

# ○ THE ROLE OF BROADBAND IN THE QUEST FOR ENVIRONMENTAL SUSTAINABILITY

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Broadband is changing the way in which we work, communicate and access information and entertainment. These changes have significant implications for environmental sustainability. Broadband is increasing the speed and capability of the Internet, generating new possibilities and making online applications far more attractive for businesses and the community. This paper discusses the role of broadband in contributing to sustainability under three headings; social, environment and economic.

## BACKGROUND

If you had raised the topic of broadband at a dinner party only a few years ago, you would have been met by puzzled faces and accusations of being a ‘tech geek’. Today however, it is a hot political and social issue, with many realising that sufficient broadband infrastructure and affordable services are essential for Australia to play and trade in the modern economy. Broadband is defined by the Australian Government as ‘fast, “always-on” online access to digital content, applications and a range of services, some or all of which can occur simultaneously’ (DCITA 2006). This definition is consistent with international understanding. This paper will follow the earlier definition of broadband used by the Organisation for Economic Cooperation and Development (OECD), viz. broadband is defined as providing downstream access of at least 256 kbit/s (and upstream access of at least 128 kbit/s) (OECD 2003).

Both political and business leaders now advocate that broadband will become the next great utility after roads, water, electricity and gas (Coonan 2006). However, the power of broadband is not the infrastructure but the practical application of the technology (DCITA 2006). This is where the Eckermann challenge lies. Many have discussed the application of broadband for economic and social development, but few have explored how broadband could contribute to the third pillar of society, the environment.

## SO WHAT IS SUSTAINABLE DEVELOPMENT?

One of the most commonly cited definitions of is that of the Bruntland Commission (Brundtland 1987):

... development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability relates to the continuity of economic, social, institutional and environmental aspects of human society, as well as the non-human environment.<sup>1</sup>

While sustainable development relates to the management of resources it is most often raised in the context of concern over climate change or global warming. While climate change is a natural process, the Intergovernmental Panel on Climate Change (IPCC) has confirmed that increased greenhouse gas emissions resulting from human activity are damaging the earth’s enviro-

onment (IPCC 2007a). Average global temperatures have risen by 0.7°C over the past century and are predicted to continue to increase by between 1.8 and 4°C by 2100 (IPCC 2007a). This will result in rising sea levels, shifting climates and altered rain patterns (Brahic et al. 2007). The consequences will be far reaching. Biodiversity of plants and animals will be reduced, human settlements in coastal areas will be under threat (IPCC 2007b)<sup>2</sup> and some economies dependent on agriculture will fold.

Australia will feel the impact of these changes. On 13 April 2007 the Council of Australian Governments (COAG) endorsed a *National Climate Change Adaptation Framework* (Framework) (CAG 2007). The Framework identifies vulnerable sectors including agriculture, biodiversity, fisheries, forestry, settlements and infrastructure, coastal, water resources, tourism and health that require immediate attention to adapt to the impacts of climate change.

The Australian Government has also committed funding of up to \$126 million over five years for climate change adaptation. This will include the establishment of the Australian Centre for Climate Change Adaptation and actions to assist affected sectors and regions to improve understanding of the impacts of climate change and develop adaptation responses. State Governments have also committed to tackling climate change with South Australia passing the nation's first climate change legislation, the *Climate Change and Greenhouse Emissions Reduction Act 2007*, on 3 July 2007 (GSA 2007).

## **ROLE OF BROADBAND IN THE QUEST FOR ENVIRONMENTAL SUSTAINABILITY**

Broadband is changing the way in which we work, communicate and access information and entertainment. These changes have significant implications for environmental sustainability. Thanks to broadband, working at least partly from home has become a reality for many Australians (reducing the need to travel to and from the office); large reports and documentation can be emailed or made available over the Internet (reducing the need to print and post documents); and the general community has greater access to information on issues affecting climate change and the environmental performance of private and public sector organisations. While these changes are all possible via dial-up technology, broadband is increasing the speed and capability of the Internet. This generates new possibilities and makes the online applications far more attractive for business and the community. This paper discusses the role of broadband in contributing to sustainability under three headings; social, environment and economic.

