# 18 Global ICT — connections, disparity and impacts

## 18.1 Overview

Technology makes our lives easier and helps us connect, but at what cost to people and the planet?

### 18.1.1 Introduction

The rapid development of information and communication technologies has led to immense change in the way we live and work, and has created a degree of global connectedness unseen and perhaps unimaginable in the past. But not everyone is equally connected. Variations in access exist that lead to social and economic disparity, and there are social, economic and environmental impacts of our increasing production and consumption of technology-related goods and the **e-waste** that results.

**on** Resources

**eWorkbook** Customisable worksheets for this topic

**Video eLesson** Plugging in (eles-1725)

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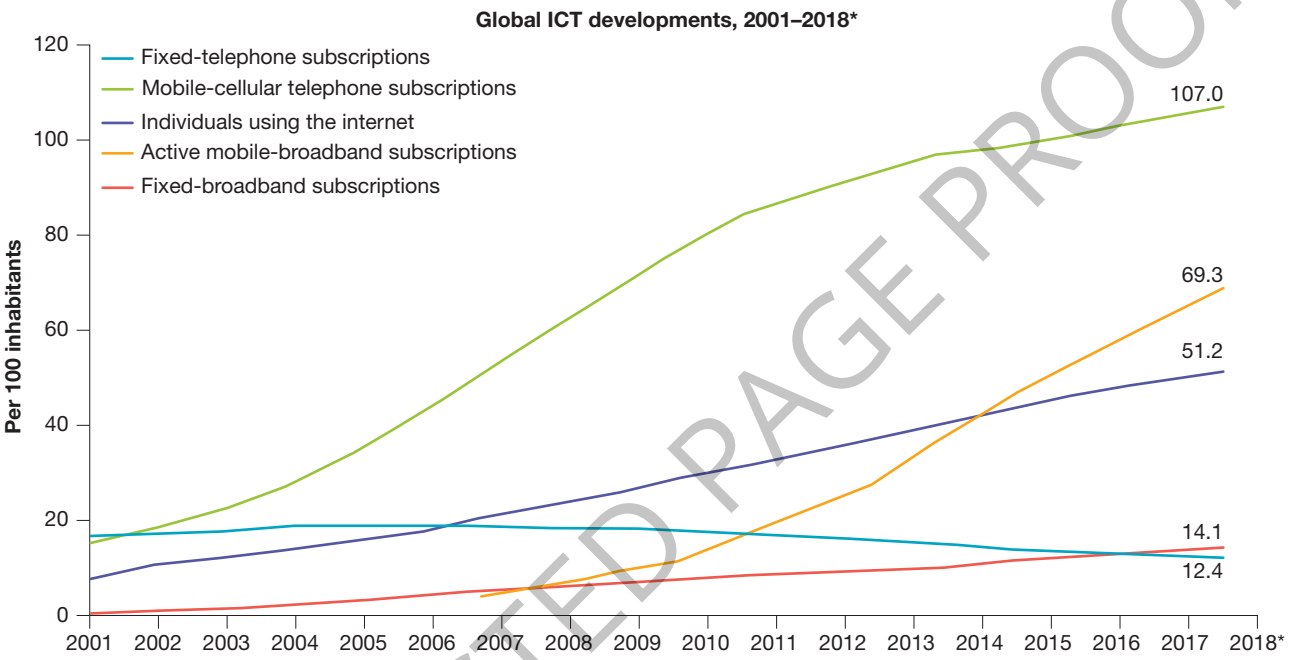
# 18.2 Information and communications technology

## 18.2.1 Changing communications technology

The information and communications technology (ICT) sector is a rapidly evolving aspect of our lives. Change is ongoing, with new technologies constantly emerging. At the same time, some technologies have been superseded. **FIGURE 1** shows the surge in use of mobile phones and in particular the active (used within last 30 days) use of mobile broadband, compared to the decline of the fixed telephone line.

**FIGURE 1** The change in our use of technology




*Note:* *Estimate

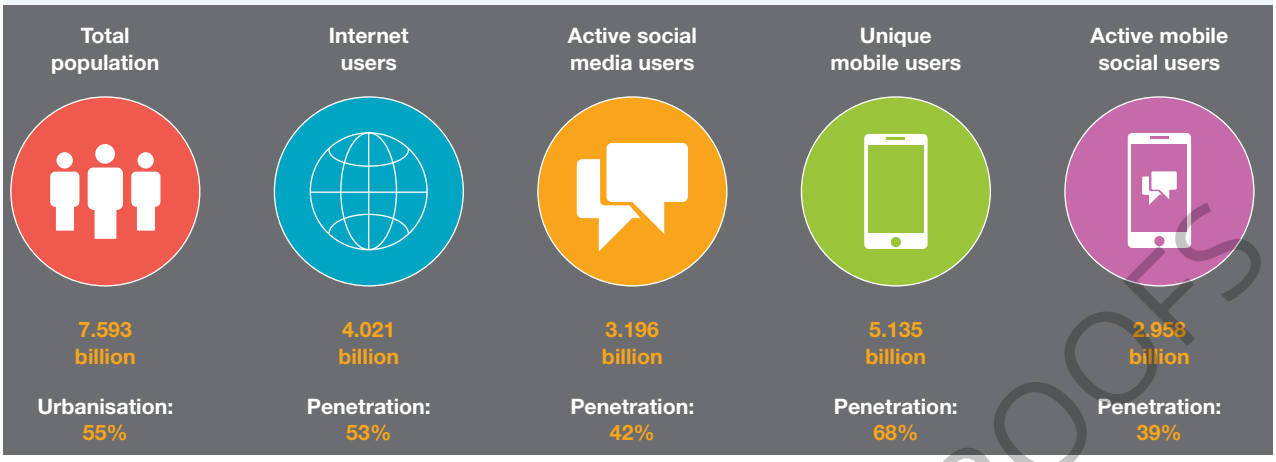
***Source:*** ITU World Telecommunication/ICT Indicators database

The **World Wide Web** was developed as a way of accessing and spreading information. It was once simply a means of collaboration and exchanging ideas online. Today it is an enabler that makes our lives connected to almost everything through the internet.

The first mobile phones in the 1980s were used solely for conversation. Today mobile phones have evolved with a global demand for smartphones — technology that can map travel routes, take photos and videos, act as a diary or notebook, do shopping and banking, participate in gaming, record music, print documents wirelessly, allow face-to-face talking, share documents via the cloud and much, much more. Applications (apps) are being developed at a high rate for the interpretation and use of everything from human health matters, to bird calls, to alerts for disaster management, and so on. Virtual reality is taking us places we have never been.

Although there are more than 750 million adults in the world who lack basic literacy skills, youth culture worldwide has adopted ICT as a mainstream part of life. It has become a fundamental element in the way many of us connect to services and information, and to people in other places. Today there are more people globally using the internet on their mobile phones than those using the internet from a stand-alone computer (see **FIGURE 2**).

**FIGURE 2** Global users of digital communications, 2018




***Source:*** wearesocial.com

## 18.2 EXERCISES

**Geographical skills key: GS1** Remembering and understanding **GS2** Describing and explaining **GS3** Comparing and contrasting **GS4** Classifying, organising, constructing **GS5** Examining, analysing, interpreting **GS6** Evaluating, predicting, proposing

### 18.2 Exercise 1: Check your understanding

1. **GS1** What was the initial purpose of the World Wide Web (www)?
2. **GS2** What does it mean to say the www is an 'enabler'?
3. **GS1** List how the uses of mobile phones are different to when they were introduced in the 1980s.
4. **GS1** How many adults in the world lack basic literacy skills?
5. **GS2 FIGURE 2** shows the global users of ICT. Describe the role of mobile phones in our lives.

### 18.2 Exercise 2: Apply your understanding

1. **GS2** Using **FIGURE 1**, describe the ***change*** over time from 2001 to 2018 of the technologies shown.
2. **GS6** Suggest the innovations in ICT that have ***changed*** people's use of the internet.
3. **GS6** Smartphones have taken communications to a 'new level'. What might smartphones or the next generation of phones be able to do in the future?
4. **GS6** Suggest why it is youth culture that has adopted technology so readily into their lives.
5. **GS6** Will computers become extinct for communications in the future? Explain your view.

