UNIT 2 GEOGRAPHIES OF INTERCONNECTIONS

TOPIC 11

For better or worse?

11.1 Overview

11.1.1 Introduction
The development of technology and communication around the world has had both positive and negative effects. One positive outcome is that advances in technology have made people's lives more interconnected. On the other hand, drawbacks include a widening gap between the 'haves' and the 'have-nots', and some negative effects on the environment. Therefore, it is essential to ask whether we are better off or worse off with ever-improving technology and communication.

Starter questions
1 What percentage of students in your class have a mobile phone? How many times a day do you use your mobile phone?
2 If you wanted to discard your outdated mobile phone, do you know how to do so responsibly? Do you think about where your e-waste goes?
3 Have you ever considered how many people in developing countries have access to the internet?
4 When did you last 'Google' the answer to a question?

Inquiry sequence

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11.2 How do you communicate?

11.2.1 Communication technology

Youth culture is strongly linked to the use of communication technology. More than 800 million adults in the world lack basic literacy skills, yet the boom in information and communication technology is skyrocketing. A survey conducted in 23 countries explored the media access and media use of 12-year-olds. The study showed that in 97 per cent of the countries surveyed, the inhabitants received at least one television channel. However, less accessible were personal computers (23 per cent) and the internet (9 per cent). Internet use among youths in developed countries is increasing at a rapid rate.

11.2.2 Who uses the internet?

Internet access in Australia is continually growing. Households with children have greater access to a computer and the internet at home than do households without children. This reflects the growing digital culture among youth (see figure 1).

It is often thought that internet communication is all done via satellite. However, that is not the case. There are also fibre optic cables under the sea that help link the network of networks that is the internet, as shown in figure 2. These cables improve the speed of the internet in Australia. New cable, which connects Australia to the United States via New Zealand, will assist in creating the national broadband network.

![Figure 1: Households with access to the internet in Australia, 1998–2008](source: ABS 2008)

![Figure 2: The global submarine cable network, which helps connect the world’s internet network](source: Telegeography)
11.2.3 What is web 2.0?
The World Wide Web is a way of accessing and spreading information on the internet. Web 2.0 technology enables the sharing of online information and ideas that anyone has created. It is the second generation of the World Wide Web, and enables collaboration and exchanging of information online. This is different from the original Web 1.0, which is considered to be read only (see figure 3). Web 1.0 allowed users only to search and read information. The nature of Web 2.0 makes it popular, because it is an easy form of communication technology to use. There is a variety of different types of Web 2.0 applications, including Facebook, YouTube, Wikipedia, Flickr and Myspace.

11.2.4 Mobile phones
Mobile phones are a form of wireless communication that is transmitted via radio wave or satellite transmission. They are no longer used solely for conversation. With new technology, mobile phones and smartphones are now a source of almost endless information. They can help people find their way from place to place, can be used as a diary, take photos and videos, print documents wirelessly, do banking, record music and much more. Mobile phones bridge the domains of communication and information technology. The Australian Bureau of Statistics (ABS) estimates that 29 per cent of all children owned a mobile phone in 2012. It was also noted that ownership increased with age. Two per cent of 5- to 8-year-olds owned mobile phones, while 73 per cent of 12- to 14-year-olds owned them.

11.2.5 Information and communication technology
Information and communication technology is now used for a variety of purposes to make connections. We often do not realise how convenient our lives have been made by various forms of communication. Some of these include online and telephone banking, storing and sharing of medical records, online shopping and online games.

Skype is another example of an online communication medium — this service makes it possible for anyone with an internet connection to converse in the form of a video call with someone else anywhere in the world. Skype is also available as a mobile phone application, allowing any user to have a more interactive telecommunication experience. This simple form of communication technology improves the interconnectedness of places around the globe.
11.3 Who has access to technology?

11.3.1 Who owns mobile phones?

When we think of using the internet and mobile phones, we often forget about those who do not have access. Access is not equal across the world, let alone Australia. This is also related to government expenditure on the infrastructure needed to access information and communication technology.

