

Geodate

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Feeding Sydney – Part 2

Understanding Urban Food Security

by **Bob Fagan**

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Introduction

The Sydney metropolitan region, containing Australia's largest city, draws on a wide variety of food supply sources, both from Australia's temperate and tropical zones, and from food imports which have increased steadily over the past 20 years. Complex networks, many with global reach, now supply Sydney's major food processing industries, supermarkets and restaurants as well as supplying fresh foods for household consumption. Yet in addition, the Sydney region produces large quantities of perishable foods grown locally on generally well-watered lands around its urban fringes. This source of supply is commonly overlooked by its residents, most people in Sydney simply taking for granted the city's supplies of nutritious and affordable food.

Urban Australia has entered the 21st century, however, to serious questions about the sustainability of future food provision systems. A primary trigger for a new focus on urban food security has been the growing debate over climate change linked to emissions of greenhouse gases like carbon dioxide (CO₂), and the challenge of introducing effective measures to reduce the 'carbon footprint' of human activities including food production and transport. In addition, there are growing concerns over impacts of future increases in the price of oil, a non-renewable resource on which food agriculture and transport has come to depend. Finally, there has been growing concern about environmental degradation, especially of water quality and soil, in many of Australia's food-growing regions.

An earlier paper in *Geodate* (Fagan, May 2008) explored the idea of reducing total 'food miles' travelled to feed residents of cities like Sydney in order to reduce CO₂ emissions and oil dependence. While commodity chains linking food farmers with final consumers have lengthened throughout conventional, industrialised food provision systems, a variety of local food systems already play a part in feeding metropolitan regions like Sydney. This present paper extends the earlier one by considering food security more broadly and exploring challenges facing local food agriculture in cities like Sydney. If localisation – reducing food-miles – is to play a significant role in making food provision systems more sustainable and secure, challenges facing food agriculture in Australia's major urban regions become especially significant.

What Is 'Food Security'?

The United Nations' Food and Agriculture Organisation (FAO) defines food security as '... the basic human right to secure food supplies which are in sufficient and affordable quantities,

nutritious and culturally-appropriate' (FAO, 1996). By the early 21st century, various kinds of food insecurity had emerged at all geographical scales from global to local. Globally, many of the world's poorest nations began to experience rapid increases in food insecurity and growing problems of hunger and malnutrition which had been reducing, albeit unevenly, during the last two decades of the 20th century. The primary trigger was a dramatic rise in world prices for basic grains from 2006 to 2008 of 267 per cent for wheat, 231 per cent for maize (corn) and 187 per cent for rice. These price rises reflected a combination of causes including: rising oil prices; loss of food-growing land to biofuel production or urban expansion; increasingly intensive production of meat from grain-fed rather than grass-fed livestock; and impacts of lengthy droughts and environmental degradation in some of the poorest countries, for example in Africa. Good seasons since late 2008 in some parts of the world, and increases in food production following the steep price rises, caused significant falls in basic grain prices by mid 2009. Yet if global food security is indicated by the number of days the world's available supply of basic grains would last given total demand, food security in 2009 still remained among its lowest levels since the early 1970s.

Urban Food Security

The Australian government is committed to assisting developing countries improve their food security through its foreign aid program (AusAID, 2008) and by encouraging international trade. Yet, somewhat belatedly compared with other developed countries, it has also begun to focus on future sustainability of Australia's own food supplies especially in relation to impacts of environmental degradation and climate change. This has been encouraged by state governments and non government organisations (NGOs) like the Australian Conservation Foundation, humanitarian organisations like Red Cross, social welfare organisations like Anglicare, and a range of community-based food movements promoting more sustainable food systems within Australia (see Sydney Food Fairness Alliance, 2009).

In a preliminary study of its emergency food provision programs in Wollongong, south of Sydney, Anglicare defines food insecurity as '...limited or uncertain availability of nutritionally adequate and safe foods' (Babbington and Donato-Hunt, 2007, p. 7) and regular anxiety at household level about access to food. By mid 2009 food insecurity was most severe in remote communities in northern Australia especially involving Indigenous Australians. Yet food insecurity also occurs in

particular localities within Australia’s metropolitan regions. As with many issues involved in feeding Sydney, little information has been collected systematically about the extent of food insecurity in this affluent, ‘global’ city. Yet the importance of the issue is suggested by preliminary research conducted by public health authorities and welfare organisations.

The NSW Department of Health in 2001 found about six per cent of households in Sydney had run out of food at some stage during the preceding year and had been unable to purchase more at that time. In 2004 surveys of households in three areas of southwestern Sydney considered to be socially-disadvantaged, however, showed 22 per cent had experienced food insecurity including 45 per cent of single parent households. In Anglicare’s Wollongong study, people using emergency food programs were often in low-income, single parent households, about half with young children, or were elderly people (Babbington and Donato-Hunt, 2007, p6).

Such food insecurity can contribute to household diets with substantial proportions of high-fat, high-carbohydrate and relatively low-cost processed food (including fast food). Food insecurity has thus been implicated in higher rates of childhood obesity and other public health problems in socially disadvantaged areas within cities like Sydney and can also have an impact on children’s ability to keep up with schooling. Welfare organisations such as Anglicare and Australian Red Cross have developed local food distribution programs, including in urban areas regarded as socially-disadvantaged, including Red Cross’s Good Start Breakfast Program which supplies nutritious breakfasts to school children.

STUDENT ACTIVITIES

1. Define the following terms: temperate, tropical, sustainability, carbon footprint, non-renewable resource, food security, food insecurity, urban fringe.
2. What types of foods can be produced locally to large urban centres?
3. Refer to an atlas map of Sydney and identify the rural-urban fringe
4. Outline the argument for reducing food miles. Look at the student resource about the geography of logistics and supply chains at <<http://www.tdtvictoria.org.au/node/53>> and comment on the complexity and distances required to deliver selected products. How might this contrast with perishable goods grown in urban fringes?
5. Complete the following table to outline some of the global and local food security issues and their causes.