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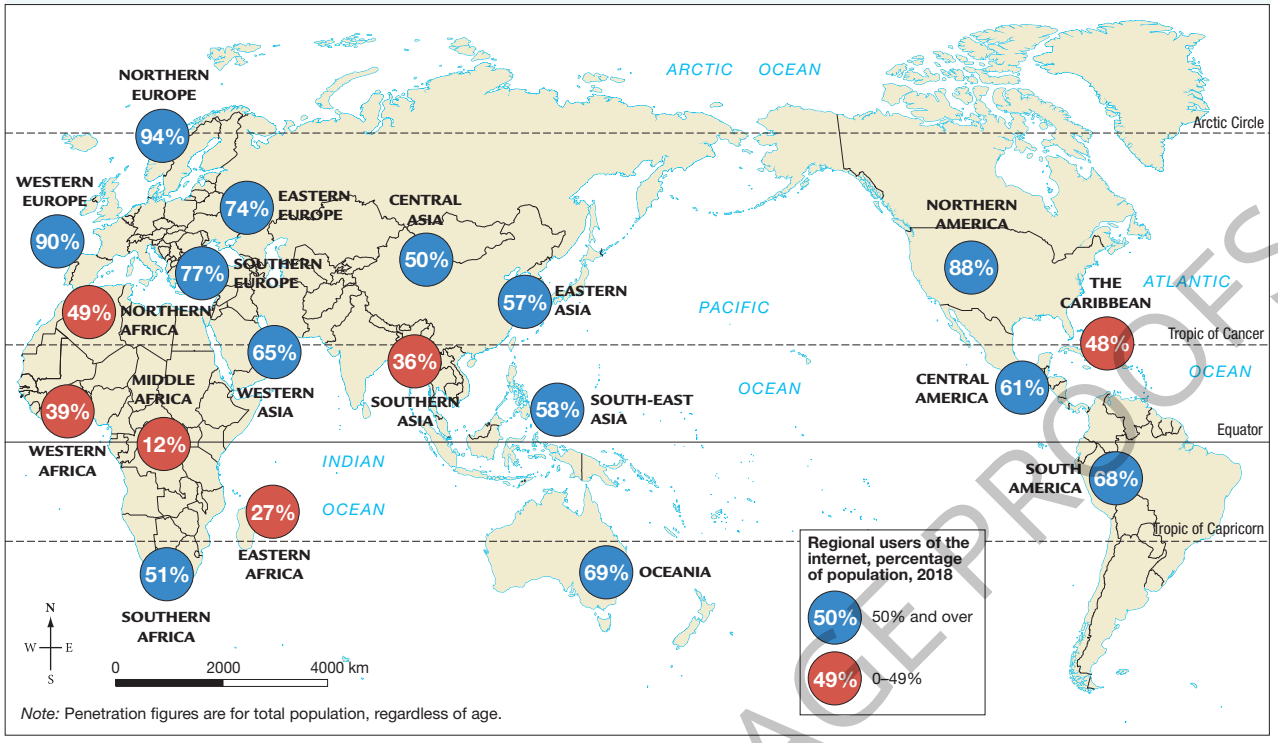
# 18.3 The internet connects us

## 18.3.1 Global internet connections

Internet **connectivity**, whether via a computer or a mobile phone, is available across the world, but its distribution is not even across regions or within countries. From **FIGURE 1** it is clear that the regions with a very high level of **human development**, for example Europe and North America, also have a high level of internet users. The countries of Middle and Eastern Africa with a lower level of human development have fewer people using the internet. **TABLE 1** shows the **digital divide** between countries and regions, with the top ten countries and the bottom ten countries measured per head of population using the internet.

**FIGURE 1** Regional users of the internet as a percentage of the population, 2018




*Note:* Penetration figures are for total population, regardless of age.

***Source:*** Internetworldstats; ITU; Eurostat; Internetlivestats; CIA World Factbook; Mideastmedia.org; Facebook; government officials; regulatory authorities; reputable media.

**TABLE 1** Countries with (a) the highest and (b) the lowest population proportion using the internet, 2018 (b) Countries with the highest and lowest population proportion using the internet, 2018

| (a) Rank | Country | Proportion of population | Number of users |
|---|---|---|---|
| 1 | Qatar | 99% | 2 640 360 |
| 2 | United Arab Emirates | 99% | 9 376 171 |
| 3 | Kuwait | 98% | 4 100 000 |
| 4 | Bermuda | 98% | 60 125 |
| 5 | Bahrain | 98% | 1 499 193 |
| 6 | Iceland | 98% | 329 675 |
| 7 | Norway | 98% | 5 222 786 |
| 8 | Andorra | 98% | 75 366 |
| 9 | Luxembourg | 98% | 572 216 |
| 10 | Denmark | 97% | 5 571 635 |

| (b) Rank | Country | Proportion of population | Number of users |
|---|---|---|---|
| 213 | North Korea | 0.06% | 16 000 |
| 212 | Eritrea | 1% | 71 000 |

*(Continued)*

**TABLE 1** Countries with (a) the highest and (b) the lowest population proportion using the internet, 2018 (b) Countries with the highest and lowest population proportion using the internet, 2018 *(Continued)*

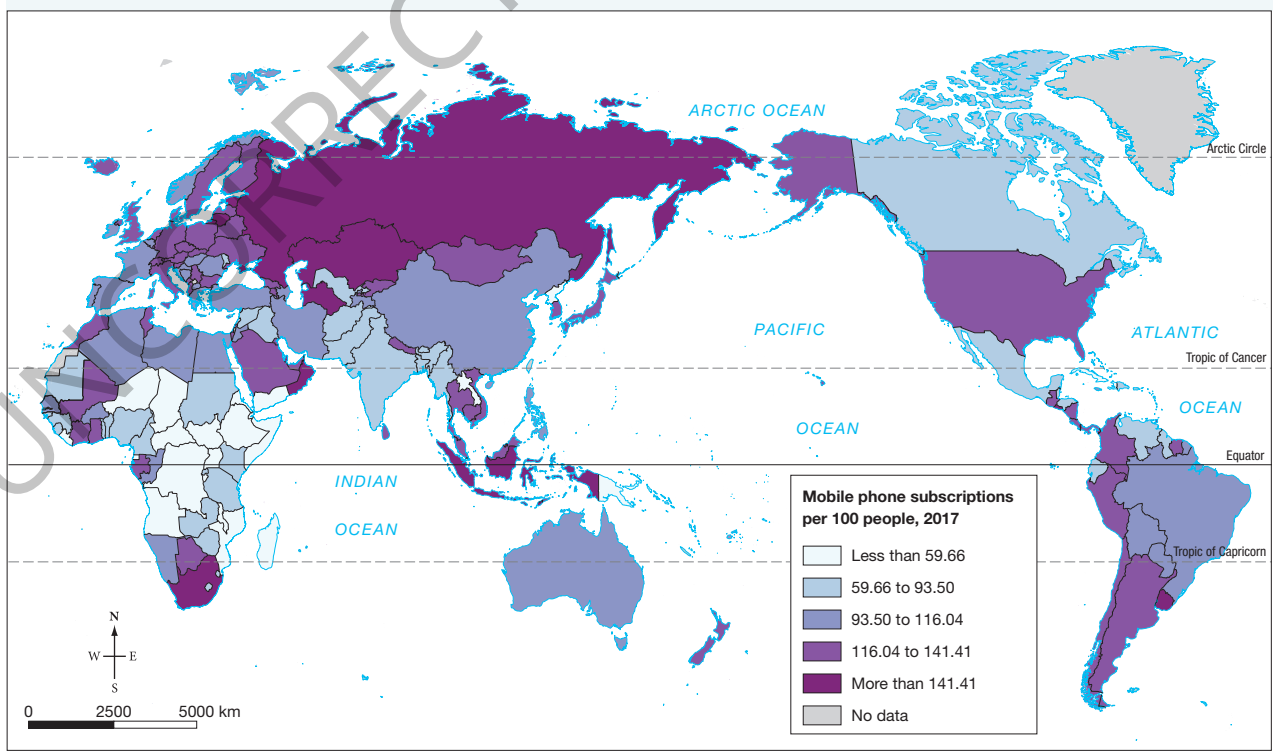
| (b) Rank | Country | Proportion of population | Number of users |
|---|---|---|---|
| 211 | Niger | 4% | 946 440 |
| 210 | Western Sahara | 5% | 28 000 |
| 209 | Chad | 5% | 756 329 |
| 208 | Central African Republic | 5% | 246 432 |
| 207 | Burundi | 6% | 617 116 |
| 206 | Democratic Republic of the Congo | 6% | 5 133 940 |
| 205 | Guinea-Bissau | 6% | 120 000 |
| 204 | Madagascar | 7% | 1 900 000 |

## 18.3.2 Mobile phones connect with the internet

Today people of all ages carry a mobile phone. For young people, it is just a regular way to connect with friends, family and the world. People in their middle years were introduced to the technology as young adults and have embraced the interconnections provided; they readily take on each new development offered by the service providers. For older people, the adaptation to the technology has needed to be rapid and many see the technology as complex — understanding the technology and mastering the skills are a challenge, especially to many people over the age of 80.

Just like internet access, the distribution of mobile phones across the world is not even (see **FIGURE 2**).

