the area.

Various measures could be taken to reduce the impact of food transportation on food from the time it is produced to its disposal.

Food Processing and Manufacturing

Electric Trucks

Using electric trucks to transport food may help decrease the environmental impact of food transportation. An Australian company, Janus Electric, has designed a swappable battery for electric trucks. This battery can provide a truck's energy for almost non-stop travel between Brisbane and Sydney. While electric vehicles still use non-renewable resources, they do not emit carbon dioxide and pollutants into the atmosphere that a diesel or petrol vehicle releases. They are therefore considered a more sustainable option.

Modifying Food Packages

Packaging food into smaller-sized packages so that more products can be transported at once is another way to reduce the environmental impact of food transportation. In 2010, Cottees cordial decreased the size of its cordial bottles by producing a concentrated cordial. By putting a more concentrated liquid in a smaller package, the

manufacturer saved on freight costs and increased the amount of product they could transport in one load. This decreased the number of trucks needed to transport the cordial to stores and had a positive environmental impact.

Watch this video about electric trucks being used to transport goods in Australia: https://youtu.be/4rAKqch3oMQ

Watch this advertisement for Cottee's concentrate cordial: https://youtu.be/zAUSZ0Aw0f0

Food Retailing and Food Service

Grocery and Meal-Kit Delivery Services

Offering grocery and meal-kit delivery is how food retailers can help reduce the impact of transporting food on the environment. Efficient delivery services operate by working out the best route to travel to deliver groceries to customers in the shortest possible distance and time. These groceries are sometimes delivered straight from a distribution centre to the customer, further reducing the distance the food travels.

Sourcing Local Food

Food retailers like IGA are increasing the amount of food they sell from local providers. This decreases the distance the food travels from farm to retail.

Using Drones and Electric Bikes to Deliver Fast Food Meals

The number of people ordering their meals using food delivery services has increased rapidly in Australia over the last few years. Meal delivery services provide people with one meal that they can consume immediately. Delivery of one meal to one customer at a time can increase the overall distance food travels. Some fast food outlets provide employees with electric bikes to deliver food to overcome this problem. These bikes travel at 25 km per hour without getting held up in traffic. This significantly reduces fuel costs and produces fewer carbon emissions. Using drones to deliver fast food may also become mainstream in the future. Drones consume less energy per kilometre than delivery trucks.

Watch this video about how IGA stores are reducing the distance their food travels: https://youtu.be/JCoTA9upDk0

Watch this video about the use of drones to deliver groceries: https://www.youtube.com/watch?v=caJYSaVvUnQ

Food Marketing: Pathways to Environmental Sustainability

Marketing, often referred to as advertising, has a significant impact on the environment. Firstly, traditional forms of marketing such as print media contribute to deforestation and waste, while also using energy and resources in their production and distribution. Secondly, marketing plays a substantial role in driving consumerism. By creating demand for new products, it encourages overconsumption, leading to increased production, resource use, and waste. Furthermore, marketing can encourage unsustainable practices either by promoting products with high environmental footprints or by misleading consumers into believing a product is sustainable when, in reality, it is not.

On the positive side, marketing can also contribute to environmental sustainability. It can raise awareness about environmental issues, promote sustainable products and behaviours, and drive consumer demand towards more sustainable options.

Use of QR Codes

The marketing of food can adopt sustainable practices in various ways, with technology playing a crucial role. For instance, the use of QR codes is increasingly popular. Australian company Kialla Pure Foods offers QR codes on their product packaging that, when scanned, provide consumers with detailed information about a product's origins, ingredients, and the environmental impact of its production. This transparency can help consumers make more informed and sustainable choices.

Certification Logos

Food companies can use marketing to promote local and seasonal produce, which typically have a lower carbon footprint than imported or out-of-season goods. Highlighting organic, fair-trade, or plant-based options can also drive demand toward more sustainable food choices. A prime example is Loving Earth, an Australian company that produces chocolate and other products using organic and fair-trade ingredients. They prominently display these certifications on their packaging to inform consumers about their sustainable practices.

Sustainable Packaging

Packaging is an essential aspect of food marketing, and many companies are exploring sustainable options such as compostable packaging or minimal packaging strategies. One such company is Coles Supermarkets, one of Australia's largest grocery chains. Coles has pledged to make all of its own-brand packaging recyclable by the end of 2023.

Dyes and Inks

An essential feature of packaging is communicating information about a food product and for marketing. Unfortunately, the ink used to print marketing messages on food packages can be made from mineral-based oils. These oils are not biodegradable and therefore contribute to soil and water pollution when sent to landfill. The dye used to add colour to plastic can also pollute the environment. Some food processing and manufacturing companies, like BioPak, use biodegradable and water-based inks made from renewable resources such as vegetables on their food packages to reduce the environmental impact of using mineral-based oils.

Food Consumption: Pathways to Environmental Sustainability

Food consumption refers to the amount and types of food that individuals and populations eat. Without food, we simply can't survive. Our food consumption behaviours play an important role in environmental sustainability. The types of food we choose to eat, where we source it from, how it's packaged, and how we manage waste all contribute to the environmental footprint of our consumption patterns.

Food Choices and Environmental Impact

Different foods carry different environmental impacts. Generally, plant-based foods such as fruits, vegetables, legumes, and whole grains **use** fewer resources (like land, water, and energy) and result in fewer greenhouse gases than animal-based foods such as meat and dairy. A dietary shift towards more plant-based or flexitarian diets (a predominantly plant-based diet with occasional meat consumption) can lessen the environmental impact of our food consumption.