## **EMPOWERED COMMUNITIES (SOCIAL)**

The Earth is one, but the world is not. We all depend on one biosphere for sustaining our lives. Yet each community, each country, strives for survival and prosperity with little regard for its impact on others. Some consume the Earth's resources at a rate that would leave little for future generations. Others, many more in number, consume far too little and live with the prospect of hunger, squalor, disease, and early death. (Brundtland 1987)

Climate change and sustainability are global issues – action is required at both local and international level to achieve change. The worldwide proliferation of ICT has increased global access to information and effectively reduced the barrier of distance between nations (Friedman 2006).

Consequently, countries are much more visible and accountable for their actions. Broadband enables individuals to access a greater level of information on poor environmental practices. It provides a platform for people to raise issues and pressure business and political leaders. An example of this is the 'Fox Attacks' campaign of Brave New Films. This campaign includes a YouTube video attacking the environmental reporting credentials of Fox News. Brave claims that Fox misrepresent the facts surrounding global warming to discredit scientific concern.<sup>3</sup> The video calls for companies, in particular Home Depot (an environmentally friendly product label), to stop advertising with Fox. Information related to the video on YouTube refers viewers to a 'Fox Attacks' website (<http://foxattacks.com>) which includes facts, videos, blogs and an online petition calling for Home Depot to stop advertising with Fox. While the facts and motives behind such campaigns must be examined, there is no dispute that the Internet is a powerful medium for raising global awareness of issues such as climate change in order to propel change.

Political leaders are also open to greater scrutiny as a result of new communication media enabled by broadband. Recently in the United States (US) the Democrats held a political debate based solely on video questions submitted online by the public. Many questions related to environmental sustainability, including 'who took a private jet to the debate?'; 'what is being done to ensure the ethical trade of carbon emissions?'; and 'what would be done to address global warming?' (Seeyle 2007). The ability of the Internet and high speed applications to improve accountability is a powerful step forward in achieving change and political action.

Broadband has empowered communities, linking people to global networks of like-minded individuals (IIA 2007). Environmental lobby groups have established websites to share their message and provide information on local events and issues. One such website, the Sierra Club (<http://www.sierraclub.org/>) has over 1.3 million members and provides a range of information on how individuals can get involved in local environmental issues. Other examples include <http://www.avaaz.org> and <http://www.getup.org.au>. These sites have been established to provide people with a voice over a range of global issues, including the environment. They also alert people to campaigns and opportunities to act online and offline to make a real difference on pressing global issues.

Broadband has enabled powerful online lobby tools, including short films, petitions, blogs and fund raising tools. Before the availability of broadband, short videos and films were extremely expensive to produce and disseminate. Now, through individual websites and YouTube, videos can be produced and shared with the world for a fraction of the cost. And the world is listening. The 'Fox Attacks' clip mentioned above received 367,448 views in first two weeks of being posted. One environmental website, Tree Hugger (<http://www.treehugger.com>), has also held a green video competition which includes many compelling short films raising awareness of sustainability issues.<sup>4</sup> Without the Internet it would be impossible for lobby groups to reach such a wide audience (OECD 2007). Online petitions and fundraising sites are now widespread. Sites such as Earth Share (<http://www.earthshare.org.au>) have been established to assist environmental organisations to use ICT to raise funds. Earth Share provides affordable web-based services, through the website eGive (<http://www.egive.org.au>), which allows non-profit organisations to set up and manage online services, communications and campaigns at minimal cost.