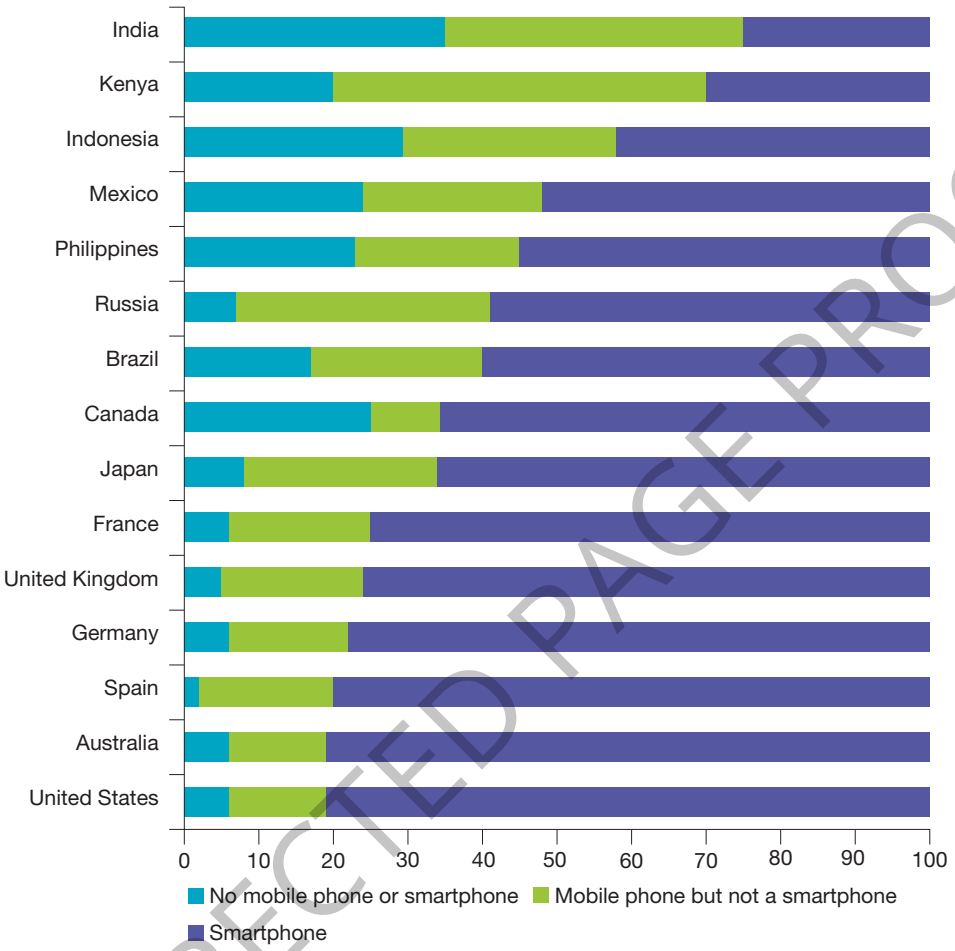
**FIGURE 2** The distribution of mobile subscriptions per 100 people, 2017




***Source:*** JUMIA (2018)

In countries with a very high level of human development there has been a shift to smartphones. In the countries with a lower level of human development the adoption of the latest technology is not as evident. **FIGURE 3** shows the adoption of mobile phones and smartphones in a few selected countries.

**FIGURE 3** The adoption of mobile phones by adults in selected countries, 2018




## 18.3 INQUIRY ACTIVITIES

1. **GS4** Refer to **FIGURE 1**.
   (a) On a blank map of the world, shade the different regions according to the data shown. Develop a key for 'very high', 'high', 'medium', 'low' and 'very low' users of the internet.
   (b) Compare your map with those of others in your class. Is your map the same as someone else's? Why or why not?
   (c) Describe the pattern of users shown on your map. **Classifying, organising, constructing**
2. **GS5** Using a world map, find the countries listed in **TABLE 1**.
   (a) In which parts of the world is the highest proportion of internet use found? Suggest a reason for this occurrence.
   (b) In which parts of the world is the lowest proportion of internet use found? Suggest reasons for this occurrence. **Examining, analysing, interpreting**

## 18.3 EXERCISES

**Geographical skills key: GS1** Remembering and understanding **GS2** Describing and explaining **GS3** Comparing and contrasting **GS4** Classifying, organising, constructing **GS5** Examining, analysing, interpreting **GS6** Evaluating, predicting, proposing

### 18.3 Exercise 1: Check your understanding

1. **GS1** Is everyone across the world connected to the internet?
2. **GS1** In which regions of the world are the lowest number of people using the internet?
3. **GS2** Using **TABLE 1**, name three countries in which the proportion of the population using the internet is greater than 97 per cent.
4. **GS1** Which age groups have been able to handle the ***changes*** in mobile phone connectivity with the internet better than other age groups?
5. **GS2** In which parts of the world has the adoption of smartphones been greatest?

### 18.3 Exercise 2: Apply your understanding

1. **GS4** Using statistics from **FIGURE 3** to support your answer, describe the level of mobile phone use in:
   (a) India
   (b) Kenya
   (c) Australia.
2. Mobile phone use differs between the developed world and the less developed world. Use data from **FIGURE 3** to support this statement.
3. Choose one European country, one African country and one Asian country included in **FIGURE 3** and hypothesise the ***changes*** to mobile phone adoption that might occur in those countries by 2030.
4. **GS6** Suggest three reasons for the uneven distribution of mobile phones across the world.
5. **GS6** For the next generation of mobile phones after smartphones, provide a reasoned answer as to which countries might be the first adopters of such a technology.

Try these questions in learnON for instant, corrective feedback. Go to www.jacplus.com.au.

# 18.4 Connected Australians

## 18.4.1 Australia's digital divide

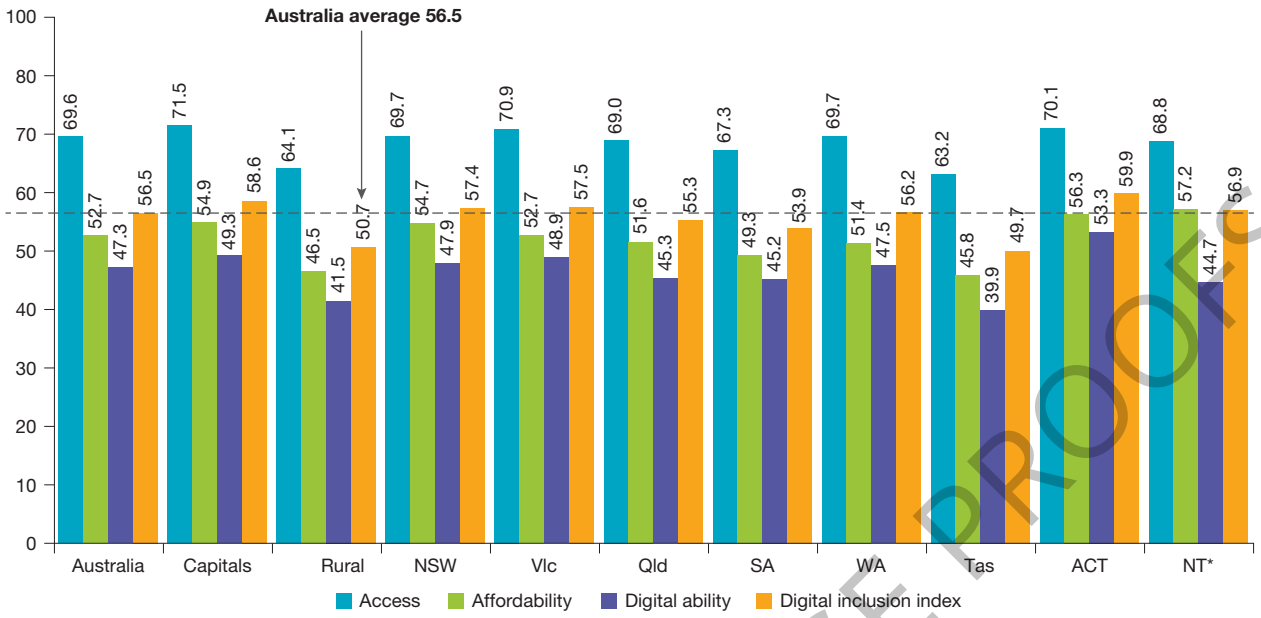
Australia is a highly developed country in which we consider access (immediate connection, advanced equipment, and high data allowances) to the internet a necessity. Australians also expect the technology to be affordable as a proportion of their income. Our ability to adapt to the rapidly changing environment and our high skill levels are such that Australians make good use of their connectivity. However, not everyone across the country has equal access to the internet — there is a 'digital divide', whereby some areas experience greater levels of digital inclusion than others.

The Australian Digital Inclusion Index (ADII) takes into consideration the three key components of ICT quality — access, affordability and digital ability. **FIGURE 1** shows the Australian average at a medium level (rating 56.5 from a possible 100). Most of the states are around that average, although people across South Australia and Tasmania appear to be less well connected. The divide is further evident between the capital cities and the rural areas. According to the 2017 ADII report, Australia's least digitally included regions are: Burnie and western Tasmania (44.1), north-west Queensland (45.9), north Victoria (46.5), east Victoria (47.0), Launceston and north-east Tasmania (47.7), and north-west Victoria (48.2).

## 18.4.2 Some Australians are less well connected

In addition to disparities in connectedness based on geographical location, there are also particular groups within Australian society that are more digitally disadvantaged. **FIGURE 2** shows that people on lower incomes, those with no income, those older than 50 years and especially those over 65, the disabled and the Indigenous (remote communities were not included in the ADII) have a digital inclusion index lower than the Australian average.