Sustainable Packaging and Bulk Purchasing

Packaging is another crucial factor to consider. Bulk purchasing reduces the volume of food packaging utilised and, consequently, the energy, materials, and resources expended in packaging. However, bulk buying is environmentally advantageous only if the food doesn't end up wasted. Although single-serve or multi-serve packages generally use more packaging, they may actually prove more sustainable for those who consume small amounts of food at a time, as they help minimize food waste.

Decreasing Shopping Trips

Our shopping habits also influence our carbon footprints. Frequent trips to the store, especially via car, can add significantly to carbon emissions. Planning meals in advance, preparing a comprehensive shopping list, and minimising the number of shopping trips can reduce the carbon emissions tied to sourcing our food.

Sourcing of Food

Where our food originates from also matters. Locally sourced food usually has a smaller carbon footprint compared to food that has been transported long distances. In many countries, including Australia, food labels must indicate where the food was grown, made, packaged, and produced, or from which country it was imported. This allows consumers to make informed decisions about the 'food miles' associated with their diets. Shopping at local farmers' markets can provide access to a range of foods that have been grown and produced locally, thereby minimising the environmental impact associated with long-distance transportation.

Food Disposal or Recycling and Repurposing: Pathways to Environmental Sustainability

Food disposal or recycling and repurposing play a crucial role in environmental sustainability. These practices offer significant opportunities for reducing greenhouse gas emissions, conserving resources, and maintaining the health of our ecosystems.

In April 2022, Sustainability Victoria reported that Victorian households discard 250,000 tonnes of edible food each year. Many people believe that when they put their waste in a rubbish bin, it will go to a landfill and decompose just as it would in a compost bin. However, this is not the case.

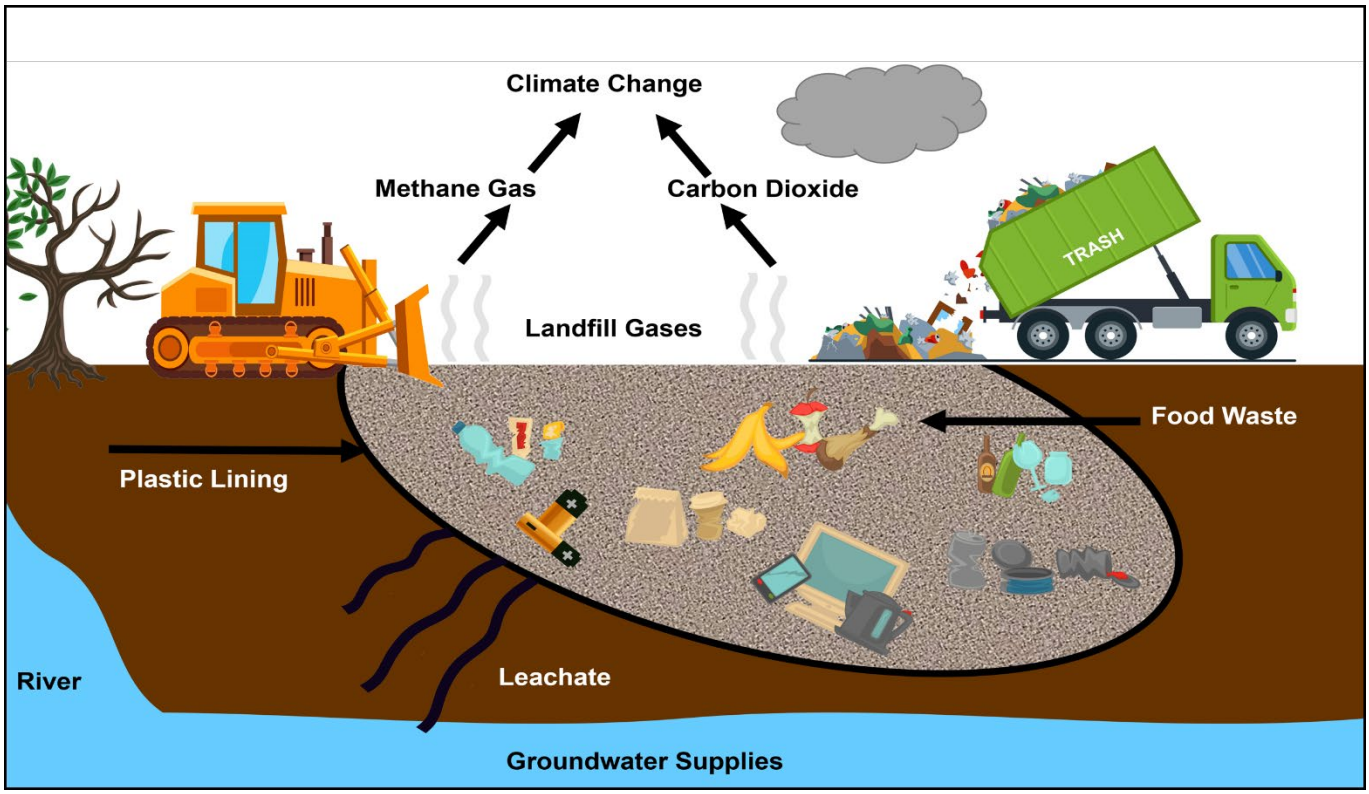
In both landfill and home compost systems, bacteria break down food. Most bacteria require oxygen to decompose food waste efficiently and safely. However, food that ends up in landfill is compacted by machinery, leaving little to no oxygen to aid in decomposition. Some bacteria can break down food without oxygen, but this process is slower and produces a strong smell. These anaerobic bacteria also emit significant greenhouse gases, carbon dioxide, and methane. Methane is more potent and concentrated than carbon dioxide in our atmosphere.