Today it seems that mobile phones have become the most important form of communication. However, it is interesting to note that not everyone in Australia owns one, and Tasmania actually has the highest proportion of mobile phone ownership (see figure 2). As at June 2015, there were 21 million mobile phone users in Australia.

Mobile phone use across the globe is also uneven. This could be due to a variety of factors, such as access, financial situation and way of life. Some countries, such as Saudi Arabia, have 180 mobile phones per 100 individuals, indicating that some people own two devices. In Bangladesh 76 mobile phones are owned per 100 individuals.

**FIGURE 1** Internet users (per 100 people) in 2008–12
11.3.2 Internet access
Some of us take for granted the fact that we can access the internet almost everywhere we go, whether we are at home, at school, at the shops, or even walking down the street. While this might not be the case for everyone in Australia, it is definitely not the case for everyone in the world (see figure 1).

11.3.3 ICT expenditure
It is important to note that the amount of money spent by individual countries on information and communication infrastructure can play a vital role in consumer access and uptake. Figure 3 indicates expenditure on information and communication technology (ICT) as a percentage of GDP. This map shows that expenditure across the globe is uneven and there is no set pattern. It is difficult to correlate access to ICT with country expenditure; for example, Australia spends between 3 and 6 per cent of its GDP, but access is relatively high. In contrast, a developing nation such as Bangladesh spends 9 to 12 per cent of its GDP, yet access is limited.

It is interesting to note that Estonia, a small country in Europe, sets a worldwide benchmark by providing free wireless internet access almost everywhere. A group of volunteers successfully lobbied Estonian cafes, hotels, hospitals, local governments and small business owners to provide this free access, which has been made available in a country with a GDP per capita of about $US 20 000; considerably lower than that of Australia, which has a GDP per capita of about $US 61 000. As a result, Estonian society has become reliant almost entirely on information in electronic form — doctors issue only electronic prescriptions, voting is conducted online, and government cabinet meetings are now paperless. Not only has free wifi helped the environment, it has also led to a better educated society.

![Figure 2: Mobile phone ownership by Australian states and territories](source: ABS 2009)

**FIGURE 2** Mobile phone ownership by Australian states and territories

![Figure 3: Expenditure on information and communication technologies by country, 2015](source: World Bank. 2016. The Little Data Book on Information and Communication Technology 2015. Washington, DC: World Bank.)

**FIGURE 3** Expenditure on information and communication technologies by country, 2015

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**GDP** gross domestic product — the value of all the goods and services produced within a country in a given period of time. It is often used as an indicator of a country’s wealth.
**ACTIVITIES**

**REMEMBER**
1. Refer to figure 2. Which two states have the same percentage of mobile phone ownership?

**DISCOVER**
2. Research the reasons for Senegal and Morocco having a high expenditure on ICT.
3. Using figure 1 and the Mobile phone subscriptions weblink in the Resources tab, explain how global internet users and mobile phone subscribers are spatially interconnected. What are the similarities and differences?

**THINK**
4. Refer to figure 1. What factors do you think affect the pattern of internet use throughout the world?

**PREDICT**
5. Refer to figure 3. Where in the world do you predict there will be an increase in infrastructure expenditure in the next 10 years? Explain.

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**11.4 What are the consequences of unequal access?**

**11.4.1 What is the digital divide?**

Unequal access to information technology creates a division between people with access and people without. Such divisions can have implications for economic growth and social equity. How often do you consider access to the internet as a necessity, not a luxury item?

There is a growth in internet access worldwide. However, the gap between low-income and middle-income countries is widening. This is known as the digital divide. The divide is primarily based on internet access, but it includes all forms of information and communication technology, as can be seen in tables 1 and 2.

It is also evident within countries that some people have access to high-speed internet, while others only have access to dial-up internet. This may be because of:
- income levels
- availability in local areas
- capabilities of computers and laptops
- the speed of internet access
- the level of technology assistance
- the price of connections
- capabilities of mobile phones.

This gap does not necessarily divide society in two. It is also important to note that large populations do not always correlate with increased internet access (see figure 1).