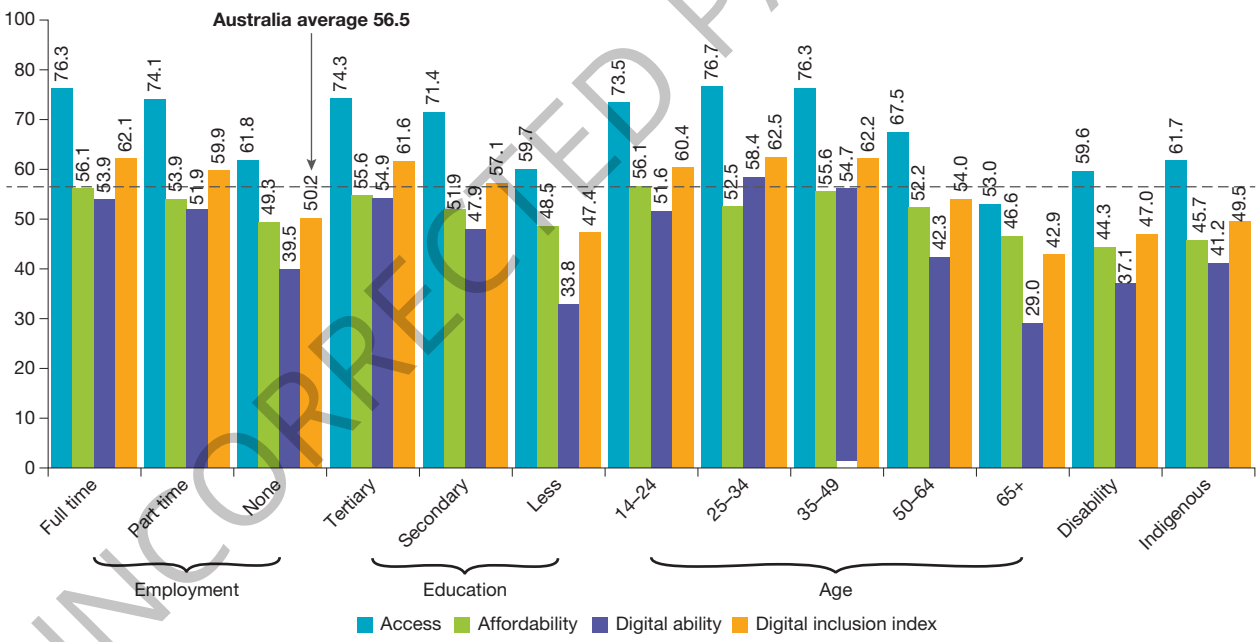
**FIGURE 1** Australian Digital Inclusion Index by state, 2017




* Sample size <100, exercise caution in interpretation.

***Source:*** Roy Morgan Research, April 2016–March 2017

**FIGURE 2** Australian digital inclusion by demography 2017




***Source:*** Roy Morgan Research, April 2016–March 2017



## 18.4 EXERCISES

**Geographical skills key: GS1** Remembering and understanding **GS2** Describing and explaining **GS3** Comparing and contrasting **GS4** Classifying, organising, constructing **GS5** Examining, analysing, interpreting **GS6** Evaluating, predicting, proposing

### 18.4 Exercise 1: Check your understanding

1. **GS1** Define the term *digital divide* in your own words.
2. **GS1** Outline the components that make up the Australian Digital Inclusion Index (ADII).

3. **GS1** Which regions of Australia are the least digitally included?
4. **GS1** Which state or territory has the highest level of digital inclusion?
5. **GS1** Which groups within Australian society are more digitally disadvantaged?

### 18.4 Exercise 2: Apply your understanding

1. **GS5** Is there a digital divide between Australia's capital cities and its rural regions? Support your answer with evidence from **FIGURE 1** across all three components of the ADII.
2. **GS5** With reference to **FIGURE 1**, describe how close each of Australia's states and territories is to the average ADII.
3. **GS6** If you were moving to Australia and choosing in which state to live based on digital inclusion, where would you go? Use data from **FIGURE 1** on access, affordability and digital ability to justify your choice.
4. **GS5** The digital divide in Australia occurs across different sectors of our society. Use **FIGURE 2** to assess the following.
   (a) Which sector of Australia's population is furthest from the average Australian inclusion index?
   (b) Which is more of a hindrance to achieving digital connection: lack of employment or lower level of education?
   (c) For the disabled and Indigenous groups, how accessible, affordable and digitally skilled is their digital connection?
5. **GS5** Which of the ADII components — access, affordability, or digital skill — creates the greatest divide across Australia for the greatest proportion of the population? Explain.

Try these questions in learnON for instant, corrective feedback. Go to www.jacplus.com.au.

# 18.5 Improving lives via digital connection — Kenya

## 18.5.1 Increased consumption of ICT

Globally, there is a difference between the developed and the developing world in terms of levels of digital connection, but it is important to note that access to the internet and mobile phone networks has improved, especially across Africa. In Kenya, for example, many people live in rural and remote places in the countryside. In the past this left families disconnected from one another, as the primary earner in the family often had to work in a distant town to provide the family income. No longer do these rural and remote people have to make a long journey on poor quality roads into town to transfer money. Today these people use their mobile phones.

The number of mobile phone subscribers in Kenya has risen steadily (see **FIGURE 1**) and the mobile phone coverage has spread with the introduction of each new network speed (see **FIGURE 2**). Internet connection is via mobile phones and the young are the dominant users — 52 per cent of the 16–24 age group and 39 per cent of the 25–34 age group, as opposed to just six per cent of the 35–44 group and four per cent of the 45+ group.

**FIGURE 1** Mobile phone subscriptions and internet penetration, Kenya

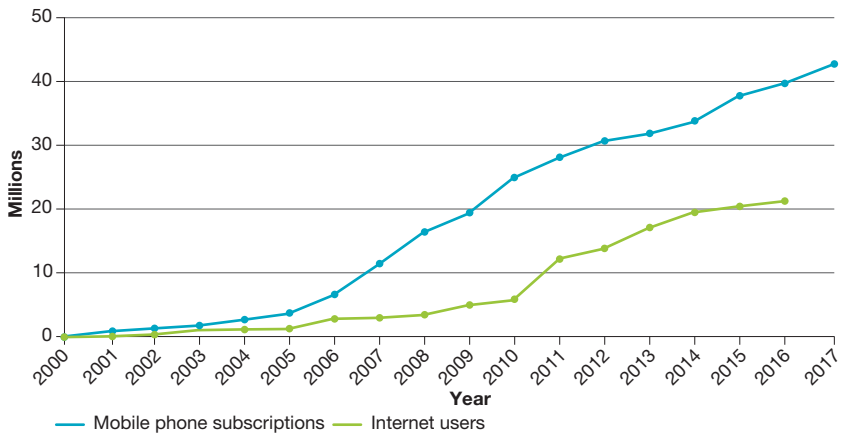
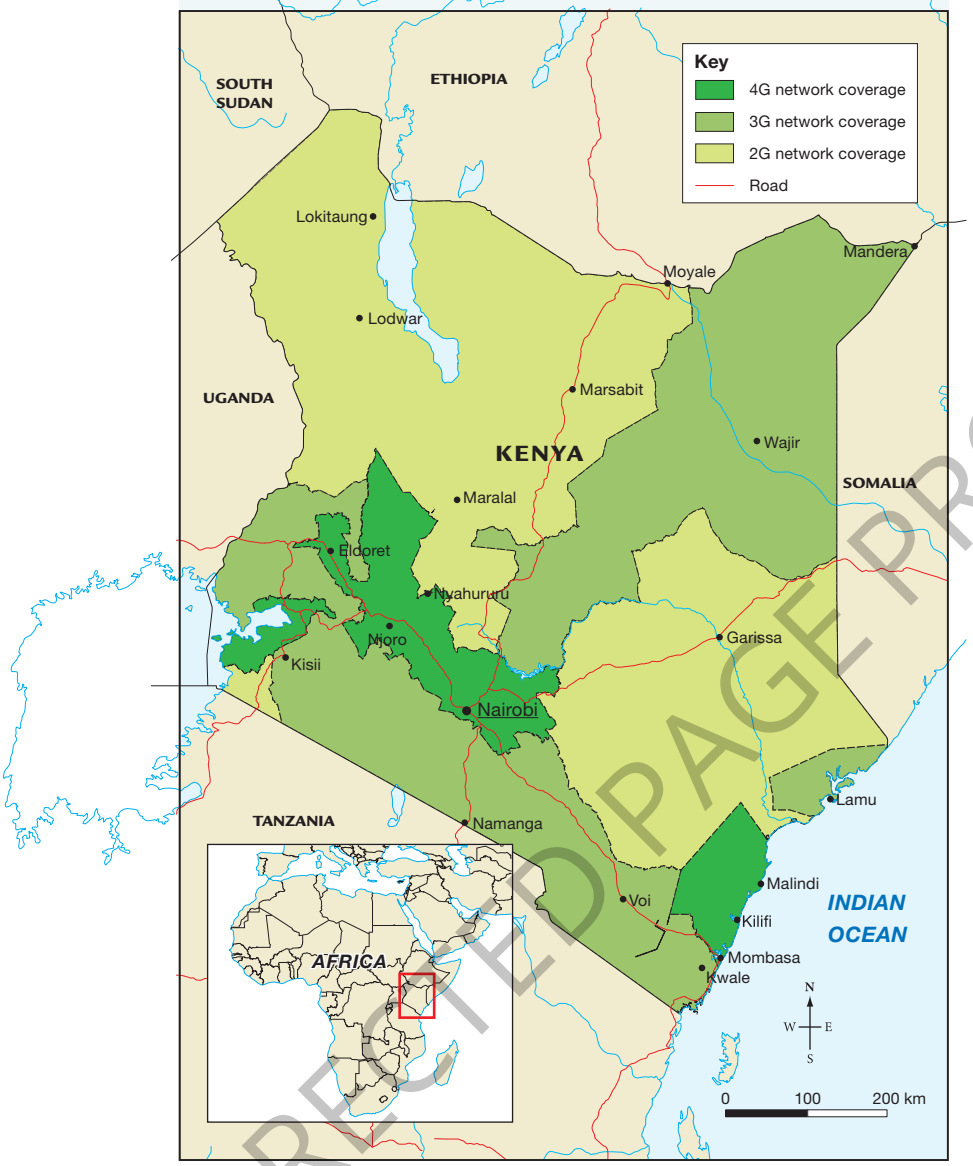