	Food Security Issue	Cause/s
Global		
Local		

6. Which groups in Australia most suffered food insecurity in 2009? What reasons are there for this situation?
7. Which socio-economic groups in Australia suffer food insecurity?
8. Read about the Red Cross Good Start Breakfast Program at <http://www.redcross.org.au/nsw/services_breakfastclub.htm>. Do you think this is an important program? Explain.
9. Draw a diagram to summarise the links between food insecurity, childhood obesity and education levels.
10. Read about the Australian government’s response to food security at <http://www.ausaid.gov.au/publications/pdf/ausaid_food.pdf>.

Food Agriculture In The Sydney Basin In The Early 21st Century

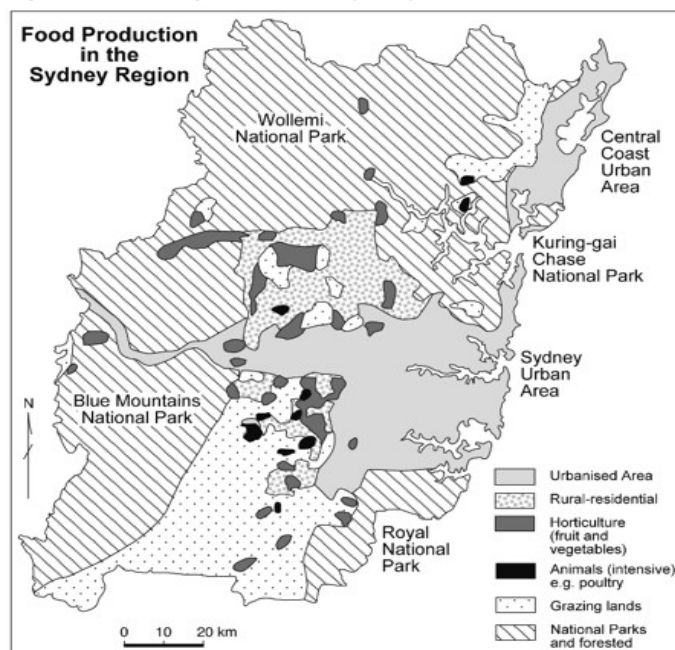
By the early 21st century, while seemingly well-placed nationally in relation to overall food supplies Australia faces a range of challenges to environmental sustainability of food agriculture as well as rising concerns about food insecurity based on social disadvantage. The idea of localising urban food supply, through both conventional supply chains and alternative food networks reviewed in the earlier *Geodate* article (Fagan, May 2008), has become a crucial dimension of debates about urban food sustainability and security. This raises the question of how much food could be produced locally to supply Australia’s principal food markets, its largest cities.

Food is grown commercially, often called market gardening, in most of Australia’s urban regions and Sydney’s Greater Metropolitan Area produces a variety of fresh food consumed locally. Despite continued urban expansion, Sydney’s outer metropolitan fringes remain among Australia’s most productive farming regions for some fresh vegetables, fruits and poultry. Sydney residents might be surprised to learn that up to 90 per cent of fresh (perishable) vegetables consumed in the city are currently grown around the metropolitan fringes, plus virtually 100 per cent of Asian vegetables, four-fifths of fresh mushrooms, and two-fifths of chicken, meat, and eggs (Sinclair *et al.*, 2004). According to the NSW Department of Primary Industries, Sydney’s market gardens, orchards, glasshouses and poultry farms currently produce food to a value of at least one billion dollars per annum.

Food agriculture is concentrated in two main districts in the metropolitan region (Figure 1):

- the northwestern plain from outer Blacktown municipality to the Hawkesbury River in Hawkesbury Shire;
- the southwestern urban fringe in local government areas of Liverpool, Camden and Campbelltown along with extensions into the grazing lands of Wollondilly Shire adjacent to the NSW Southern Highlands region.

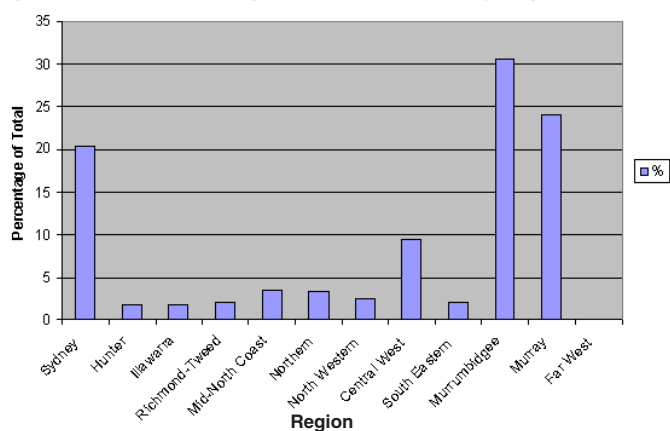
Figure 1: Food agriculture in Sydney Basin 2003–2008



Source: based on recent satellite photographs of the Sydney Basin and information in Sinclair *et al.*, 2004.

Arable lands in the Sydney region are generally well-watered with good soil and support highly-productive food agriculture by Australian standards. This allows fresh produce to be transported quickly to the city's central fruit and vegetable markets and also direct to supermarket distribution centres. The extent of land suitable for intensive farming at the urban fringes, however, is bounded to the north, west and southeast of the Basin by rugged, forested landscapes and national parks. Figure 2 shows the importance of the Sydney Basin in NSW vegetable production. Inland irrigated regions along the Murrumbidgee and Murray Rivers remain the state's principal vegetable-growing areas but Sydney is the state's third most important region with 20 per cent of NSW vegetable production from about one per cent of its total agricultural land. Food agriculture in the Sydney metropolitan region remains dominated by small-scale farms – an average size of 40 hectares compared with the state average of 1,454 hectares (Sinclair *et al.*, 2004).