Information is also more widely available to individuals to assist them to better understand their impact on the earth and what they can do to help. Online tools, such as the Carbon Footprint

Calculator (<http://www.carbonfootprint.com/>) and Walk Score (<http://www.walkscore.com/index.shtml>) have been developed to assist people calculate their emissions and gain information on how they can modify their behavior to reduce their impact on the environment. The European Union has also released information on You Tube on topics such as the environmental impact of air travel (EC 2007). Thousands of blogs,<sup>5</sup> wikis,<sup>6</sup> and websites have also been created to share information on what can be done at a local level to tackle climate change, for examples Tree Hugger mentioned above and Climate Change Hub (<http://www.saclimatechange.net/>).

While dial up Internet access can facilitate many of the points discussed above, broadband increases the speed at which information can be accessed. It also enables the transfer of large files and graphic-rich content, including movies and flash animation. These features improve the impact of online information and awareness raising campaigns.

## **REDUCED IMPACT OF HUMAN ACTIVITIES (ENVIRONMENT)**

Broadband is helping communities reduce their impact on the environment. For example, broadband has facilitated the convergence of electronic goods by enabling people to access television (TV) and radio channels and movies over the Internet. Broadband also enables teleworking and online shopping, which reduces greenhouse gas emissions produced by car travel, and sharing of electronic documents and media, so reducing demand on paper.

### **ELECTRONIC GOODS**

Many electronic entertainment goods are converging into one. Increased bandwidth offered by broadband enables TV, music and videos to be accessed via the Internet. In time this will led to a reduction in consumer demand for single-purpose electronic goods. Broadband has also influenced telecommunications by enabling Voice over Internet Protocol (VoIP).<sup>7</sup> As VoIP becomes more popular, consumers will no longer require a separate telephone or telephone line. This theory is supported by the Energy Saving Trust (2007, 32) in the United Kingdom (UK) who suggest that the convergence of electronic goods will assist to ease this pressure on the environment in terms of demand for multiple electronic devices and energy use.

Of course the manufacture, use and disposal of electronic equipment must be managed to ensure minimal impact on the environment. Zero Waste SA estimate that these processes currently produce over 42 million tones of greenhouse gases per year.<sup>8</sup> Emissions result from increased:

- Consumption of raw materials, including water from manufacturing processes;
- Waste to landfill, which includes hazardous substances such as lead, mercury, chromium, and brominated flame retardants which can leach into soil and water.

The key will be to ensure that new products are designed to be as eco-friendly and energy efficient as possible. Some electronic companies have committed to improving the environmental performance of their products. PC World has announced plans to develop a carbon neutral computer. The computer case will be made of aluminium recycled from cans and will make energy savings by using the case as a heat sink, avoiding the need for case fans (Sparkes 2007). PC World also plans to purchase carbon offsets for energy used in the production process. Initiatives such as these and e-waste recycling schemes will help to reduce the environmental impact of computer

usage. Other ICT players such as the US-based Internet search site, Google, will also be important in reducing the impact of ICT use. It is estimated that an all-white web page background, such as Google's home page, uses about 74 watts to display. An all-black background is said to use 59 watts. It is estimated that Google could reduce global energy use by 750 megawatt-hours a year by simply changing the colour of its homepage to black. In response, a black version of Google has been created (<http://www.blackle.com>).

## **PAPER**

Increased bandwidth capability has led to the development of online books and publications (for example Google Books and Google Scholar).<sup>9</sup> It has also increased the popularity of online news services and enabled large reports to be downloaded and sent via email rather than as printed publications. US research body, Pew Internet, reported that in December 2005 approximately 50 million Americans turned to the Internet for news on a typical day (PIALP 2006). Pew also found that broadband users are 28 per cent more likely to access news online than from their local newspaper (71 per cent online versus 43 per cent local newspaper) (PIALP 2006). This trend has significant environmental benefits. The Information Technology and Innovation Foundation reports that receiving the news to a Personal Digital Assistant (PDA) wirelessly results in the release of 32 times less carbon dioxide emissions than purchasing a newspaper (Atkinson and McKay 2007). That is a significant reduction which is only possible through broadband technology.