The digital divide is not fixed or static; it changes as the structure and characteristics of the population shift. Digital disadvantage is a dimension of poverty, which leaves people with a sense of powerlessness. If your ability to connect to information and communication technology is limited, this can affect what you are able to do with your life.

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**TABLE 1 Middle-income countries, 2005 and 2014**

<table>
<thead>
<tr>
<th>Sector performance</th>
<th>2005</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed-telephone subscriptions (per 100 people)</td>
<td>13.5</td>
<td>10.2</td>
</tr>
<tr>
<td>Mobile/cellular telephone subscriptions (per 100 people)</td>
<td>23.4</td>
<td>93.6</td>
</tr>
<tr>
<td>Fixed (wired) broadband subscriptions (per 100 people)</td>
<td>1.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Households with a computer (%)</td>
<td>14.1</td>
<td>32.2</td>
</tr>
<tr>
<td>Households with internet access at home (%)</td>
<td>6.7</td>
<td>32.5</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International voice traffic, total (minutes/subscription/month)</td>
<td>3.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Individuals using the internet (%)</td>
<td>7.1</td>
<td>34.1</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population covered by a mobile/cellular network (%)</td>
<td>86</td>
<td>97</td>
</tr>
</tbody>
</table>

**TABLE 2 Low-income countries, 2005 and 2014**

<table>
<thead>
<tr>
<th>Sector performance</th>
<th>2005</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed-telephone subscriptions (per 100 people)</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Mobile/cellular telephone subscriptions (per 100 people)</td>
<td>3.9</td>
<td>57.2</td>
</tr>
<tr>
<td>Fixed (wired) broadband subscriptions (per 100 people)</td>
<td>0.00</td>
<td>0.2</td>
</tr>
<tr>
<td>Households with a computer (%)</td>
<td>1.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Households with internet access at home (%)</td>
<td>0.3</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International voice traffic, total (minutes/subscription/month)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Individuals using the internet (%)</td>
<td>1.0</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population covered by a mobile/cellular network (%)</td>
<td>38</td>
<td>—</td>
</tr>
</tbody>
</table>
11.4.2 Why bridging the gap is important

- **Economic equality.** Some social welfare services are administered electronically, so access to a telephone and the internet is important. The telephone also provides security, and can be used in emergency situations. In addition, access to the internet can be important for career development and accessing civic information.
- **Social mobility.** Computers play an important role in learning and education. The digital divide is unfair for children in lower socio-economic groups. The higher the qualification held by an individual, the more likely they are to have internet access at home.
- **Democracy.** Some people think that access to the internet creates a healthier democracy. It is thought that it increases public participation in elections and decision-making processes.
- **Economic growth.** Information and communication infrastructure and active use could stimulate economic growth, particularly for less developed nations. Economic changes and improvements tend to be associated with information technology. Certain industries can give a country’s economy a competitive advantage.

**ACTIVITIES**

**REMEMBER**
1. Define the term *digital divide* in your own words.

**EXPLAIN**
2. Refer to tables 1 and 2.
   a. Comparing low-income and middle-income countries, what *changes* have occurred between 2005 and 2014 to the percentage of individuals using the internet? Why?
   b. Comparing low-income and middle-income countries, what *changes* have occurred between 2005 and 2014 to the percentage of fixed telephone subscriptions? Why?

**PREDICT**
3. Based on table 2, predict how many people in low-income countries will have access to mobile networks in 2100. Give reasons for your answer.

**THINK**
4. Why do you think the uptake of mobile/cellular telephone subscriptions in middle-income countries has been significantly higher than in low-income countries? Explain.
11.5 How has technology improved lives in developing countries?

11.5.1 The situation in Kenya

While there is a difference between the developed and developing world, it is important to note that access to the internet and mobile phone networks is improving. This is largely thanks to non-government agencies and to service providers. The people of Kenya, for example, no longer need to take long journeys into town or to wait in long queues just to transfer money. Instead, they can type in a couple of numbers, hit a button, and pay for anything they want within seconds via mobile phone.