**FIGURE 2** Mobile phone network coverage, Kenya, 2017




***Source:*** JUMIA (2018)

## 18.5.2 Mobile money and moving forward

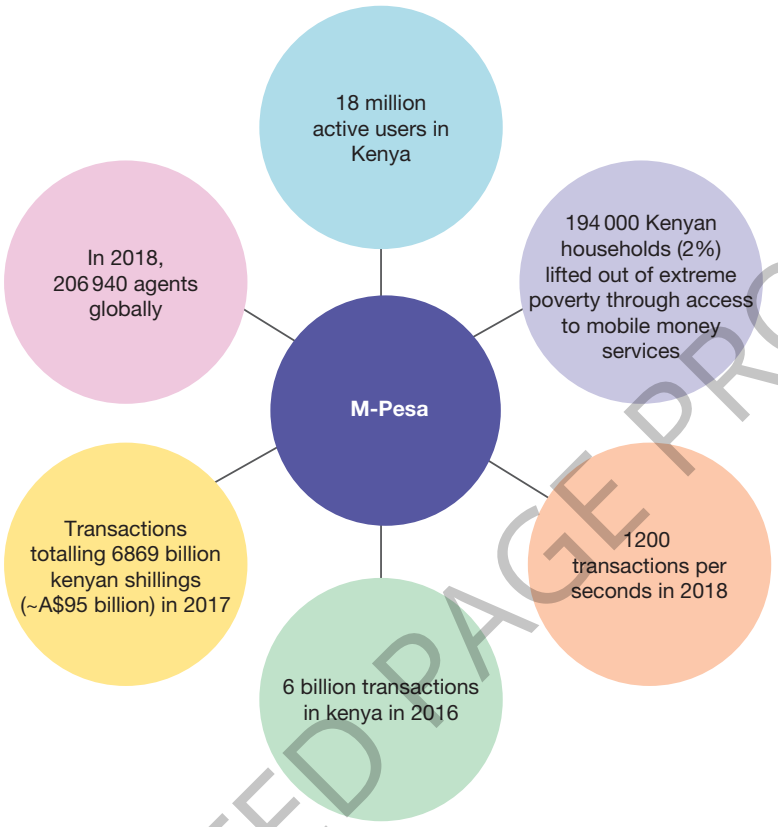
In 2007, the UK-based organisation Financial Deepening Challenge Fund (FDCF) worked in Kenya to set up M-Pesa (meaning 'mobile money'), and various agencies were set up to assist users (see **FIGURE 3**). Customers could then transfer, withdraw and deposit money through mobile phones; nearly 50 per cent of Kenya's **gross domestic product** (GDP) is processed over M-Pesa.

**FIGURE 3** A customer at an M-Pesa agent


Access to mobile phones for small-business owners 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. M-Pesa has eliminated the need to carry large sums of cash to markets, thus improving personal safety.

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.

**FIGURE 4** The impact of M-Pesa




Kenya has 'jumped forward' with its use of ICT — it is now dubbed the Silicon Valley of Africa. About 84 per cent of the population is connected to the internet. Additional service providers have opened up innovative platforms to give Kenyans connection to the world. For example, Kenyan channel KTN News joined YouTube in 2016 with 145 000 uploaded videos and 278 300 subscribers. With increased providers covering 90 per cent of the country, mobile phone packages are more affordable and smartphones are now cheaper, to the benefit of the consumers. By 2018 several local digital start-ups and international ICT companies were calling Kenya home. Kenya is bridging the digital divide.

## DISCUSS

a. In small groups, suggest a list of possible criteria that you could use to judge how effective technology has been in improving people's lives in Kenya.
b. Share and discuss your group's criteria with the class and select the three criteria that the class considers the most effective for judging.
c. Did you have to make many changes to create the class list? Why or why not? How difficult was it to reach a consensus? **[Critical and Creative Thinking Capability]**

## 18.5 EXERCISES

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### 18.5 Exercise 1: Check your understanding

1. **GS2** Make a list of five ***interconnections*** than can occur between Kenyans thanks to M-Pesa.
2. **GS2** Use **FIGURE 4** to describe the success rate of M-Pesa. Use specific data in your answer.
3. **GS2** Explain how Kenya is bridging the digital divide.
4. **GS1** Which age group in Kenya is the dominant user of mobile phones?
5. **GS1** What percentage of Kenya is covered by ICT providers?

### 18.5 Exercise 2: Apply your understanding

1. **GS5** Mobile phone usage has been an important part of the improvement in communications in Kenya. Using **FIGURE 1**, describe the ***change*** over time in mobile phone subscriptions and users of the internet.
2. **GS5** Which areas of Kenya are well serviced by the mobile phone network?
3. **GS5** Which ***places*** in Kenya are not well serviced by the mobile phone network?
4. **GS5** Which parts of Kenya have the most recent development of 4G services?
5. **GS2** Is there a correlation between the use of mobile phones and the internet as shown in **FIGURE 1**? Explain your answer.

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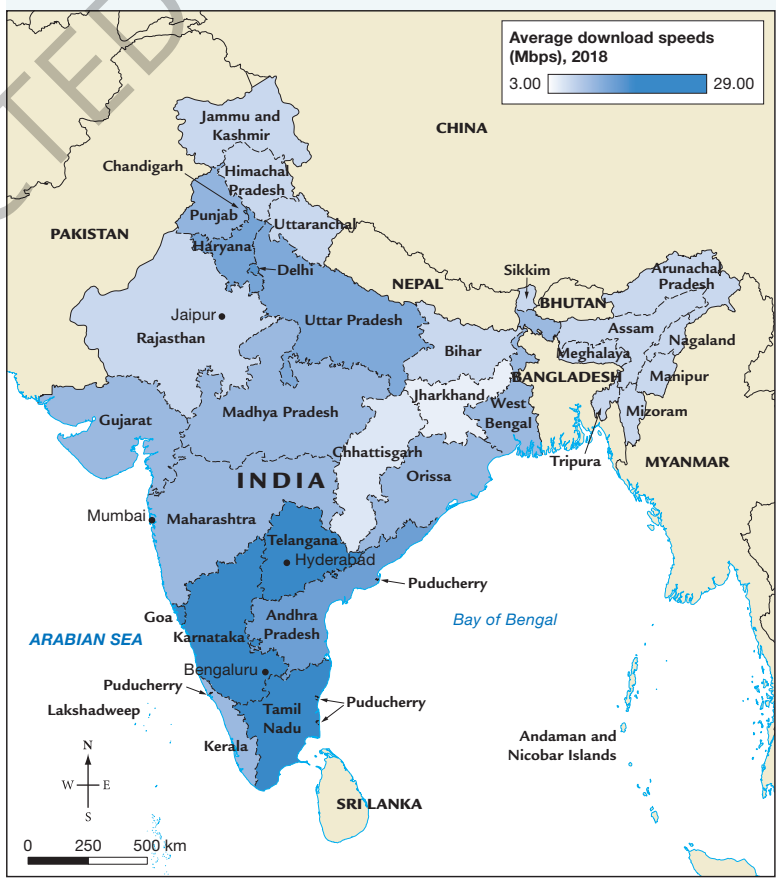
# 18.6 Forging new ICT directions — India

## 18.6.1 The digital divide in India

India is a medium-level-development country with varying levels of prosperity among its people. In 2017, for example, Indian gross national product (GNP) was relatively low, at US$6353 per person, and 21.2 per cent of the population earned less than US$1.90 per day. However, mobile phone subscriptions are high (85.2 per cent in 2017, with an increase of 39.4 per cent between 2010 and 2016), providing greater connection within India and to the world. Conversely, internet users comprise a much smaller percentage of the population (only 29.5 per cent in 2017). Despite this, ICT is a boom industry in places like Bengaluru and Hyderabad, where many international companies have set up their service industries providing the world with call centres, and conducting research and development within the ICT sector.