Figure 2: NSW total vegetable production by region 2003



Source: Sinclair *et al.*, 2004.

Food farming at Sydney's urban fringes, therefore, is generally not dominated by large-scale or corporate farming. As well as contributing employment opportunities in local government areas such as Hawkesbury, Camden, Campbelltown and Liverpool, food farming has provided livelihoods for

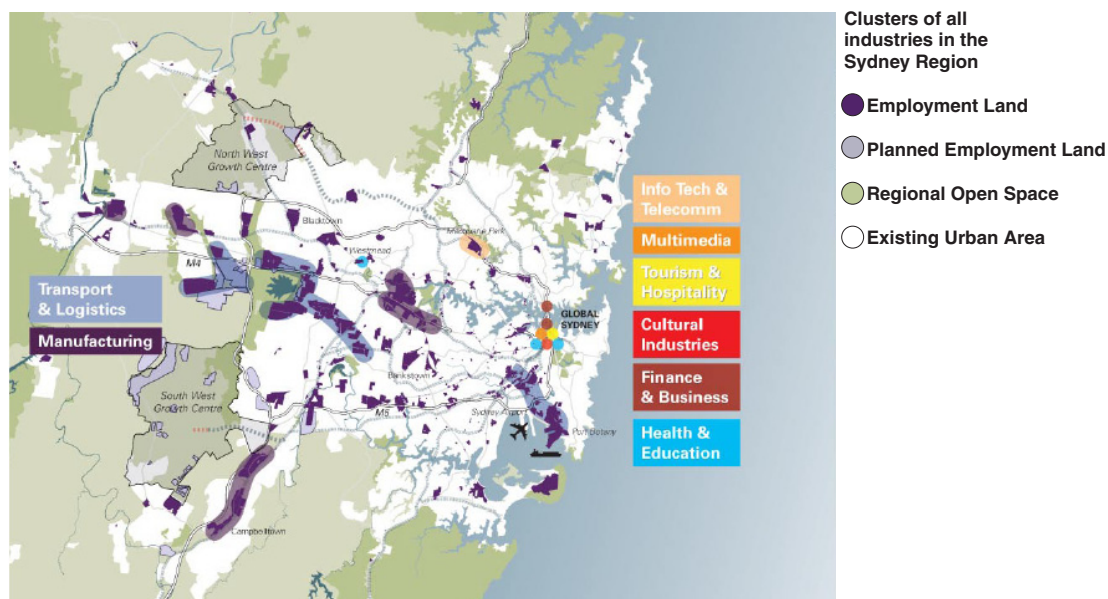
immigrants continuously since the 1950s when market gardening was associated with migrants from southern Europe. Since the early 1990s, food agriculture at the urban fringes has involved new settlers from Lebanon, China, Vietnam and other Southeast Asian countries with an estimated 80 per cent of food farmers in the Sydney Basin coming from such migrant groups.

As well as drawing fruit and vegetables from its urban fringes and the Murray-Darling Basin, Sydney also sources such foods from irrigation areas in Victoria and South Australia and from the Atherton tableland region of North Queensland. In 2008 continued drought in the Murray-Darling Basin plus unseasonably hot weather in the Atherton Tablelands district meant green leafy vegetables would have been scarce and expensive in Sydney supermarkets were it not for horticulture at the urban fringes (Aggs, 2005). The impacts of global warming are predicted to increase the variability of these weather patterns which will only increase the importance of local supplies of fresh food on the city's backdoor step.

The importance of the urban fringe in feeding contemporary Sydney is clear, therefore, as is the likelihood of its increased significance in future given environmental problems in the Murray-Darling Basin, the likely introduction of policies to curb carbon emissions and rising oil prices. Yet food production in Sydney has been under threat continually from suburban expansion.

1. Over the past 30 years, there has been a steady loss of farming land sometimes to new industrial estates but more often, in recent years, to residential land use. Both the north-western and south-western food-growing districts shown in Figure 1 are adjacent to areas designated by Sydney's Metropolitan Planning Strategy (2006) for major residential development in the north west and south west growth centres (Figure 3).
2. Land uses with much higher returns per hectare than farming compete strongly for urban space. The likelihood of future purchase for residential or commercial development can create a 'watchful zone' around the metropolitan fringes in which the intensity of agricultural land use falls as farmers

Figure 3: Where Has Food Agriculture Gone?



Source: NSW Government, 2005, p. 48. <http://www.metrostrategy.nsw.gov.au/dev/uploads/paper/employment/images/EconomyEmployment_FINAL.pdf>

put on hold development plans or farming investments in anticipation of selling out.

3. Metropolitan planning regulations can also place severe constraints on food production. In particular, by 2004 over three-quarters of designated rural land in Sydney's outer areas was zoned for 'rural residential' purposes rather than productive agriculture (Sinclair *et al.*, 2004). High-income residents moving to these fringe areas usually choose to live on larger acreages for lifestyle reasons valuing more spacious blocks, tranquillity and aesthetic values provided by proximity to surrounding bushland or the Hawkesbury River. Such land use conflicts with food agriculture and there has been a growing NIMBY issue facing food production, especially for poultry production but also horticulture using manure and composting and, more generally, because of needs for transport access.
4. Farming households on the urban fringes are finding their children unlikely to work on family farms in future as they seek further education and opportunities presented by the complex metropolitan labour market at their doorstep. In addition, the cost of hiring on-farm labour can be prohibitive for small farms traditionally reliant on the (extended) family. This has been exacerbated by relatively low returns to small scale horticulture because of supermarket pricing policies coupled, over the past decade, with the availability of imported fresh foods at low prices.