Most people in Kenya live in rural and remote places in the countryside. Landline access is very limited, and it is also considered costly to install, owing to the vast distances. This can leave families disconnected from one another, as the primary earner in the family often has to work in a distant township in order to provide money for the family. Those left in the rural villages are often self-employed farmers or tradespeople. Without communication, families are often disconnected.

Improving access

Mobile phone coverage and access has been significantly improved in Kenya, which has dramatically improved people’s lives. The UK-based non-government organisation (NGO) called Financial Deepening Challenge Fund (FDCF) has worked with Vodafone to set up M-Pesa, meaning ‘mobile money’. A customer can go to an M-Pesa agent, such as a supermarket, and:

• deposit and withdraw money
• transfer money to other users and non-users
• pay bills
• purchase phone credit
• transfer money between the service and a bank account (see figure 1).

People do not need a bank account or even a permanent address to use M-Pesa. They receive a text message to confirm a transaction, and the money can then be stored on the phone or it can be forwarded to someone else. At any time, the money can be transferred back to cash through an M-Pesa agent or an ATM. Figures 2 and 3 show population and mobile phone coverage, indicating the coverage is significant in highly populated areas.
11.5.2 How successful has it been?

Today there are about 19 million subscribers and over 2200 M-Pesa agents in Kenya. These agents include petrol stations, supermarkets and other retail outlets. By 2010, over 50 per cent of Kenya’s population was using M-Pesa. In 2012, when M-Pesa celebrated its fifth birthday, it had recorded over 15 million transactions. By March 2014 there were 260 transactions taking place every second. Figure 4 reflects this change in mobile phone usage and mobile money customers.

Taxi drivers have benefited, too. They no longer need to drive around with a lot of cash in their cars, because their passengers are able to pay using M-Pesa. It has also been seen as an improvement in personal safety, because it is a secure and easy way to transfer money.

Access to mobile phones for small business operators has meant they are now able to advertise to a larger audience, and are no longer dependent on word-of-mouth advertising. Clients can now
contact business operators with ease. For those working away from home, it is a safe and easy way to send money back to families in the countryside. This has enabled Masai herdsmen to go to the markets and make purchases by using their mobile phones. M-Pesa has eliminated the need to carry large sums of cash to markets, and has reduced the number of thefts.

M-Pesa demonstrates how dreaming big but thinking locally can have a significant effect on the economic and social structure of a place, just through the use of a mobile phone.

### ACTIVITIES

**REMEMBER**
1. How successful has M-Pesa been in Kenya? Ensure you use specific examples in your answer.
2. What *interconnections* can now occur between people because of M-Pesa?

**EXPLAIN**
3. Why would safety be a concern to people in Kenya? How does safety relate to information and communication technology in Kenya?
4. Which *places* in Kenya are well serviced by the mobile phone network?

**5.** Which *places* are not well serviced by the mobile phone network? Suggest reasons for this.

**DISCOVER**
6. Using the internet, research how another developing country has improved its information and communication technology. Create a multi-modal presentation on your findings.

**THINK**
7. Which services in Australia serve a similar purpose to M-Pesa? Explain what they are and how they operate.

### 11.6 What are the impacts of e-waste production and consumption in China?

#### 11.6.1 Introduction

China is one of the largest producers and consumers of electronics. Almost 50 per cent of the major home appliances manufactured in China are exported. However, due to China’s growing economy and the increase in its development, the other 50 per cent is attributed to local consumption. Figure 1 shows the changing nature of the sale of home appliances in China, which reflects growth in the national economy.

As a result, China has a growing e-waste problem from both domestic and international markets. The informal processing of e-waste has resulted in damage to local environments and people’s health. Until formal policies are established, informal recycling will co-exist with formal recycling companies.

#### 11.6.2 Production and consumption

Manufacturing accounts for about one-third of China’s economic output; of this, about half is the production of electronic goods. This growing industry has resulted in an increase in the GDP per capita of the country. The GDP (per capita) has risen from $US 5572 in 2011 to $US 7590 in 2014. In 2011, 0.25 billion mobile phones were sold in China—more than any other electronic product.
11.6.3 E-waste
The importation of e-waste was banned by the Chinese Government in 2000; however, flows are still making their way into the country. The high levels of consumption of electronics globally poses a challenge for the Chinese Government as items reach the end of their life cycle or become obsolete. There are four main ways e-waste is making its way into China, even though the government has placed a ban:
• direct shipment to Chinese ports
• mixed shipments with bulk steel and copper scraps
• transit through Hong Kong
• transit through Vietnam.