Advertising companies have noted the trend towards online publications and have significantly increased online advertising. Forrester predict that in 2010, \$26 billion will be spent by marketers on online display ads, email, search, and classified ads (Forrester 2005). This is said to represent 8 per cent of total advertising budgets. Many companies are also replacing traditional print catalogues with online catalogues.<sup>10</sup> This shift in advertising spending away from print will lead to a reduction in paper use.

Broadband has also led to a reduction in printing and production of publications in the business community. Hard copies of large documents such as annual reports and telephone directories are no longer required, as people can access and distribute this information electronically via broadband. While the ideal of the 'paperless office' may not be realistic, many organisations such as the South West Investment Group in the UK have reported a significant reduction in paper use following the installation of broadband.<sup>11</sup>

## **COMMUNICATION**

ICT and broadband are also changing the way we communicate. Home ownership of computers in Australia has increased by 26 per cent to 70 per cent from 1990 to 2006 (ABS 2006). Home Internet and broadband access has also increased. In 2006, of the 60 per cent of households with Internet access, 48 per cent had broadband Internet access (ABS 2006). As more people get online, communications such as cards and letters are replaced by email. This reduces the impact of paper usage and postage. Many 'e' alternatives, such as e-cards and e-flowers, have been developed to replace traditional sentimental gestures. Through broadband, these alternatives include impressive graphics and are very popular. Sharing photos online through sites such as Flickr (<http://www.flickr.com>) have also reduced the need to print and send photos to friends and rel-

atives. This has significant environmental benefits with photographic development processes using many harmful chemicals.

Broadband has also increased the accessibility of video conferencing.<sup>12</sup> Video conferencing requires a minimum bandwidth of 384 kilobits per second (Kbit/s),<sup>13</sup> and 768Kbit/s for optimal quality, which can be delivered by most broadband services.<sup>14</sup> Videoconferencing reduces the need to travel. For organisations and individuals wishing to connect people across great distances, videoconferencing offers an efficient means of communication, collaboration and decision-making. Files and data can also be shared, making it easy to hold presentations, review documents and make fast decisions. Many organisations are taking advantage of videoconferencing, so reducing emissions generated by car and air travel. From 2008, TAFE SA will use videoconferencing via a broadband network to extend education opportunities to regional communities (Coonan 2007). The project is said to extend a number of TAFE courses to around 3377 students. Potential applications for health services, such as real-time medical diagnosis for regional populations by metropolitan based specialists using videoconferencing, are also promising.

## **ONLINE SHOPPING**

Unlike many years ago we no longer need to leave home to go shopping, whether for food, clothing or other items. According to Visa, Australian Visa customers spent around \$13 billion online in 2005 (Anon. 2006). This represents 9 per cent of Visa credit sales for 2005. The increased popularity of online shopping has great potential to contribute to sustainability. While emissions generated by delivery must be taken into consideration, the potential benefits are significant. Online shopping reduces individual commutes to shopping centres as one delivery vehicle can deliver products to many customers in one area rather than many customers driving to the store. Products can also be ordered and delivered on demand reducing energy and resource requirements to store goods. Online action sites, such as e-bay (<http://www.ebay.com>), also promote re-use, a key component in society's quest for environmental sustainability.

## **TELEWORKING**

Broadband provides a cheap and effective way for people to work from home (otherwise known as teleworking or telecommuting) (Shore 1999).<sup>15</sup> People can access files and documents, communicate and access the Internet for research purposes without needing to travel to the office.

The European Telecommunications Office suggests that teleworking can contribute to sustainability in three key areas (ETO 2000):

1. Vehicle-related materials and resources;
2. Highway-related materials and resources; and
3. Office-related materials and resources.

Studies in the US suggest teleworking could save up to 540,978 tons of pollution per year in the US alone.<sup>16</sup>

Teleworking is on the rise. In the UK, teleworker numbers rose from 921,000 (4 per cent of workers) in 1997 to 1.8 million in 2005 (8 per cent of workers) (Tandberg 2006). It is estimated that each commuter in the UK produces approximately 1700 kg (3800 lbs) of carbon dioxide

per day into the atmosphere. Similar opportunities are possible for Australia, particularly given the urban sprawl of most major cities.