Conclusion

Urban food security will be an issue of increasing social and political importance in Australia over the next two decades as both climate change and policies to curb carbon emissions, along with inevitable increase in oil prices, begin to reshape Australian food agriculture. Social welfare agencies are also urging a greater focus in social and urban policy on reducing food insecurity which has increased among socially-disadvantaged people and localities in the largest cities. The role of local food agriculture in feeding Sydney has become increasingly important not only because, in common with international experience, many strategies for making food provision systems more sustainable and secure involve localisation, but also because the Sydney Basin is such an important food-growing region.

Further loss of prime agricultural land from the Sydney Basin is likely to cause increases in prices of perishable vegetables which could make them less accessible to low income households in socially-disadvantaged areas already vulnerable to food insecurity and poor nutrition. A decline in food production in Sydney's outer areas will:

1. increase further the food-miles to supply Sydney with fresh food;
2. increase the quantities of food sourced from large-scale agricultural enterprises with greater carbon footprint;
3. have cumulative impacts on livelihoods of small farmers remaining;
4. contribute to loss of regional biodiversity.

It seems particularly disappointing that in its section setting out plans for the future urban economy, the Sydney Metropolitan Strategy Plan does not include food agriculture (see Figure 3). Agricultural land uses have been included in the 'environment and resources' section of the Strategy where they are discussed as

part of the overall issue of balancing agricultural land use against other uses of 'resource lands' such as extractive industries, water catchment, public open space and tourism. Food agriculture at Sydney's urban fringes needs to be considered as part of an integrated policy on urban food security and sustainability.

STUDENT ACTIVITIES

11. List some of the challenges to environmental sustainability of food production.
12. See if you can find out about food grown locally in your area. Are there labels on food? Should food be labelled with this information? How else can you find out?
13. Describe the distribution pattern of food agriculture in Sydney shown in Figure 1. Account for this pattern.
14. Why will further expansion of food growing areas be limited in the north and west of Sydney's urban fringe?
15. What reasons is there for mainly small-scale farms being located in the Sydney metropolitan region? How will this affect food production?
16. Develop a timeline to summarise the cultural change in Sydney's urban food growing areas. Annotate your timeline with explanatory notes
17. How might global warming affect future food production and supplies?
18. Draw a table to show the list of threats to urban food production in Sydney. For each, suggest ways that the land could be protected and maintained for food production.
19. What impact might supermarket monopolies have on farmers' incomes
20. Write a summary paragraph outlining why food security is a socio-political issue.
21. Present an argument to the NSW government that food agriculture must be considered in all of Sydney's urban planning strategies. Use Figure 3 in your preparation.

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Mobile Telephony: Effects On People And Place

By Aharon Kellerman

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Introduction

Two wireless communications technologies have been widely adopted in recent years: mobile, or cellular, telephones, and computer wireless communications (Wi-Fi). These two technologies have now been integrated, so that mobile phones permit also Internet communications through Wi-Fi. Mobile phones connect two (or more) *people*, rather than two (or more) *places* as fixed-line telephones do. Mobile communications permit voice, short message services (SMS), and in newer 3G (third generation) phones also video communications. Mobile telephone technology was introduced already back in 1906 by Lee de Forest who claimed that 'it will be possible for businessmen, even while automobiling, to be kept in constant touch'... The first limited mobile telephone services were introduced in the UK in 1940 and in the US in 1947, followed by commercial introduction in 1979. Mobile telephony showed, thus, a rather slow evolution from the time of its original invention, early after the introduction of the fixed-line telephone, until its mass adoption in the 1980s–1990s.

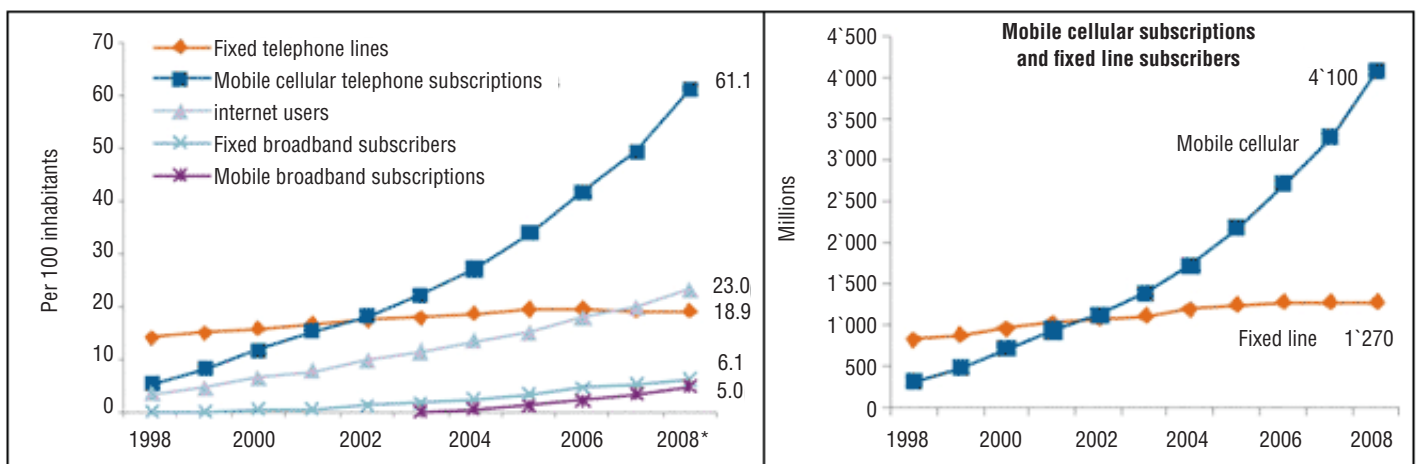
Adoption

The mass adoption of mobile telephony as of the 1980s–1990s, has turned it into the most widely and most rapidly adopted information technology and device. In 2008 there were globally some 61.1 mobile phone lines per 100 inhabitants! However, the actual percentage of the population having access to mobile telephony was higher, since mobile phone services are sold in