Another issue with landfills is the production of leachate. Leachate is a sludgy liquid produced when food mixes with various other materials in the landfill, such as batteries. Rainwater filters the leachate to the bottom of the landfill, potentially contaminating soil and groundwater supplies. Nowadays, landfills must have a lining and pipes to collect the leachate and prevent water and soil contamination. Despite these measures, leachate contamination in landfills can still occur.

Environmental Issues Associated with Food Disposal in Landfills:

- Transporting waste to landfill sites consumes fuel and releases additional carbon dioxide and pollutants into the environment.
- High amounts of methane gas, more toxic and potent than carbon dioxide, are released from food waste in a landfill, contributing significantly to global warming.
- Developing landfill sites requires clearing land, leading to habitat loss, land degradation, and reduced biodiversity.
- Landfills occupy space that could serve other community purposes or be left as areas for vegetation and wildlife.
- Rainwater passing through landfill material forms a thick liquid called leachate, which can contaminate nearby groundwater and soils.
- Resources used in food production, such as energy, fertilisers, pesticides, and water, are wasted when food ends up in a landfill.

The diagram below represents some problems associated with sending food waste to landfills.



Watch this video to learn more about the negative environmental impact of food disposal: https://youtu.be/ishA6kry8nc

Watch this video about food waste throughout the food system: https://youtu.be/Dx7RWtfgbVw

Note: The Food Studies curriculum focuses on issues in Australia rather than overseas.

Food Processing and Manufacturing

With its unique position in the food supply chain, the industry has the potential to drive substantial change in reducing or recycling and repurposing food waste.

Automation and Robotics

Automation in food processing can help streamline operations, reduce overproduction, and ensure consistency, thereby reducing waste. For example, Marley Spoon, a meal kit provider in Australia, uses automated production lines to pre-portion ingredients, reducing the risk of overproduction and waste.

Precision Machinery (machines and robots)

Using precision machinery reduces waste in food processing as products are cut or shaped with high accuracy, minimising scraps. Food companies like Ingham's Group Limited utilise precision machinery in their poultry processing lines to ensure efficient use of raw materials and minimise waste.

Waste-to-energy Technology

Waste-to-energy solutions are making food waste management more sustainable in Australia. A key example is McCain Foods' potato processing facility in Ballarat. McCain Foods has adopted an innovative approach by installing an anaerobic digester at their facility. This system converts organic waste from potato processing into biogas, which then powers the facility's operations.

Upcycling Food Waste

The concept of upcycling food waste involves technological innovations that allow the transformation of food waste into valuable products.

Goterra, an Australian company, uses a technology-driven system to manage food waste by feeding it to insects (specifically, Black Soldier Fly larvae). These insects are then harvested to produce livestock feed, transforming food waste into a valuable product. This innovative technology is automated and can be monitored remotely, ensuring efficiency and scalability.

CSIRO and Fresh Select have partnered to establish a new food manufacturing company, Nutri V. They use advanced food processing techniques to convert vegetables that would typically be discarded for not meeting retailers' quality standards into nutritious vegetable powders. The process involves technologies like rapid dehydration and fine milling to retain the nutritional quality of the vegetables while ensuring a long shelf life. These powders can then be used in various dishes, promoting healthier diets and reducing vegetable waste.

Watch this video to learn more about this business: https://youtu.be/xEka0FpmR5k

Watch this video to find out more about this innovation: https://youtu.be/pgwkuHPWFP0

Retail

The retail sector is utilising various traditional and technological innovations to repurpose food and reduce waste, creating more sustainable practices.

Inventory Management Software

Modern inventory management systems can forecast demand and optimise supply to reduce overstocking and subsequent waste. Some systems even integrate AI to improve forecasting accuracy.

Advanced Barcoding Systems

GS1, a manufacturing company, developed a 2D barcode system that aids in reducing food wastage. This technology won the Packaging Design Innovation Award in 2022 and is now being implemented at Woolworths. The barcodes allow staff to quickly scan packages to identify the use-by dates, enabling them to adjust prices for items approaching expiry, thereby minimising food waste.

Watch this video about the 2D barcodes and their ability to reduce food wastage: https://youtu.be/erqCcq52DDE

Food Repurposing

Woolworths, a major retailer in Australia, is an example of repurposing food waste to minimise losses. At one of their Sydney stores, unsold loaves of bread are transformed into frozen garlic bread to be sold, reducing food wastage and generating revenue.

Food Waste Apps

Several apps have emerged that connect retailers with consumers to sell surplus food at discounted prices, preventing it from becoming waste.

Bring Me Home is a Food Rescue App that facilitates the purchase of surplus food from businesses at discounted rates. It aids businesses in reducing food waste and allows consumers access to affordable meals. Businesses list their surplus food on the app, specifying pickup times. Consumers can then browse, purchase the discounted meals, and collect them at the specified time. This system helps to reduce the amount of food that goes to waste at the end of the business day, providing an affordable meal option for consumers while offering businesses a way to recoup some costs and reduce their waste output. As a mission-driven social enterprise, Bring Me Home also invests its profits into education and programs to further fight food waste and food insecurity, underlining the link between sustainability, food waste reduction, and community well-being.

Watch this video about the App, Bring Me Home: https://youtu.be/S79DN9S7hiU

Food Service

Reducing the amount of food wasted in food service businesses like cafes and restaurants is good for the environment and helps companies save money. The food service sector is increasingly turning to innovative strategies and technologies to minimise and repurpose food waste.