**FIGURE 1** Broadband speeds across India, 2018



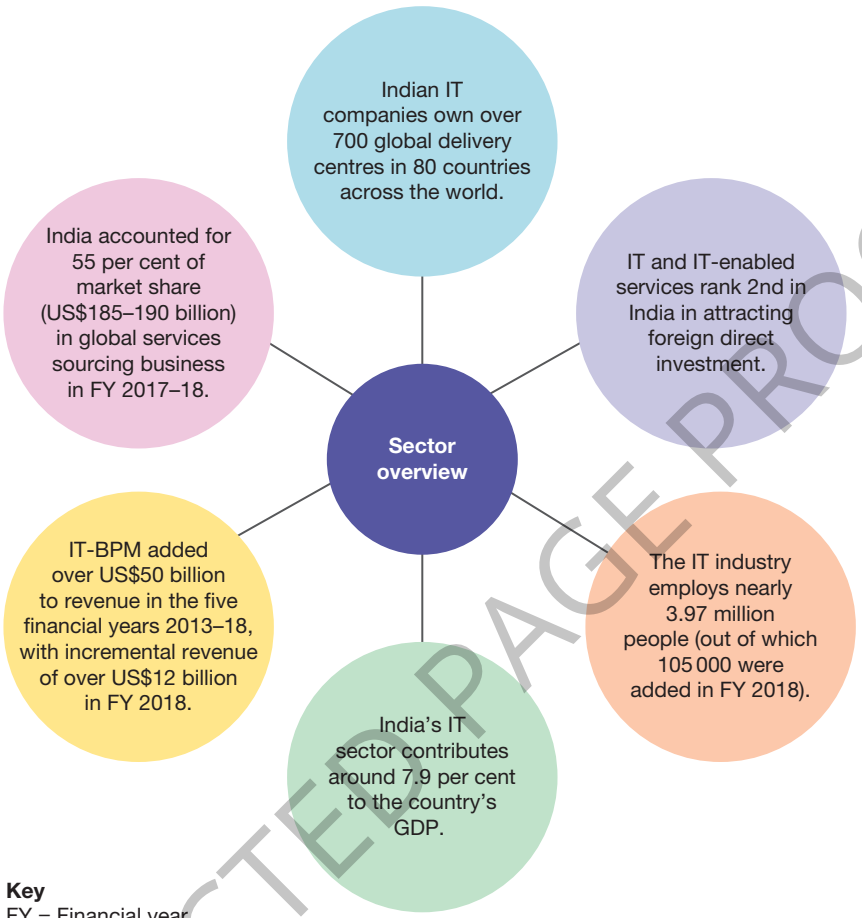

***Source:*** © 2006–2019 Ookla, LLC

## 18.6.2 ICT in India

Among Asian countries, India is a leader in internet affordability and is ranked third in its readiness for the internet, but poor mobile speed and uneven availability mean that a digital divide does exist within the country. **FIGURE 1** shows the uneven average download speeds across India. The ICT hubs are within the

highest-rated areas, although this rate of connection is lower than can be expected in Melbourne, where the average download speed is over 40 Mbps.

**FIGURE 2** The strength of India's IT sector




**Key**
FY = Financial year
IT = Information technology
BPM = Business process management

## 18.6.3 Bengaluru — a dynamic city

Bengaluru began its role in the ICT world back in the 1980s when two Indian tech companies — Infosys and Wipro — moved their head offices there. Other tech companies followed, growing their businesses around the two firms. This included foreign companies looking to cut costs by employing cheap local ICT developers. The ICT outsourcing model had begun.

**FIGURE 3** Modern Bengaluru

Bengaluru is now a modern city. These new jobs raised living standards and attracted educated Indians from across the country, as well as expatriates from across the world. Academic institutions set up alongside the innovative ICT businesses. Indians working elsewhere in the world are bringing their knowledge and skills home. More and more international companies are outsourcing to India because labour costs are lower and skill shortages occur across the world. India also has a large and able English-speaking workforce (there are more than 80 million English-speakers in India). In 2019, Australia's Telstra launched its Telstra Innovation and Capability Centre in Bengaluru to overcome the skill shortage in

Australia. Bengaluru has grown into a major international hub for ICT companies. Since 2018, Bengaluru and Hyderabad (part of India's Silicon Valley) have shared top billing as the world's most dynamic cities, according to a ranking devised by the investment management firm Jones Lang LaSalle.

## 18.6 EXERCISES

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### 18.6 Exercise 1: Check your understanding

1. **GS1** What percentage of the Indian population earns less than US$1.90 per day?
2. **GS1** How rapid was the uptake of mobile phones in India between 2010 and 2016?
3. **GS1** In which Indian cities is the IT industry developing rapidly?
4. **GS1** In what aspects of the IT industry is India particularly well regarded?
5. **GS2** How significant is the ability of the Indian population to speak English? Explain.

### 18.6 Exercise 2: Apply your understanding

1. **GS2** Look at **FIGURE 1**. Describe the broadband speeds across India.
2. **GS6** Suggest what impact India's broadband speeds would have on the establishment of technological companies across the country.
3. **GS5** In what ways does the ICT sector help the economic development of India within the country?
4. **GS5** In what ways does the ICT sector help the economic development of India with its connections to the world?
5. **GS6** List the advantages of Bengaluru and India to the world as a major ICT hub.

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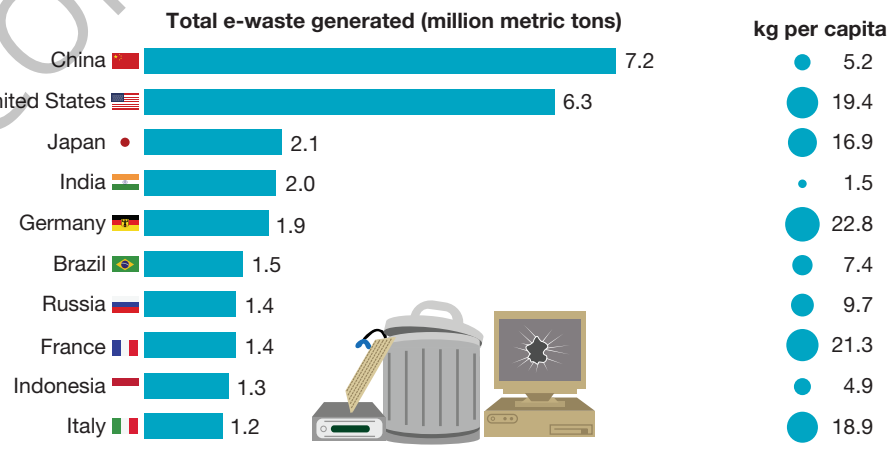
# 18.7 The impact of ICT production

## 18.7.1 Production and consumption

China is one of the largest producers and consumers of electronics. With the short lifespan of some products — the Chinese buy a new mobile phone on average every 18 months — and with advances in technology, there is a growing amount of **e-waste**, produced both within China and by overseas countries (**FIGURE 1**). Globally 44.7 million metric tonnes of e-waste were produced in 2016; it is expected this figure will reach 63.7 million metric tonnes by 2025. For a long time, places like China, India and Ghana have accepted and processed the world's e-waste to enhance their economic development.

**FIGURE 1** Countries generating the most electronic waste, 2016



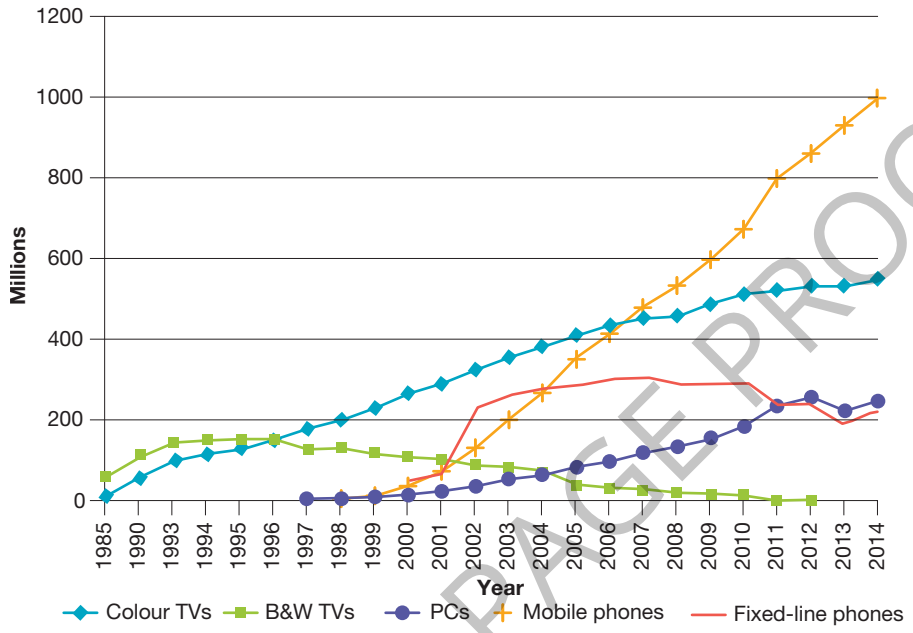

Note: *Includes discarded products with a battery or plug including mobile phones, laptops, televisions, refrigerators, electrical toys and other electronic equipment