developing countries by owners of mobile telephones to others without. The number of mobile phone lines per 100 population grows by some 10 per cent annually (Figure 1). Thus, in 2006 the ratio was 41 per cent and in 2007 it stood at 50.1 per cent. Higher percentages of mobile phones are associated with higher personal income and in small and/or densely populated countries, as it is easier to set up of wireless infrastructure in these places.

The phenomenal growth in mobile phone adoption reflects two trends. First, a vast expansion in the number of people enjoying mobile telephony, mainly in China, India, and developing countries, including Africa in which 28 per cent of the population owned mobile telephones in 2008. This represents a *leapfrogging process*, relating to the adoption of a new technology, while skipping the adoption of older ones, in this case telegraph and fixed-line telephones (Figure 1). Mobile telephony is, thus, frequently the only available communications technology. Second, a deepening of the ownership of mobile telephones in developed countries, because of children receiving their own telephones, sometimes as early as age six. The growing numbers of children receiving their own phone represents both parents' wishes to have instant communications with their children, as well as children's knowledge of the various uses they can make of mobile phones. In addition, a growing number of adult users have more than one telephone line at their disposal, thus bringing the total penetration rate to over 100 per cent of the population in numerous countries.

Figure 1: Global ICT Developments

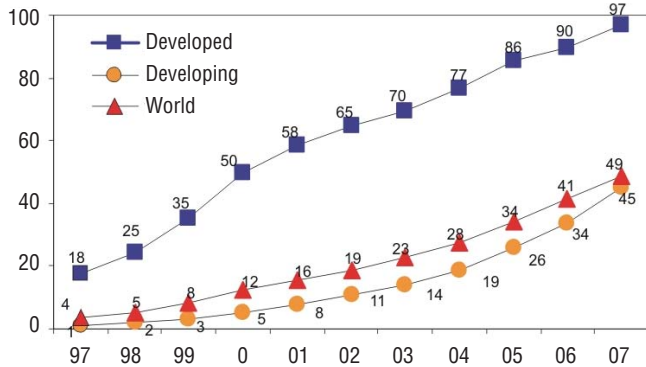


Copyright will need to be sought for this figure

Note * Estimates

Source: Courtesy of ITU: http://www.itu.int/newsroom/press_releases/2009/07.html

Figure 2: Mobile telephone subscribers per 100 inhabitants 1997–2007



Source: Courtesy of ITU:
<http://www.itu.int/ITU-D/ict/statistics/ict/index.html>

Since almost all the settled areas of the globe *facilitate* the use of mobile telephony, this technology is *global*. The technology is also almost *universal*, in the sense of its being potentially almost fully *available*, and it is on a fast track for becoming ubiquitous, namely *owned* by all. Mobile telephony permits fast interpersonal transmissions for both business and pleasure, even for farmers located at the most remote areas, seeking information on yield pricing. In 2001 the global number of mobile telephone lines exceeded that of fixed ones, and by the end of 2008 there were globally only 18.9 fixed lines per 100 inhabitants, as compared to 61.1 mobile lines!

STUDENT ACTIVITIES

1. Define the following terms: Wi-Fi; information technology; developing countries; personal globalisation.
2. In your own words, describe how mobile phones connect people rather than places.
3. Outline the relationship between mobile phones, income levels and population density. How strong is this relationship?
4. a. Describe the change in the ratio of global mobile phone users compared with other ICT products shown in Figure 1.
 b. Use Figure 1 to compare and contrast the change in mobile and fixed line subscriptions over time.
 c. List some reasons for this change.
5. Describe some of the trends seen in mobile phone use by children and adults.
6. Study Figure 2 and outline the change over time in mobile phone use in developing countries. Why is this described as a leapfrogging process? What opportunities might this open up for people in these countries?
7. Why is mobile phone technology regarded as both global and universal?

Uses

In more recent years mobile phones have turned into diversified communications and organisational devices, including cameras, MP3-4, radios, calculators, etc, and they are gradually being integrated with TV, the Internet, and GPS, through 3G devices and technologies. Of these added functions, the most attractive one for adolescents is MP3-4, permitting listening to favorite music. More recently, however, the introduction of higher level phone cameras, involves growing exchanges of pictures among youngsters. SMS has from the outset been most popular among

youth and young adults, getting easily used to fast typing of messages, thus bringing about flexible and enhanced connectivity at cheaper prices than through vocal communications. More recently SMS has turned from an interpersonal medium into a business-to-clients medium, as well. Of special importance for the urban scene are mobile LBS (location-based services) services, permitting users to receive information on specific functions and services (for example, restaurants) in their immediate location. More importantly, in Victoria, following the tragic bushfires on 7 February 2009 mobile LBS is being trialed to warn people of natural hazard events.

The growing integration of mobile phones with Internet communications signals a completion of a major phase in the emergence of information society, permitting one to have immediate access to all personal and public information, and permitting constant and universal communications through all possible channels. A contemporary urbanite, notably in developed countries, may already now access all possible classes of information, whether being at a fixed location, such as home or work, or being on the move, on the street, or while staying in-between, for example, when stopping in stores, or in cafes. Interestingly enough, despite the location-free nature of mobile telephony, location telling is a common practice among users of mobile phones.