11.6.4 Informal and formal collection
Formal collectors of e-waste are tax-paying businesses that recycle using environmentally sound methods. In contrast, informal collectors are self-employed, and often migrants, who travel door-to-door collecting household items for cash.

The formal collectors form a part of the national Home Appliances Old for New Rebate Program. This program was set up by the government to stimulate the purchasing of new products, and hence the economy, and to ensure the proper recycling of old appliances. Only authorised collectors such as retailers, chain stores and supermarkets are allowed to participate in this program (see figure 2).

In 2011 formal collectors collected 61.29 million home appliances, with e-waste making up about 64 per cent of this. Informal collectors work as brokers between consumers and medium-level scrap dealers. This method is convenient for households as it saves them time and also generates a small amount of money. About 20 million migrants are involved in the informal collection of household goods, many of which are e-waste. Figure 3 shows the distribution of informal sites and ports throughout China.
The formal sector is also less efficient than the informal sector as it does not have access to individual households. A similar trend is also seen in countries such as India, Nigeria and Pakistan, where the informal sector is growing and employs a lot more people.

**FIGURE 3** Spatial distribution of informal e-waste recycling sites and ports through which e-waste shipments enter China

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11.6.5 Impacts of informal collection

The two largest centres for informal collection are located in the Guangdong Province and the Zhejiang Province (see figure 3). This method of collection is often labour intensive and involves contact with toxic and dangerous hazards. When workers dismantle equipment they do not use adequate protection, which leads to exposure (see figure 4).

11.6.6 Law and regulations

There are five main pieces of legislation regarding the management of e-waste in China:

- The Basal Convention, passed in February 2000
- The Technical Policy on Pollution Prevention and Control, enacted in 2006
- The Ordinance on Management of Prevention and Control of Pollution from Electronic and Information Products, implemented in 2007
- Administrative Measures on Pollution Prevention of Waste and Electrical Equipment, enacted in 2008

Despite this, illegal activity still occurs. Some local governments see these laws as a way of restricting progress and contrary to local interests and as a result they are not enforced. In addition, given the large number of ways e-waste is still entering China, reforms of customs controls are required.

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11.7 How are e-wastes managed?

11.7.1 What is e-waste?
Litter in the schoolyard is only minor waste compared with that produced by technology and communication: e-waste. A controversial issue is how to dispose of it. The disposal and trade of e-waste is seen by developed nations as a solution and by many developing countries as a money maker. How e-waste is dealt with has serious economic, environmental and social consequences.

E-waste is any old electrical equipment, such as computers, toasters, mobile phones, iPods and televisions, that is broken, obsolete or no longer wanted. Given our technology-based lifestyle, our e-waste pile is growing at an alarming rate — faster than we know what to do with. There are five main places where e-waste usually ends up (see figure 1).

11.7.2 What are the impacts of e-waste?
Many of us do not think about where our rubbish goes. We just put it in a bin, and then it is out of sight, out of mind. However, e-waste is now a part of the global economy, and is sold, shipped and dumped worldwide.
We must think about the ramifications of such actions. Computers are made up of many toxic chemicals and metals; when dumped, these can cause significant environmental and health problems (see figure 2).

**Health impacts**

In the slums of Delhi, computers, keyboards and monitors are pulled to pieces and then placed in acid baths or melted, to extract metals. This practice should only ever occur in proper recycling facilities, where safety precautions can take place. Consequently, there has been a rise in Delhi of mercury poisoning and other side effects of dealing with cadmium, plastic, PVC, barium, beryllium, and carcinogens such as carbon black and heavy metals (see figure 3).

A report by India's Department of Scientific and Industrial Research showed that e-waste being sent to India is increasing by 10 per cent each year. Slum dwellers are unsafely disassembling the e-waste, and toxins are damaging the health of an enormous number of people.