Meal Planning and Inventory Management Software

Melbourne-based restaurant Attica has been using a tool called Winnow, which helps track and manage food waste. By using this tool, the restaurant managed to cut its food waste by half, making substantial savings and becoming more sustainable

Food Donation Programs

OzHarvest, Australia's leading food rescue organisation, has developed an app called REAP by OzHarvest. It connects businesses with surplus food to local charities. Restaurants, cafes, and hotels can post about their extra food on the app, and nearby charities are notified to pick up and distribute the food, ensuring edible food doesn't end up in the bin.

Smart Waste Tracking Systems

Some Australian food businesses are starting to adopt waste tracking technologies. For instance, Dexus, an Australian Real Estate Investment Trust, piloted an initiative called the 'Smart Waste Project' in their shopping centres. By using smart meters, they monitored waste generation from food retailers in real-time, helping them identify where waste was coming from and how to minimise it. This data-driven approach has helped food retailers to make informed decisions to adjust their practices, leading to significant reductions in food waste.

Consumption

According to a 2019 report by the Australian Government, households are the largest contributor to food waste in the country, discarding over 3.1 million tonnes of edible food a year. This waste is not only costly - with the average Australian household throwing away nearly $1,036 worth of groceries each year - but it also has significant environmental implications.

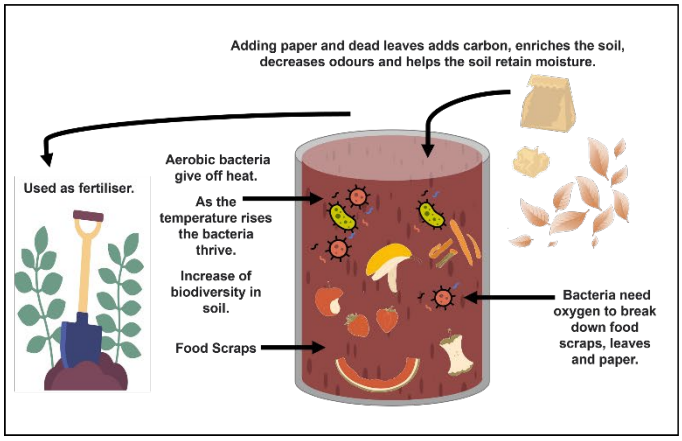
The food we waste is responsible for more than 5% of Australia's greenhouse gas emissions. When organic waste decomposes in landfills, it produces methane, a potent greenhouse gas. However, it's not all bad news. The good news is that we can make a significant impact on reducing this waste through smart and sustainable practices right in our own homes. By repurposing leftovers, composting, meal planning, and using innovative tools, households can lead the way in Australia's fight against food waste.

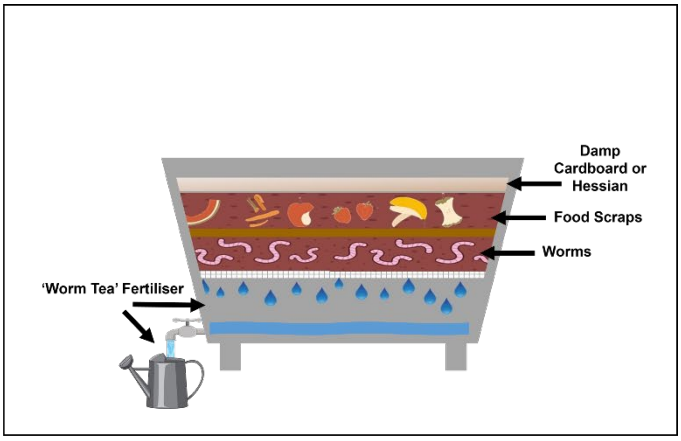
The are numerous practical strategies households can employ to reduce food waste. Not only do they help diminish food waste, but they also contribute to efficient resource utilisation, cost-saving, and overall sustainability.

Repurposing and Reducing Food Waste through Home Composting

Home composting and worm farming present a practical, eco-friendly solution to recycling food waste. These systems assist in the decomposition of organic matter such as fruits, vegetables, paper, and dead leaves. Fungi, insects, microbes, and worms utilise the oxygen in these environments to break down organic waste into a nutrient-rich fertiliser that can enhance soil quality and nourish plants. The process of composting not only reduces methane emissions and decreases the need for chemical fertilisers, but it also enhances biodiversity by attracting various organisms.

The diagram below shows how food in a home compost system decomposes.





Use leftovers creatively

Instead of discarding leftovers, find creative ways to incorporate them into new meals. For example, use leftover roasted vegetables in salads, omelettes, or wraps. Overripe fruits can be blended into smoothies or used for fruit-based desserts.

Make stocks and broths

Save vegetable scraps, such as carrot tops and onion peels, to make homemade vegetable stock. Leftover bones from meat or poultry can be used to create flavourful stocks or broths.

Freeze or can excess food

If you have surplus fruits, vegetables, or cooked meals, freeze them for later use. Alternatively, learn how to can and preserve seasonal produce for extended shelf life.

Get creative with ingredients

Explore different ways to repurpose ingredients. Stale bread can be transformed into breadcrumbs, croutons, or bread pudding. Wilted vegetables can be used in soups, stews, or stir-fries.

Utilise online platforms and apps:

Take advantage of meal planning apps that assist in creating weekly meal plans. These apps consider the ingredients you have and provide recipe suggestions, minimising food waste by optimising the use of existing ingredients.

SuperCook is a platform that enables users to find recipes based on the ingredients available in your pantry. Simply input your supplies, and it will suggest suitable recipes, helping you utilise existing ingredients efficiently.

Proper storage and organisation

Keep your pantry, refrigerator, and freezer well-organised to easily identify ingredients and use them before they expire. Appropriate storage techniques can help extend the shelf life of food items.