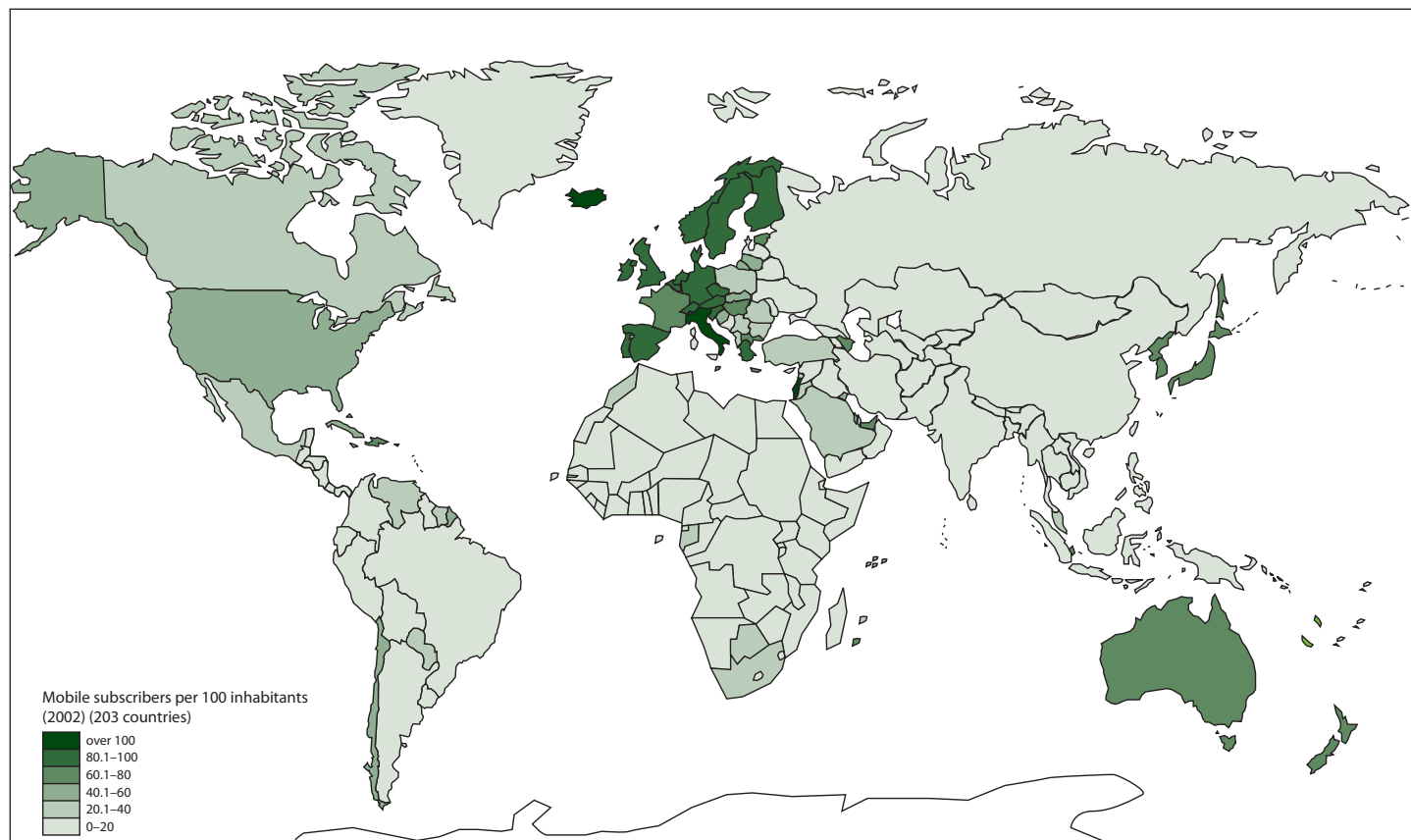
Features

A major feature of mobile phones is their small size and weight. The contemporary sophistication of mobile phones through added functions, for example, cameras, radio, TV, recording, etc., still keeps them in small size and weight. Japan has led in larger mobile phones than in other countries, permitting convenient SMS and e-mail typing, so that the phones are used more for written rather than spoken communications. This has had to do with the average small size of Japanese homes, which limits the use of full-size computers in them.

Automobiles provide a special moving space of privacy for calls made over mobile phones. Generally, however, since users can be reached anywhere, mobile phones nullify possible isolation. The use of either mobile phones or wireless Internet connection implies a blurring between the private and the public, as well as between indoors and outdoors. Whereas telephones and computers were traditionally considered devices to be used indoors and involving some privacy of communications, the use of wireless communications media implies less privacy and a change of social boundaries regarding the acceptance of communications activity in the public sphere. Wireless devices further encourage more travel, notably business travel, through the availability of full connectivity while physically on the road.