Exposure to mercury, even in tiny amounts, can lead to health problems and threaten child development. It damages the nervous, digestive and immune systems, and harms the lungs and kidneys. It is corrosive to the eyes and skin and to the gastrointestinal tract if swallowed. Neurological and behavioural disorders have also been observed, which can lead to insomnia, memory loss and motor dysfunction. A large number of women and children in India now expose themselves daily to mercury while working in makeshift e-waste recycling facilities in slums.

**Environmental impacts**

As we have seen, thousands of tonnes of e-waste are being dumped in developing countries. There, the e-waste is burned in informal recycling stations in slums. In the slums, there is nowhere to dispose of byproducts such as acid and cyanide, and they are simply dumped in the local waterways or onto the soil. This contaminates aquifers and destroys vital freshwater resources, making the land too toxic to farm.

<table>
<thead>
<tr>
<th>Ferrous metal</th>
<th>Plastic</th>
<th>Non-ferrous metal</th>
<th>Glass</th>
<th>Electric boards</th>
</tr>
</thead>
<tbody>
<tr>
<td>32%</td>
<td>23%</td>
<td>18% Lead</td>
<td>15%</td>
<td>12% Gold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antimony</td>
<td></td>
<td>Palladium Silver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beryllium</td>
<td></td>
<td>Platinum</td>
</tr>
</tbody>
</table>

**FIGURE 1** Where does e-waste end up?

**FIGURE 2** The composition of a computer

<table>
<thead>
<tr>
<th>Metal Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous</td>
<td>32%</td>
</tr>
<tr>
<td>Plastic</td>
<td>23%</td>
</tr>
<tr>
<td>Non-ferrous</td>
<td>18%</td>
</tr>
<tr>
<td>Glass</td>
<td>15%</td>
</tr>
<tr>
<td>Electric</td>
<td>12%</td>
</tr>
</tbody>
</table>

**FIGURE 3** Health impacts of e-waste on waste workers and people who live near landfills or incinerators

**mercury poisoning**
a toxic condition caused by the ingestion or inhalation of mercury or a mercury compound. It has various symptoms, including vomiting, nausea, insomnia and fevers.
The issue is that the e-waste can be of great value to the citizens of developing nations, such as China and India, because it is a fairly easy way to make money. For example, the circuit boards of most phones contain precious metals such as copper, gold, lead and zinc which can be extracted and sold. However, there are many poisonous substances as well, which are dangerous to people and the environment (see figure 3). For example, burning the plastic coating around copper wires gives off deadly fumes, while heavy metals dumped into local rivers creates hazardous pollution.

The burning of plastic leads to an increase in air pollution, resulting in above-standard emissions. The air is often left with the stench of acid, paint and plastic, which impairs people’s quality of life. Contamination of agricultural soils may occur, affecting local farms, which are often the main form of income in developing countries.

Waste acids recovered from the burning process, which are of no value or use, are often dumped in rivers and streams, damaging the ecosystem. Often this leaves waterways black and pungent, and leads to contamination of drinking water. In Guiyu, China, the water is so toxic it can disintegrate a coin within a few hours.

### 11.7.3 International management of e-waste

By the start of this century, many countries could not deal with either the quantity or toxicity of the e-waste they were generating. One solution was to export it to developing nations that did not have laws in place to protect workers or the environment. It is also significantly cheaper to recycle waste in developing nations.

Concerns in Europe regarding the export of e-waste led to an agreement, known as the Basel Convention, being developed to manage the movement and disposal of hazardous wastes. The convention was adopted by the European Union (EU) in 1994 and has now been accepted by more than 151 countries, including Australia. The countries that sign the convention must:

- keep the production of hazardous waste as low as possible
- make suitable disposal facilities available
- reduce and manage the international movement of hazardous waste
- ensure management of waste is controlled in an environmentally friendly way
- block and punish illegal movement of hazardous waste.