Meal Planning

Plan meals for the week and make a shopping list before you go to the store. Buy only what you need, and try to stick to the list.

Proper Storage

Store fruits and vegetables properly to increase their lifespan. Some fruits and vegetables produce gases as they ripen that can cause other produce to spoil faster.

Portion Control

Serve smaller portions to avoid unfinished meals. You can always go back for seconds.

Use-by and Best-before Dates

Understand the difference between "use-by" and "best-before" dates. Food is still safe to eat after the "best before" date, though it might not be at its best quality.

Repurposing Leftovers

Get creative with your leftovers instead of throwing them out. Leftover vegetables can go into a soup or stir-fry, and overripe fruit is great for smoothies or baking.

Innovations in technology can also help significantly reduce food waste at the consumption stage in the home.

Smart Fridges and Appliances

These devices can monitor your food supply, send alerts when items are nearing expiry, and suggest recipes to use up ingredients.

Written Activity One

Question Time

Answer the following questions:

Food Packaging: Pathways to Environmental Sustainability

1. What are the environmental impacts associated with food packaging? How do they contribute to climate change and pollution?

2. What is bioplastic packaging? Why is it considered sustainable? Are there any drawbacks to using bioplastic packaging?

3. What is edible packaging? Why is edible packaging considered an effective solution in reducing waste and minimising environmental impacts? Provide examples.

4. Why is polystyrene considered unsustainable? Why is low-grade wool being considered as a sustainable packaging option to replace polystyrene?

5. What kind of plant-based packaging materials are used in the food industry? What are the benefits and concerns related to using plant-based packaging?

Food Transportation: Pathways to Environmental Sustainability

6. What are the environmental impacts associated with food transportation, and how do they contribute to climate change and pollution?

7. How can electric trucks contribute to reducing the environmental impact of food transportation?

8. In what ways can food retailers and food service providers reduce the distance their food takes to get to their In what ways can food retailer and food service providers reduce the distance their food takes to get to their consumers?

9. How can the marketing industry ensure its practices are sustainable?

Food Disposal or Recycling and Repurposing: Pathways to Environmental Sustainability

10. What are the environmental implications of food disposal in landfills, and how can we address this issue?

11. What are some strategies that households can employ to reduce food waste and contribute to environmental sustainability?

12. How can the food service industry contribute to reducing food waste and promoting environmental sustainability?

Written Activity Two

Case Studies: Food Processing and Manufacturing, Retailing and Consumption

In this activity, you will form groups of 3 to 5 students.

1. Read the case study carefully.
2. Discuss the questions within your group, considering possible answers based on the knowledge and concepts covered in the chat. These case studies are designed to encourage critical thinking and group discussion. The answers to the questions are not explicitly provided in the text but require you to analyse the information given, think creatively, and share your ideas with your group members. There may be multiple valid answers to the questions.
3. Take notes or document your group's discussions, recording the key points and insights shared.
4. Share your group's findings and listen to other groups' perspectives and consider different viewpoints.

Case Study 1: Food Packaging Innovation

A large food manufacturing company is exploring sustainable packaging options for their products. They are considering transitioning from single-use plastic packaging to more environmentally friendly alternatives, such as compostable packaging made from plant-based materials. However, they are concerned about the cost implications and the impact on product shelf life.

Questions:

1. What are the environmental challenges associated with single-use plastic packaging?
2. Discuss the potential benefits of transitioning to compostable packaging made from plant-based materials.
3. How might the transition to sustainable packaging affect the company's product shelf life and overall costs?
4. What ethical considerations should the company consider when making packaging decisions?
5. What other innovative approaches could the company consider to reduce the environmental impact of packaging?

Case Study 2: Food Transportation Efficiency

A grocery delivery service is looking for ways to improve the efficiency of their food transportation system. They currently use a fleet of delivery trucks, but they are interested in exploring alternative options to reduce fuel consumption and carbon emissions. They are considering implementing electric delivery vehicles and optimising their delivery routes using advanced algorithms.

Questions:

1. What are the environmental challenges associated with traditional delivery trucks powered by fossil fuels?
2. Discuss the potential benefits of transitioning to electric delivery vehicles.
3. How can optimising delivery routes using advanced algorithms help reduce fuel consumption and carbon emissions?
4. What ethical considerations should the grocery delivery service consider when making these changes?
5. What other innovative approaches could the grocery delivery service explore to improve the environmental sustainability of their transportation system?

Case Study 3: Food Waste Reduction in Restaurants

A popular restaurant chain is committed to reducing food waste in their operations. They want to implement strategies to better manage their food inventory, reduce overproduction, and repurpose leftover ingredients. They are considering implementing inventory management software, donating surplus food to local charities, and creating new menu items using food that would otherwise go to waste.

Questions:

1. What are the environmental challenges associated with food waste in restaurant operations?
2. Discuss the potential benefits of implementing inventory management software in reducing food waste.
3. How can food donation programs help minimise food waste and contribute to sustainability?
4. What ethical considerations should the restaurant chain consider when managing food waste?
5. What other innovative approaches could the restaurant chain explore to further reduce food waste and promote sustainability?

Case Study 4: Sustainable Food Choices

A group of friends are passionate about promoting sustainable food choices among their peers. They are organising an event to raise awareness about the environmental impact of food consumption and encourage individuals to make more sustainable food choices. They plan to showcase plant-based alternatives, locally sourced ingredients, and the benefits of reducing food waste.