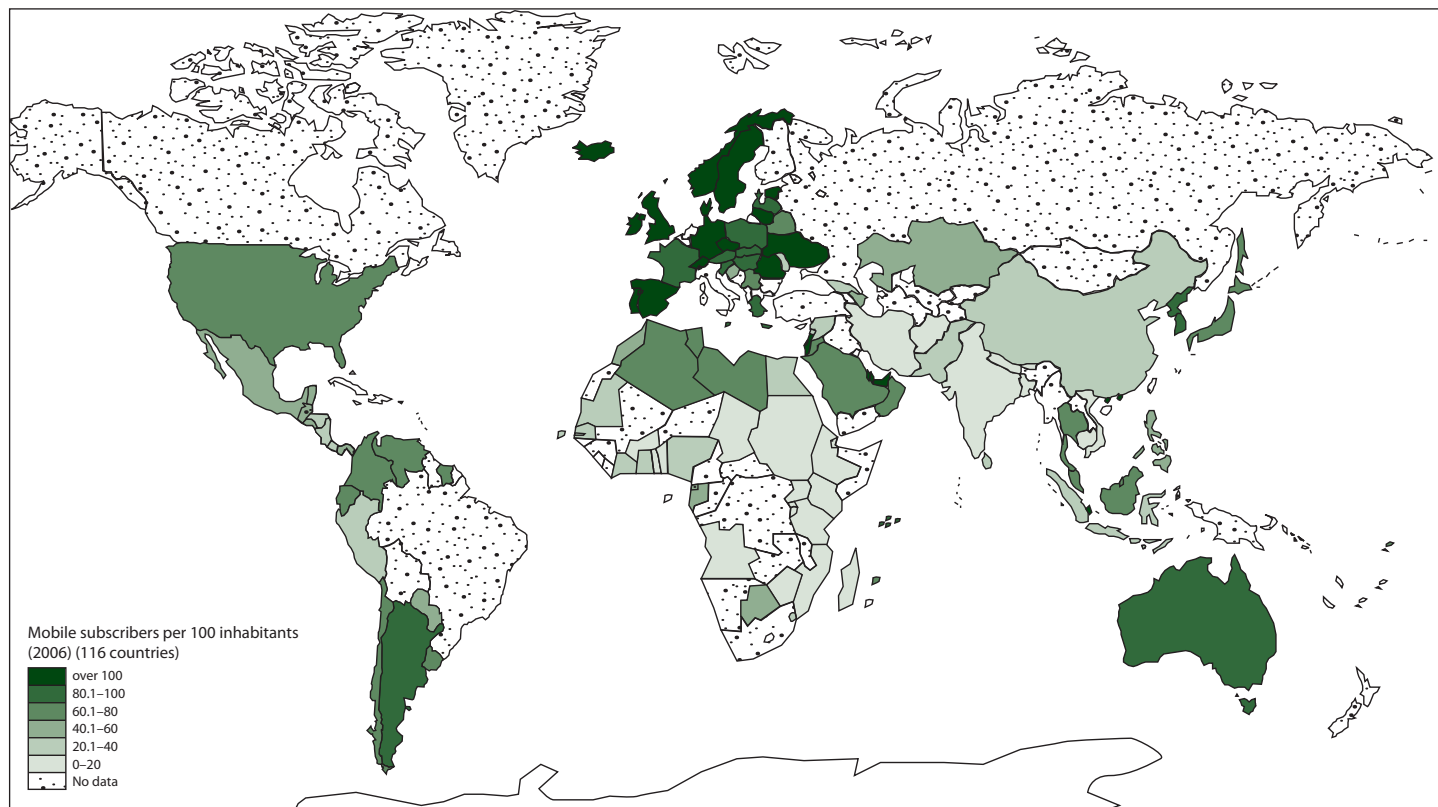
Wireless phones may turn into status symbols as compared to fixed-line telephones. Though being smaller in their size than fixed telephones, mobile ones are being carried and used in public, and the current large variety of features of mobile telephones of various generations and makers may permit viewing some of them as status symbols. Wireless communications infrastructure constitutes a minor land-use, but the need for many antennas for its uninterrupted functioning is still considered a potentially hazardous radiation source, and thus presents an environmental problem.

Figure 3: Mobile telephone subscribers per 100 inhabitants – 2002 (ITU estimates) (203 countries)



Source: UNData: ITU estimates: The data can be found at <http://data.un.org/Data.aspx?d=CDB&f=srID%3A13110>

Figure 4: Mobile telephone subscribers per 100 inhabitants – 2006 (ITU estimates) (116 countries)



Source: UNData: ITU estimates: The data can be found at <http://data.un.org/Data.aspx?d=CDB&f=srID%3A13110>

Urban Contexts

Mobile phones fit well with urban living. They permit immediate contact when, for example, some scheduling requires change because of any unforeseen traffic congestion. By the same token, mobile phones permit more spontaneity in time use. For individuals, wherever located, mobile phones may further imply personal globalization, as overseas destinations may be reached instantaneously from any location, albeit frequently at high costs for vocal calls (and low ones for SMS). International calling may become much more popular with the current integration of the Internet into mobile phones, thus potentially facilitating VoIP (voice over Internet protocol) calls, for instance through Skype.

Growingly, mobile phones are equipped with GPS (Global Positioning Systems), which are satellite communications devices providing vocal and visual navigation assistance, especially when driving in unknown urban environments. The penetration of GPS, as a stand-alone device, is still in its infancy as compared to mobile telephony. The US was one of the three leading countries in GPS penetration (jointly with Japan and Korea), with some 17 per cent of its adult population using GPS devices in 2007.

Conclusion

Connectivity is the name of the game of our age. As individuals we are swiftly becoming accustomed to expecting full connectivity and access available to us anywhere we are, permitting both interpersonal communications and information retrieval, vocally and visually alike. From the perspective of the geographical location of individuals, space and distance were viewed time and again as constituting 'tyranny' for people at times of more veteran past technologies, which did not provide for universal communications (the telegraph and the fixed-line telephone). However, in the contemporary information age, mobile communications permit already and will permit even more in the future flexible locational opportunities for individuals, in the form of online shopping, exposure to other cultures, and social interaction.