However, the EU has reluctantly admitted that its rules are only somewhat effective, as the bans on exporting e-waste are being ignored or avoided.
Rotterdam is Europe’s busiest port, with more than 11 million shipping containers passing through it each year. Despite every effort, only about three per cent of all containers in Rotterdam are checked; consequently only about one illegal shipment of e-waste is caught each week. Inevitably, containers of e-waste slip through. One of the difficulties that customs officers face is the fact that it is not illegal to export goods to be re-used and sold as secondhand goods. The fines for companies illegally exporting e-waste are between AU$300 and AU$9000.

The United Kingdom’s Environment Agency, which is in charge of regulating hazardous waste in England and Wales, has set up international cooperation and intelligence with over 40 countries. This is being done in order to combat the illegal smuggling of e-waste, and companies are fined if they are caught. The United States has not ratified the Basel Convention, and they are seen as lagging behind Europe. Almost 80 per cent of its e-waste goes to China via Hong Kong (see figure 5).
Until we find a cheap alternative to dumping waste overseas, it is going to be difficult to compete with this process in developed countries. More research needs to be done on how to make recycling safer in developing countries, and how to enable it to take place in proper factories instead of unsafe makeshift plants.

### 11.7.4 Local e-waste management

According to the Australian Bureau of Statistics, almost all Australian households were involved in some form of recycling in the past 12 months. One report shows that by 2017, e-waste production in Australia will reach 65.4 million tonnes, which is the equivalent of about 1200 Sydney Harbour bridges.

Locally, most waste transfer stations in metropolitan areas now have e-waste facilities. A visit to the tip is no longer a matter of putting everything into landfill; it involves a more complex system of organisation. On arrival at your local waste transfer station, you are directed to various stations to dispose of your waste. Such stations include green waste, white goods, oils, gas bottles, petrol cans, copper and e-waste. This sorting of waste not only reduces the need for landfill, but also encourages and enables more recycling to take place.

**FIGURE 6** An e-waste facility at a refuse station

REMINDERS

1. Define the term e-waste. Compile a list of potential e-waste either in the classroom or in your home.
2. Why is it difficult to prevent the illegal trade in e-waste?

EXPLAIN

3. Using figure 5, explain the geographical pattern to illegal dumping of e-waste. Ensure you make specific reference to places in Asia on the map.

DISCOVER

4. Discover the difference between ferrous and non-ferrous metals. Which is more harmful to humans and the environment?

5. Research the metals listed in figure 3, and explain what makes them harmful to humans and what environmental effects they can have.

THINK

6. Create a presentation on how e-waste is managed at your school. Suggest strategies for making the current management techniques more sustainable.
7. Why are international agreements on e-waste difficult to manage?
11.10 How can you reduce your consumption?

11.10.1 Act local, global

On a global scale, entrepreneurs are tackling the waste problem society is creating. We live in a part of the world where consumption of information and communication technology is high. However, some global solutions have now been set up to ensure that individuals can easily find out online about what is recyclable, and can then undertake recycling from their own home. Society is now being encouraged to act locally, while thinking globally. This is an important concept when it comes to reducing and managing our own consumption.

11.10.2 Recycling your e-waste

In 2009, only nine per cent of the 16.8 million electronic devices discarded were recycled. About 88 per cent went to landfill, and the rest was exported as waste. Globally, 57.4 million tonnes of e-waste was recycled in 2010, and more than 75 million tonnes in 2015.
According to the Australian Bureau of Statistics (ABS), when people were surveyed about their e-waste disposal, most stated that they did not recycle because they did not generate enough materials to warrant the use of e-waste services or facilities. Perhaps if everyone knew more about the hazardous nature and environmental impacts of e-waste, the idea of recycling would be embraced.

Below are some innovative ways of dealing with waste.

Ziilch
Most of us have an old computer we no longer use, or an old charger for a device we no longer have. We may even have books, furniture or clothing that could be recycled. The website Ziilch has come up with an easy solution to de-clutter, find new items and save on disposal costs. It is as easy as a click of a button (see figure 1).

This online company connects people in different places, and the platform enables you to exchange goods for free. This promotes the idea of recycling, which reduces consumption and will hopefully lead to a more sustainable future.