Questions:

1. What are the environmental benefits of choosing plant-based alternatives over animal-based foods?
2. Discuss the advantages of sourcing ingredients locally in terms of reducing the carbon footprint of food.
3. How can individuals reduce food waste in their daily lives, and what impact does this have on sustainability?
4. What ethical considerations should individuals consider when making sustainable food choices?
5. What other innovative approaches could the group explore to promote sustainable food choices among their peers?

Case Study 5: Recycling and Repurposing Food Waste

A community organisation is implementing a food waste recycling and repurposing program in their local area. They collect food waste from households, restaurants, and supermarkets and convert it into compost for community gardens. They also repurpose surplus food by creating packaged meals for those in need.

Questions:

1. What are the environmental benefits of recycling and repurposing food waste?
2. Discuss the challenges and potential solutions for collecting and managing food waste from various sources.
3. How can composting food waste contribute to sustainable gardening and soil health?
4. What ethical considerations should the community organisation consider when implementing the recycling and repurposing program?
5. What other innovative approaches could the organization explore to further reduce food waste and maximize its environmental impact?

Practical Activity One

Let's do the Bus Stop!

In this activity, there are some stations set up, each featuring a different activity related to the impact of food processing and manufacturing, retailing and consumption in Australia, including food packaging, food transportation, marketing, retailing, food service, and consumption and disposal or recycling and repurposing of food. production.

You will work in small groups and rotate through the stations, completing the activities at each one. Your task will be to record your results and take notes on the discussions held. You may find that you will be able to use some of these activities in your Research Inquiry Report.

Activity 1: Comparative Food Testing – Food Miles

1. **Study** each of the snack foods at this station and list them in the first column.
2. **Use** Google Maps to record the distance the food has travelled from the manufacturers address to you.

   Go to this link: https://www.google.com/maps/

   Enter your school's name in the search field.

   Select directions.

   Enter the address of the manufacturing company.

   Record the distance in kilometres between your school and the manufacturing company in the second column of the table below.
3. **Go to** this website: https://co2.myclimate.org/en/car_calculators/new/

   Enter the distance your food travelled between your school and the manufacturing company.

   Select a type of fuel.*

   Click on "I don't know the consumption and would like to make an estimation based on the car type".

   Enter a car type.*

   Note: *Select what you like but keep these details the same for each product/distance you enter.

   Record an estimate of the amount of CO_2 used in the third column.

Food Product	Distance Travelled in Kilometres	Estimated Amount of CO_2 used

Group Discussion Questions:

- What are the advantages of using distance as a measure of food miles?
- What are the limitations or potential drawbacks of relying solely on distance?
- Are there any other factors that should be taken into account when measuring food miles? If yes, what are they?
- Reflect on the simplicity of this analysis, what other factors might influence the environmental impact of food transportation?

Activity 2: Comparative Food Testing – Energy and Water

1. **Study** each of the food that three fictional families have thrown out at the end of one day.
2. **Go to** this website: http://www.iga.com.au/food-smart/calculator/
3. **Use** the website to calculate the amount of electricity wasted (using mobile phone charging as a measurement) and the quantity of water lost due to discarding this food.
4. **Record** the results in columns 3 and 4.

Family	Food Item	Energy: Electricity (Mobile phone charges)	Water
The Savoury Carnivores	1 x rotisserie chicken that is four days old.		
	1 x out-of-date quiche pie that we forgot about		
	½ carton milk past it's use-by-date		
	1 x rotten pear that was at the bottom of the fruit bowl.		
	3 x stale bread rolls, we got lunch orders instead.		
	Total		
The Fresh Fusion Family	1 punnet of strawberries that were mouldy when we bought them.		
	1 capsicum that nobody liked in the stir-fry		
	1 soggy lettuce that we accidentally froze in the back of the fridge.		
	1 carton of cream bought on special because it was near its use-by date and never used.		
	1 leftover sausage from a barbecue over the weekend where we overestimated the amount we needed.		
	Total		
The Veggie Vanguards	3 rotten bananas that were left to ripen for too long		
	1 mouldy mango with a few fruit flies buzzing around it.		
	1 bowl of dip made from eggplant and capsicum that was left out for more than 4 hours when friends came over.		
	3 cups of orange juice that were made from 8 fresh organs that no one drank for breakfast		
	1 unwanted milkshake made from 250 ml milk and a banana		
	Total		

Group Discussion Questions:

- How does the amount of electricity wasted, and water lost due to food waste align with your initial expectations? Were you surprised by any of the calculations?
- In your opinion, which family's food waste had the most significant impact in terms of energy and water waste? What factors contributed to this outcome?
- Reflecting on the data gathered, what are some potential strategies or changes that the families could implement to minimise energy and water waste caused by food disposal?
- Consider the larger implications of food waste beyond just energy and water consumption. How does food waste impact issues such as food security, resource allocation, and environmental sustainability?
- How can individuals and communities raise awareness about the environmental consequences of food waste and encourage responsible food management practices? Share some ideas or initiatives that you believe could make a meaningful difference.

Activity 3: Waste Sorting Activity

1. Open the bin labelled ‘household rubbish’ that your teacher has provided.
2. Examine food waste and identify items that can be recycled and those that need to be sent to landfill.
3. Record each item and weight in the table below under the appropriate heading: Compostable, Recycling, Reusable, and Landfill.

Compostable	Recycling	Reusable	Landfill

Class Discussion Questions:

- What items did you find in the food waste bin that can be recycled? Why are these items recyclable?
- What items did you find that cannot be recycled and need to be sent to landfill? Why are these items not recyclable?
- Discuss the importance of proper waste management and the environmental impacts of food waste.
- Brainstorm strategies to reduce food waste at home and in the community.
- How can recycling and proper waste management contribute to environmental sustainability?