***Source:*** The Global E-waste Monitor 2017

## 18.7.2 The impact of e-waste on people in China

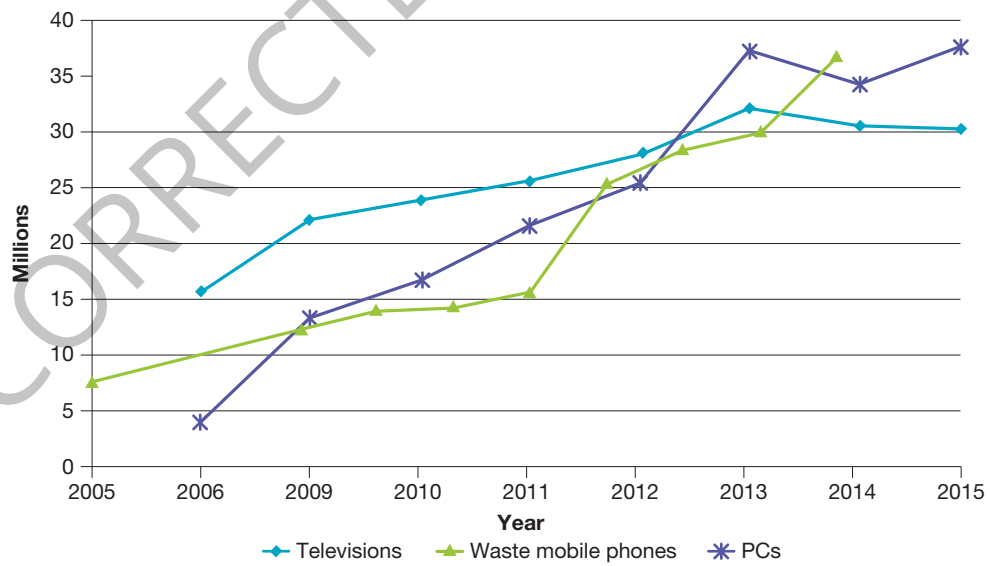
Growth in China's national economy has seen a change in the sale of ICT appliances (see **FIGURE 2**) as its society develops a growing middle class. China generates the highest quantity of e-waste in Asia and in the world — some 7.2 million metric tonnes in 2016 alone.

**FIGURE 2(a)** The number of ICT devices owned in China




***Source:*** China Household Electric Appliance Research Institute (CHEARI), White Paper on WEEE Recycling Industry in China 2015

**FIGURE 2(b)** The number of devices discarded annually in China




***Source:*** CHEARI, White Paper on WEEE Recycling Industry in China 2015

In the domestic market, informal collectors travel door-to-door collecting no-longer-used technological appliances for cash. It is estimated that this mode of collection recovers most e-waste (86 per cent in 2015). Formal collectors are tax-paying businesses or waste stations that buy back old appliances. But the Chinese consumers prefer the informal collectors who offer a higher price and a more convenient service.

The informal collectors' method of handling the e-waste is a major concern for their wellbeing. In backyards and laneways families sift through the e-waste, exposing themselves to many toxic components. **FIGURE 3** shows the various human body systems and the e-waste components that can affect them. Major exposure to the toxic elements occurs when the e-waste component parts are melted down over open fires to extract gold, copper and silver (**FIGURE 4**). Recent studies have shown that exposure to such toxic components reduces intelligence and has a negative impact on the development of the central nervous system of children.

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

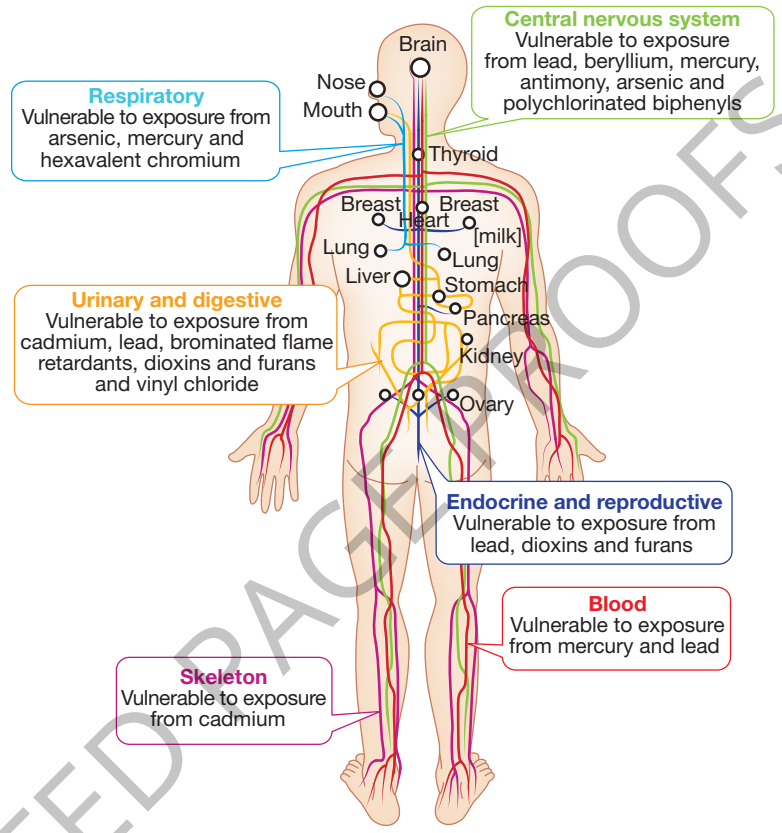



**FIGURE 4** Informal collectors sort and burn e-waste.

## 18.7.3 The impact of e-waste on places in China

For many years Guiyu, in Guangdong province, China, was known as the centre for reclaiming e-waste. The livelihood of its residents depended on this business. The air was polluted by an acidic smell, waste water as a by-product flowed into waterways, and soils were contaminated. Local agricultural produce was contaminated by the toxic water used for irrigation. Vegetables further absorbed toxins through their leaf systems, and people ate these vegetables.

Today Guiyu has a number of modern formal recycling plants. The informal collectors have been forced into operating in and through these plants. However, it has not been easy to change people's ways, so regulation and law enforcement have not always been adequate to bring about change.

**FIGURE 5** Animals graze amongst e-waste in Guiyu.


### 18.7 INQUIRY ACTIVITY

Conduct internet research to find a selection of 4 or 5 images and annotate these in a photographic essay to show an understanding of the life of an informal e-waste collector.

**Classifying, organising, constructing**

## 18.7 EXERCISES

**Geographical skills key: GS1** Remembering and understanding **GS2** Describing and explaining **GS3** Comparing and contrasting **GS4** Classifying, organising, constructing **GS5** Examining, analysing, interpreting **GS6** Evaluating, predicting, proposing

### 18.7 Exercise 1: Check your understanding

1. **GS1** Define the term *e-waste*.
2. **GS2** Compile a list of potential e-waste from items in:
   (a) your classroom
   (b) your home.
3. **GS1** Name the two countries that produce the greatest amount of e-waste.
4. **GS1** Name the five countries that produce the most e-waste per person (per capita). How would you categorise the economic development of these countries?
5. **GS2** Describe how the consumption of ICT products has increased in China since 2006.

### 18.7 Exercise 2: Apply your understanding

1. **GS2** Has the production of e-waste reflected the consumption of ICT products in China since 2006? Explain your answer.
2. **GS6** China might produce the most e-waste, but its per capita level is low. India also has a low per capita level, although it produces far less e-waste. Try to explain this situation.
3. **GS5** Interpret **FIGURE 4**, which shows an informal collector in China sorting and burning e-waste. Annotate the image to show the health effects that this person might experience in the future.
4. **GS5** Explain how the animal grazing in the ***environment*** in **FIGURE 5** is likely to be affected by the e-waste.
5. **GS6** Propose a set of regulations that might assist the city of Guiyu to replace the culture of informal collection of e-waste in the city. Suggest how each regulation might be introduced so that the program is a success.

Try these questions in learnON for instant, corrective feedback. Go to www.jacplus.com.au.

# 18.8 The future for e-waste

## 18.8.1 Addressing concerns

Since 2014, legislation regarding the management of e-waste has been developed and, to varying degrees, adopted across the globe (see **TABLE 1**). The coverage by legislation has risen from 44 per cent to 66 per cent of the world's population (in 67 countries). India, as a major generator of e-waste, has been leading the way with the adoption of legislation; African countries, conversely, have done little to address the issue.

**TABLE 1** Global adoption of e-waste legislation

| Well-developed e-waste legislation | Absence of e-waste legislation |
|---|---|
| Europe | Africa |
| North America | Caribbean |
| East Asia (China, Hong Kong, Japan, Taiwan, South Korea) | Central Asia |
| South Asia | East Asia (Mongolia, North Korea) |
| Oceania (Australia and New Zealand) | Oceania (Pacific Islands) |

## 18.8.2 Legislation

The existence of policies or legislation does not necessarily imply successful enforcement or the existence of sufficient e-waste management systems. **TABLE 2** lists some of the more significant attempts at e-waste management around the world.