MobileMuster
MobileMuster is a simple, easy way to dispose of old mobile phones, batteries and accessories. MobileMuster is voluntarily funded and managed by distributors, network carriers, service providers and manufacturers. It is a free service where you can send your mobile phone or find your nearest drop-off point, of which there are over 4500 in Australia. This ensures that mobiles are recycled correctly rather than dumped in landfill. Over 90 per cent of materials in mobile phones can be recycled (see figure 2).

By using a certified recycling program, you can ensure that your e-waste is not being illegally exported, and the environment is not being contaminated by the metals and minerals in the products.

Reduce energy consumption
It is not only important to be involved in recycling, but also to reduce your carbon emissions, which is another byproduct of information and communication technology. Some strategies include:

• turning off your PC overnight, on weekends and during holiday periods
• ensuring printers and other equipment are switched off when not in use
• refraining from printing emails whenever possible
• removing active screensavers
• only charging your mobile phone when it is flat.

National Television and Computer Recycling Scheme
The National Television and Computer Recycling Scheme, which commenced in November 2011, provides households and small businesses with free recycling services for televisions and computers. While it is governed by the Australian Government Product Stewardship Act of 2011, state and territory governments retain responsibility for regulating waste.

The first drop-off points were rolled out in 2012 in metropolitan areas, and expanded into rural and remote areas in 2013 with 98 per cent of the population having reasonable access to the service. The scheme will accept all televisions, computers, and computer accessories such as...
keyboards and hard drives. To date, more than 130 000 tonnes of televisions and computers has been collected from more than 1800 collection points.

It is hoped that by 2021–22, 80 per cent of computers and televisions will be recycled, compared to the 17 per cent that are recycled today.

**FIGURE 3**
Australia's television and computer recycling program

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**ACTIVITIES**

**REMEMBER**

1. In 2009, what percentage of discarded electronic devices was recycled?
2. What was the main excuse that people gave for not recycling?
3. Refer to figure 2. Name three byproducts extracted from mobile phones and two products that can be made from recovered resources in mobile phones.
4. Have you ever participated in a national or global recycling scheme? If so, explain what it was and what you recycled. If not, suggest what you could recycle and how to do so.

**THINK**

5. Find out where your nearest National Television and Computer Recycling Scheme drop-off point is. Describe this place in relation to where you live. Is it realistic for you to take your recyclables there?
6. In a group, conduct a class survey in which you interview students and teachers about their recycling habits. Decide on the types of questions you wish to ask and how you will record responses. If you wish to do this online, use the Survey Monkey weblink in the Resources tab.
7. After you have conducted your surveys, collate and present your findings in graphic form.
8. Analyse your graphs and write a summary of your findings, ensuring you cover the following questions.
   - Are students more environmentally conscious than teachers?
   - Does age make a difference?
9. Prepare a recycling plan for your school.
11.11 SkillBuilder: Using advanced survey techniques — interviews

What are interviews that survey people’s opinions?
Conducting a survey means asking questions, recording and collecting responses, and collating the number of responses.

FIGURE 1 Sample interview questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are your most common electronic forms of communication?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How many computers does your household have?</td>
<td>0, 1–2, 2–3, 3–4, More than 4</td>
<td></td>
</tr>
<tr>
<td>3. Who uses a computer in your household?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. How often do you use a computer?</td>
<td>Daily, Every couple of days,</td>
<td></td>
</tr>
<tr>
<td>5. How important is your mobile phone for communication with your friends?</td>
<td>Not important, Moderately</td>
<td></td>
</tr>
<tr>
<td></td>
<td>important, Extremely important</td>
<td></td>
</tr>
</tbody>
</table>

Go online to access:
- a clear step-by-step explanation to help you master the skill
- a model of what you are aiming for
- a checklist of key aspects of the skill
- a series of questions to help you apply the skill and to check your understanding.

11.12 Review

11.12.1 Review
The Review section contains a range of different questions and activities to help you revise and recall what you have learned, especially prior to a topic test.

11.12.2 Reflect
The Reflect section provides you with an opportunity to apply and extend your learning.