Activity 3: Audit – Counting the Miles!

Read the two scenarios below:

The Greenfields

Mr. and Mrs. Greenfield and their two children reside in a charming cottage on the outskirts of town. They are passionate about supporting local food systems and reducing their environmental impact. They have a compact electric vehicle.
Every six months, the Greenfields make a pilgrimage to "Harmony Farms," a small family-owned farm located 15 kilometers away. There, they purchase half a cow that they will consume over the next six months.
In addition to their half-yearly farm visits, the Greenfields visit the "Fresh Harvest Grocery Store" once a week. Despite it being a 100-kilometer drive, they embrace the opportunity to support local farmers by selecting fresh, seasonal produce and other essential groceries. By consolidating their shopping into a weekly trip, the Greenfields reduce their overall transportation frequency and associated carbon emissions.

To complete their sustainable shopping routine, the Greenfields enjoy the convenience of "Greens on Wheels," a local greengrocer who delivers an assortment of fresh fruits and vegetables to their doorstep every week.

The Wheelers

Mr. and Mrs. Wheeler and their two teenagers reside in the heart of town; they rely on convenience and daily shopping trips to fulfill their food needs.
The Wheeler family owns a large SUV, which consumes more fuel than the average car due to its size and engine type. Although not the most environmentally friendly option, it meets their transportation requirements for hauling equipment and accommodating their family's needs.

On a daily basis, the Wheelers drive their SUV to the grocery stores located within the town to shop for their meals. The stores are just a short distance away, but the reliance on their car for daily trips results in unnecessary carbon emissions and fuel consumption.

1. **Enter** the distance each family travels for food on a weekly basis; this will involve solving some mathematical equations.
2. **Go to** this website: https://co2.myclimate.org/en/car_calculators/new/
3. **Select** a type of fuel.
4. **Click on** "I don't know the consumption and would like to make an estimation based on the car type".
5. **Enter** a car type.
6. **Record** an estimate of the amount of CO_2 used by each family when shopping for food on a weekly basis.

Family	Distance Travelled in Kilometres	Estimated Amount of CO_2 used
The Greenfields		
The Wheelers		

Group Discussion Questions:

- How does the transportation of food contribute to environmental effects?
- How does the Greenfields and the Wheeler's choice of vehicle and shopping frequency impact their carbon footprint?
- How does purchasing meat directly from a local farm and selecting fresh, seasonal produce from a local grocery store contribute to environmental sustainability?
- How does the home delivery service contribute to reducing transportation emissions? Can similar services be implemented on a broader scale?
- How can reducing food miles improve environmental sustainability within the food system?

Activity 4: Creating and Responding to a Design Brief - Emily's Sustainable Kitchen Challenge

Emily is a passionate environmentalist who loves experimenting in the kitchen. She recently learned about the impact of food waste on the environment and wants to do her part in reducing it. To inspire others to join her cause,

she decides to create a digital cookbook filled with delicious recipes that use up common food waste items. Emily needs your help to come up with innovative recipes that incorporate the assigned food waste items and pantry staples.

Your Task:

1. Choose one of the assigned food waste items from the list:
    - Food scraps (vegetable peels, fruit skins)
    - Stale bread and pastries
    - Leftover cooked rice, pasta, or grains
    - Overripe fruits and vegetables
    - Unused or leftover herbs and spices
    - Bruised or overripe bananas
2. Brainstorm a food item that incorporates the assigned food waste item(s) along with the pantry staples provided. Think about the flavours, textures, and cooking methods you want to incorporate.
3. Sketch an image of your new food product. Annotate the sketch to explain the different components and how you have incorporated food waste into the food product. Use arrows, labels, and descriptions to make it clear.

    Or

    Create a recipe for your food product. Include a list of ingredients, the quantities required, and the method to follow. Be sure to highlight how you have utilised the assigned food waste item(s) and incorporated pantry staples.

Group Discussion Questions:

- Why is it important to reduce food waste and incorporate food waste items into recipes?
- What are some creative and innovative ways to incorporate the assigned food waste item(s) into recipes?
- How can we educate and inspire others to adopt sustainable cooking practices and utilise food waste items in their recipes?
- Are there any cultural or traditional recipes that traditionally use food waste? How can we draw inspiration from these recipes?

Activity 5: Demonstration – Compost Creators

In this activity, your group will use the items listed below to create:

- a miniature compost system and demonstrate the decomposition process.
- a miniature landfill site.

You will be required to use these mini-models to demonstrate the decomposition process of food in each model to your classmates.

Equipment

- Organic Waste (such as vegetable peels, fruit scraps, coffee grounds, tea bags, and shredded paper)
- Carbon-rich items like dried leaves, straw, shredded newspaper, and cardboard.
- Compost Bin or Container with holes for aeration and drainage.
- Garden soil or potting mix
- Water in a spray bottle.
- Large tray or shallow box (representing the land)
- Plastic sheet or garbage bag (to line the bottom of the tray)
- Assorted materials for waste (e.g., paper, plastic, food scraps, etc.)
- Sand
- Rocks or pebbles
- Scissors
- Plastic cup
- Labels or markers
- Thermometer (optional): If available, provide a compost thermometer. This can be used to monitor the temperature inside the compost system, which indicates the activity of microorganisms. 55 to 71 degrees Celsius is an ideal temperature for microbial growth in compost.

Group Discussion Questions:

- How does the composting process contribute to environmental sustainability within the food system? What specific benefits does composting offer?
- In contrast, what did you observe in the miniature landfill site? How does this relate to the environmental effects of food disposal?
- What are the potential environmental consequences of improper food disposal in landfills? How can these impacts be mitigated?
- Based on your observations and knowledge of the food system, what pathways or strategies can be implemented to improve environmental sustainability in relation to food processing, packaging, transportation, marketing, retailing, food service, and consumption?