STUDENT ACTIVITIES

- Use the maps and website <<http://data.un.org/Data.aspx?d=CDB&f=srID%3A13110>> to answer the following questions.
 - Which region and continent has the (i) highest and (ii) lowest rate of mobile phone users in 2002? Use specific examples to quantify your answer.
 - Which region/continent has the (i) highest and (ii) lowest rate of mobile phone users in 2006? Use specific examples to quantify your answer.
 - Summarise the change in mobile phone use that has occurred in Asia, Europe and the Middle East, using specific examples in each case.
 - How does Australian mobile phone use compare with other countries globally and within the Asia-Pacific region?
 - Write a general description of the global distribution of mobile phone users per 100 people and how this has changed over time.
- List the mobile phone features that appeal to you. Compare your list with others in the class. What are the similarities and differences? How might your list compare with other members of your family?
- Debate the following: 'The greatest advantage of mobile phone use is that it has increased access to greater amount of public and private information.'
- Describe how the size of homes in Japan has influenced phone designs by Japanese companies.
- Provide a number of examples of how the use of mobile phones has influenced the territories and boundaries of users in their private and business dealings.
- What environmental problems are associated with mobile phone use? Include an investigation of phone disposal.
- List some of the main advantages of mobile phone use to people living in urban and rural areas. Are there any disadvantages?
- Summarise how mobile phones have changed space and distance for users.
- Glance into the future – what further changes in geography might mobile phones allow? Go to <http://news.bbc.co.uk/2/shared/spl/hi/pop_ups/06/magazine_future_of_mobile/html/1.stm> and <http://www.euromonitor.com/Future_watch_The_rise_and_rise_of_the_indispensible_cell_phone> for some ideas.

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GeoSounding

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Arctic Stories

A few years ago, Inuit hunter, John Keogak saw his first robin, a bird for which the Inuit of Bank's Island in Canada's northwest territories have no word. Fellow hunters had noticed that the climate was changing as long ago as the mid 1980s but, in more recent years, the changes were rapidly accelerating.

Peter John, a 72 year-old Yup'ik Eskimo from Newtok in the southwest coast of Alaska presently lives in a wooden house raised on stilts. All around him Newtok's 60 houses and communal buildings are sinking and tilting at odd angles as the permafrost melts. According to Nasa, temperatures in Alaska have risen more than any other place in the world over the past 50 years – by some 2°C on average, and up to 5°C in winter. The decaying permafrost has resulted in severe coastal erosion threatening the very existence of Newtok. The 320 inhabitants have become arguably the first prospective settlers in a global-warming refugee camp being constructed on nearby Nelson Island. A map of the new settlement shows the planned barge landing and a brand new road spiralling up the slope. The village plan shows new buildings curved around a village hall, school and church. Three small symbols show where the new wind turbines will be located. The entire exercise will cost Alaska as much as US\$130 million.

Indigenous people across the Arctic have reported an ever increasing suite of changes that have taken place. Heikki Hirvasvuapio, from Kakslauttanen, Finland, explained how climate change had impacted on reindeer herding. Heikki said that rain had replaced autumn snowfalls so that lichen becomes inaccessible for the reindeer. The reindeer can not access the lichen when the bottom layer freezes. When they do manage to claw out the plants by its roots the vegetation is destroyed. Lichen takes a long time to regenerate.

Indigenous people from Nunavut, in eastern Arctic Canada, have reported that rivers, swamps and bogs are drying up so that access to hunting and fishing grounds and the migration of fish has been impaired.

Andy Carpenter, from Sachs Harbour, Canada explained that when there is plenty of sea ice about you do not have to worry about storms. But in recent years there is less sea ice and if a storm comes hunters and fishers are trapped at sea.

The community of Sachs Harbour has documented the changes under the Inuit Observations of Climate Change policy. They included: the difficulty of hunting seals because the sea ice was too thin; that it is harder to hunt geese because the spring melt is so rapid; there is less fat on the seals; there are more biting flies and mosquitoes, previously unknown, were prevalent; fewer polar bears are seen in the autumn because of the lack of ice.

Experienced hunters and elders who could predict the weather using traditional techniques now say that 'the weather is harder to know'. Winds suddenly change direction, skies are becoming increasingly cloudy and the frequency of lightning has increased. Setting timetables for hunting or drying fish is more difficult. The weather

and climate is fundamental to Arctic people's ways of life. The Kalaallisut (Greenlandic) word for weather and climate is *sila*. *Sila* integrates and connects a person with the natural world.

Indigenous people are undoubtedly the most acute observers of climate change but other Arctic inhabitants cannot fail to notice the changes. The 300 buildings in the Russian city of Yakutsk are affected by collapsing permafrost, including damage to a power station and the runway at Yakutsk airport.

Arctic lands are most accessible in winter when the tundra is frozen and ice roads and bridges can be used. Timber getters from Archangel, Russia, have found that their productive winter season has been shortened by some four to six weeks. Nearby herring fishers are unable to drill holes in the treacherous sea ice to lower their drift nets. In fact, pensioners in Archangel now speak of eternal autumn rather than a winter season.

The number of days per year when tundra travel is permitted under Alaska Department of Natural Resources standards has fallen from 200 to 100 days in the past thirty years, leading to a 50 per cent reduction in the number of days that oil and gas exploration and extraction equipment can be used.

China's permafrost zone carries more than 3,000 km of railway and 13,000 km of roads, all built on the premise that areas of permafrost are like rock and would never melt.

Australia's chief scientist, Professor Penny D. Sackett, recently said that the 2007 report of the Intergovernmental Panel on Climate Change, (IPCC) a world authority on global climate change, is based on data that is three to four years out-of-date. Professor Sackett said that, 'the newest science, based on more, better and a larger spectrum of data, illustrates clearly that the earth is reacting more quickly to greenhouse gases, tracking along the worst case scenario of the IPCC report.' Try telling this to the people of the Arctic.

We should also be worried about *sila*. There could be as much as 900 gigatonnes of carbon waiting to be released from rotting Arctic soils, more carbon than currently is stored in the entire atmosphere.

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