**TABLE 2** E-waste legislation around the world

| Policy/legislation | Specific actions |
|---|---|
| Basel Convention 1994 | • Keep the production of hazardous waste as low as possible.<br>• Make suitable disposal facilities available.<br>• Reduce and manage international flow of hazardous waste.<br>• Ensure management of waste is controlled in an environmentally friendly way.<br>• Block and punish illegal movement of hazardous waste. |
| Buy-back policies | Many countries have tried buy-back schemes, with varying degrees of success. |
| China's e-waste ban, 2002 | Although an official ban was placed on e-waste being shipped into China, it continued to be smuggled in or came across the borders by land. In 2017 China strengthened its ban on e-waste. |
| International Telecommunication Union | **Connect 2030** has taken on board the Sustainable Development Goals, especially Goals 3, 7, 11, 12 and 13, where ICT can be applied. |
| Kenya e-waste Act | Initiated in 2013 but stalled in parliament, this Act has been replaced by a National E-Waste Management Strategy to cover the period 2019–20 to 2023–24. Its purpose is to prescribe ways to minimise negative impacts of e-waste on the environment and human health. |
| Global e-waste Statistics Partnership 2017 | The International Telecommunication Union, the United Nations University, and the International Solid Waste Association have joined together to improve the collection, analysis and publication of worldwide e-waste statistics, with a view to increasing the awareness of the need for further development in the e-waste industry. |
| India 2018 | Rules were first established in 2011 using the concept of Extended Producer Responsibility whereby the manufacturer is responsible for safe disposal of electronic goods. In 2018 the emphasis was on regulating the dismantlers and recyclers and providing revised collection targets into the future. |

Only 41 countries in the world collect statistics. Measuring e-waste is an important step towards addressing the e-waste challenge. Statistics help to evaluate developments over time, set and assess targets, and identify best practices of policies. Better e-waste data will help to minimise its generation, prevent illegal dumping and emissions, promote recycling and create jobs.

## 18.8.3 Consumption awareness and responsible e-waste handling

In 2011, the Australian government commenced the National Television and Computer Recycling Scheme (NTCRS). The NTCRS website directs people to places to dispose of e-waste, such as MobileMuster and Planet Ark.

On 1 July 2019 Victoria banned the inclusion of e-waste in general garbage collections and curbside collections. E-waste will no longer go to landfill.

Each individual must be aware of the e-waste being produced by their consumption of modern technological appliances and their method of disposal of no-longer-wanted items. How aware are you? Act local, think global.

**FIGURE 1** Toxic components in the central processing unit and cathode-ray tube monitor of a desktop computer


## on Resources

**Interactivity** e-wasted (int-3343)

**Weblink** Survey Monkey

## 18.8 INQUIRY ACTIVITIES

1. Conduct research to find out where your nearest National Television and Computer Recycling Scheme drop-off point is located.
   (a) Is it realistic to take your e-waste there?
   (b) How can the Victorian government support its legislation on e-waste?
   **Examining, analysing, interpreting**
2. As a class, conduct a survey and interview students, teachers and families about their e-waste recycling habits.
   (a) Draft the questions you wish to ask and consider how you will record the responses. Some ideas for questions might include whether students are more ***environmentally*** aware than teachers/families, whether age makes a difference to a person's attitude to e-waste recycling, whether you consider you have enough e-waste to make it worthwhile recycling, whether it is easy to reach a location that will take your e-waste, etc.
   (b) If you wish to conduct your survey online, use the **Survey Monkey** weblink in the Resources tab. Otherwise, you can use the SkillBuilder in subtopic 18.10 to assist in your survey development.
   (c) After you have conducted your surveys, collate and present your findings in graphic form.
   (d) Analyse the graphs and write a summary of the findings. If possible, arrange to present your findings to an interested group within your school or community — you may help improve awareness of issues and ***change*** attitudes towards e-waste recycling! **Classifying, organising, constructing**
3. Research and write a considered paragraph on the state of e-waste management in Germany, the United States, Thailand or Nigeria. **Examining, analysing, interpreting**

## 18.8 EXERCISES

**Geographical skills key: GS1** Remembering and understanding **GS2** Describing and explaining **GS3** Comparing and contrasting **GS4** Classifying, organising, constructing **GS5** Examining, analysing, interpreting **GS6** Evaluating, predicting, proposing

### 18.8 Exercise 1: Check your understanding

1. **GS1** What proportion of the world's countries has legislation in place regarding e-waste management?
2. **GS1** Which areas of the world are lacking in e-waste management legislation?
3. **GS1** Outline the key actions identified in the Basel Convention.
4. **GS2** Explain the importance of statistics in addressing the issue of e-waste management.
5. **GS1** List five toxic components within a desktop computer.

### 18.8 Exercise 2: Apply your understanding

1. **GS6** Why does legislation often seem to have limited impact in the e-waste sector?
2. **GS6** Now more than 25 years on from the Basel Convention, how has the world responded to the legislation?
3. **GS6** Suggest reasons for Kenya's inability to bring into law an e-waste Act.
4. **GS6** Many countries are looking at an Extended Producer Responsibility (EPR) for e-waste. In China, the four key areas of manufacturing responsibility are: producing ***environmentally*** friendly designs; using recycled materials; standardising waste management and recycling processes; and disclosing data on recycling. Discuss whether these four aspects of e-waste management are likely to be easily, readily and willingly taken into law in China.
5. **GS5** Explain what is meant by the 'need for a global solution to the transboundary issue of e-waste'.

Try these questions in learnON for instant, corrective feedback. Go to www.jacplus.com.au.

# 18.9 SkillBuilder: Constructing a table of data for a GIS

online only

### Why are there tables within GIS?

Geographical information systems, or GIS, use tables to organise and store information about points, lines, and polygons (vector data). These tables have rows and columns, called fields. The GIS software links the rows in the table to the points, lines or polygons on a map.

| Sample | Address | No_home | No_mobiles |
|---|---|---|---|
| 1 | 42 Jacob Street | 2 | 4 |
| 2 | 27 Jacob Street | 3 | 3 |
| 3 | 36 Adele Avenue | 4 | 3 |
| 4 | 34 Flint Street | 4 | 1 |
| 5 | 35 Flint Street | 5 | 3 |
| 6 | 25 Flint Street | 4 | 2 |
| 7 | 12 Jess Court | 4 | 2 |
| 8 | 2 Jess Court | 4 | 4 |
| 9 | 12 Flint Street | 5 | 3 |
| 10 | 52 Jacob Street | 6 | 2 |

### Select your learnON format to access:

- an overview of the skill and its application in Geography (Tell me)
- a video and a step-by-step process to explain the skill (Show me)
- an activity and interactivity for you to practise the skill (Let me do it)
- questions to consolidate your understanding of the skill.

### on Resources

**Video eLesson** Constructing a table of data for a GIS (eles-1743)

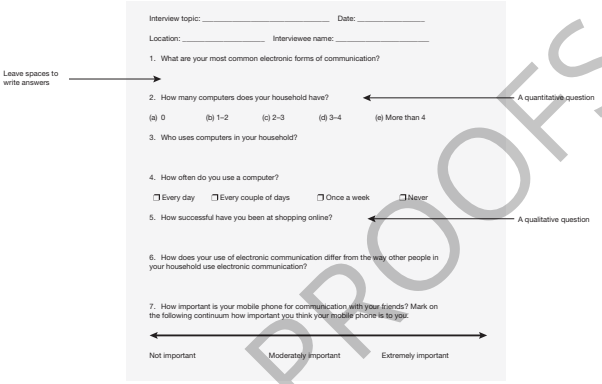
**Interactivity** Constructing a table of data for a GIS (int-3361)

# 18.10 SkillBuilder: Using advanced survey techniques — interviews

online only

## What are interviews that survey people's opinions?

Surveys collect primary data, such as data that has been gathered in the field. Conducting a survey interview means asking questions, recording and collecting responses, and collating the number of responses.




### Select your learnON format to access:

- an overview of the skill and its application in Geography (Tell me)
- a video and a step-by-step process to explain the skill (Show me)
- an activity and interactivity for you to practise the skill (Let me do it)
- questions to consolidate your understanding of the skill.

### on Resources

**Video eLesson** Using advanced survey techniques — interviews (eles-1742)

**Interactivity** Using advanced survey techniques — interviews (int-3360)

# 18.11 Thinking Big research project: Trash or treasure?

online only

## SCENARIO

Showcasing Japanese dedication to sustainability, the Tokyo 2020 Olympic medals contain electronic waste. You will create a pamphlet to accompany the medals, explaining the background to their production — how the trash of millions has been recycled to create the prized Olympic treasures of the athletes of the 2020 Olympic Games.

### Select your learnON format to access:

- the full project scenario
- details of the project task
- resources to guide your project work
- an assessment rubric.

### on Resources

**projectsPLUS** Thinking Big research project: Trash or treasure? (pro-0196)

# 18.12 Review

online only

## 18.12.1 Key knowledge summary

Use this dot point summary to review the content covered in this topic.

## 18.12.2 Reflection

Reflect on your learning using the activities and resources provided.

### on Resources

**eWorkbooks** Reflection (doc-31730)
Crossword (doc-31731)

**Interactivity** Global ICT — connections, disparity and impacts crossword (int-7652)

### KEY TERMS

**connectivity** the ability to access the internet
**digital divide** a type of inequality between groups in their access to and knowledge of information and communication technology
**e-waste** any old electrical equipment such as computers, toasters, mobile phones and iPods that no longer works or is no longer required
**gross domestic product (GDP)** the total value of all goods and services produced in a country in a given period of time (usually a year)
**human development** measures such as life expectancy, education and economic wellbeing that provide an overall indication of a place's level of development and the standard of living of its inhabitants
**World Wide Web** the global resources and information exchange available to internet users through the use of the Hypertext Transfer Protocol (HTTP)