Summary Activity

Food Processing and Manufacturing, Retailing and Consumption & the Environment

What is the main idea about this key knowledge & key skill? (Two or three sentences in your own words)	
What are some innovative approaches and technologies being implemented in Australia to address energy and water consumption challenges in the food system?	
Identify three environmental concerns that relate to the use of packaging.	
Provide two examples of environmentally sustainable packaging and describe each.	
Food Processing and Manufacturing	
Food Retail and Service	

Identify three environmental concerns that relate to the transportation of food.	
Provide two examples of how to reduce the impact of transportation on the environment.	
Food Processing and Manufacturing	
Food Retail and Service	
Identify three environmental concerns that relate to the marketing of food.	
Provide two examples of how to reduce the impact of marketing on the environment.	
Food Processing and Manufacturing	
Food Retail and Service	
Identify two environmental concerns that relate to food consumption.	

Provide two examples of how to reduce the impact of food consumption on the environment.	
Identify three environmental concerns that relate to food disposal or recycling and repurposing.	
Provide two examples of how to reduce the impact of food waste on the environment.	
Food Processing and Manufacturing	
Food Retail and Service	
Consumption	

Exam Preparation

Multiple-Choice Questions (5 marks)

Choose the response that is correct or that **best answers** the question.

1. When food that is not consumed is thrown away, what else could potentially be wasted?
    a. Money
    b. Water
    c. Energy
    d. All of the above

2. Which statement is incorrect?
    a. Landfills can create dangerous levels of gas emissions
    b. Leachate, the liquid mass produced in landfills, has the potential to contaminate groundwater supplies.
    c. Rotting fruit in landfill produces methane gas as a result of lack of oxygen and sunlight.
    d. Methane gas produced in landfills is less potent than carbon dioxide.

3. Melbourne-based company has introduced an edible coffee cup made from coconut oil, flour, oats, sugar, water, and wheat. The cup remains firm for about 40 minutes when filled with coffee and can break down in a garden or home compost system if not consumed within 2 weeks.

    Identify the option that raises a valid concern regarding the development of products like the Edicup and the environment:
    a. The amount of energy used to make the Edicup contributes to the use of fossil fuels and contributes to global warming.
    b. The Edicup is made from edible material that could be used to feed people impacted by food security.
    c. The Edicup reduces the use of single-use plastic cups, reducing plastic waste.
    d. The Edicup provides a unique and enjoyable coffee-drinking experience.

4. Study the data in the table below:

Emission factors for freight by transport mode (kilograms of CO_2eq per tonne-kilometre)		
Transport Mode	**Ambient transport (kg CO_2eq per tonne-kilometre)**	**Temperature-controlled transport (kg CO_2eq per tonne-kilometre)**
Road Transport	0.2	0.2 to 0.66
Rail Transport	0.05	0.06
Sea/ Inland Water Transport	0.01	0.02
Air Transport	1.13	1.13

*(*Ritchie, H., 2020. Whether food travels by sea or air makes all the difference. *Our World in Data.*

Zheng, S. S., 09. *RMIT University, Misconceptions of food packaging aggravates food waste problem.* [Online] Available at: https://www.rmit.edu.au/news/all-news/2023/may/food-waste [Accessed 11 July 2023].

Refer to the data provided in the table and select the food product that is the most sustainable based on the given emission factors for freight by transport mode?

a. Fresh vegetables transported by road in temperature-controlled containers.

b. Fresh fish transported by rail in ambient conditions.

c. Frozen meat transported by sea/inland water in temperature-controlled containers.

d. Fresh fruits transported by air in ambient conditions.

5. How can the use of QR codes on food packaging contribute to the reduction of global warming?

a. Manufacturers could include information on QR codes, such as recipe ideas, that they might normally include on leaflets, thereby reducing the amount of print material generated and lowering carbon emissions from production and disposal.

b. QR codes can provide information about nutrition, which may help consumers make healthy food choices.

c. QR codes provide an opportunity to incorporate additional information on food packages that they would normally not give to consumers.

d. Manufacturers could include videos from their social media platforms via QR codes, thereby reducing their advertising costs.

Short Answer Questions (15 marks)

Question 1 (3 marks)

"Recent Research by RMIT University revealed most Australians think food packaging waste is a bigger environmental issue than food waste – but the opposite is true.

Zheng, S. S., 09. RMIT University, Misconceptions of food packaging aggravates food waste problem. [Online] Available at: https://www.rmit.edu.au/news/all-news/2023/may/food-waste [Accessed 11 July 2023].

Outline three ways that consumers can reduce the amount of food they waste. 3 marks

Question 2 (4 marks)

The food retail or service sector refers to businesses that sell and provide food to consumers. This includes grocery stores, restaurants, cafes, and food delivery services.

a. Explain why food might be wasted during food retail and the service component of the food system. 2 marks

b. Describe what could be done to overcome the issue identified in part a. 2 marks

Question 3 (4 marks)

A food processing company that makes vegetable-based chips wants to minimise the environmental impact of its packaging. The company also has a zero "food waste policy," which aims to minimise food waste and efficiently use resources.

a. Explain what the company could do to ensure that its food packages are sustainable. 2 marks

b. Explain what the company could do to ensure it meets its "zero food waste" policy. 2 marks

Question 4 (4 marks)

Provide two environmental reasons why an increasing number of consumers choose to supply their own reusable containers and shopping bags when doing their grocery shopping.

Reason One

Reason Two