## **MARKET-BASED INSTRUMENTS (ECONOMIC)**

Broadband supports sustainability by improving consumer access to information on the environmental performance of products and companies and providing a platform for new sustainable businesses.

### **INFORMED MARKETS**

The Internet creates informed markets. Research suggests that consumers and shareholders are now seeking corporate environmental performance in their purchasing and investment decisions (Australian Government 2003). This trend has led to the widespread implementation of triple bottom line reporting. In 2002, KPMG reported that 45 per cent of the world's top 250 companies published a separate corporate report with details of environmental and/or social performance, up from 35 per cent 1999 (KPMG 2002). Broadband increases access to this information and places pressure on other companies to follow suit.

### **SUSTAINABLE PRODUCTS AND COMPANIES**

Broadband also enables consumers to identify environmentally sustainable products and businesses. Websites such as earth2tech (<http://earth2tech.com/>) have been established to provide information on the environmental performance on a range of ICT products. In addition, new companies such as Zipcar are using broadband to deliver sustainable businesses. Zipcar provides a car sharing service that enables people to hire cars in their local neighborhood. People in the US can visit <http://www.zipcar.com>, find a car near their current location and rent it at a moment's notice. Services such as this have great potential to reduce personal ownership of vehicles, particularly in countries such as Australia, where 10.4 million cars were registered in 2005 (ABS 2005) – a ratio of one car to every two people.

## **WHAT DOES THE FUTURE HOLD?**

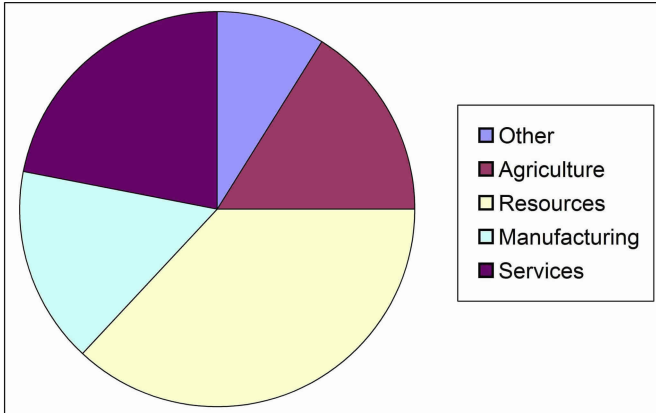
Managing the transition of the Australian economy to a carbon-constrained world will be a long-term challenge. It will involve a fundamental shift in both industry and consumer behavior and change the nature of much of the economy's capital stock Prime Ministerial Task Group on Emissions Trading (2006).

Global demand for energy is increasing. The International Energy Agency (2006) predicts that world energy requirements will expand by 50 per cent between 2004 and 2030. Increasing energy demands, international commitment to reduce emissions and the imposition of emission costs (through carbon taxes and emission trading schemes) will lead to a new economic environment where carbon emissions come at a great cost. This future is often expressed as a 'carbon-constrained' world.

Australia has a greater dependence on fossil fuels for wealth generation and power supply than most developed countries. Broadband will be central to Australia's response to climate change in terms of adaptation strategies, development of low-emission technologies (clean technology) and management of an emissions trading scheme.

## ADAPTATION STRATEGIES

Australia is a major exporter of energy intensive products, including agriculture, coal, aluminium and liquefied natural gas (LNG) (Figure 1). Australia will need to manage the risks that changing environmental conditions and carbon constraints will bring. Broadband will underpin the research and development required by agricultural producers to identify changing conditions and modify practices. It will also enable Australia to take advantage of its rich source of natural assets including geological and biological sequestration sites and renewable energy resources to continue to be a global supplier of energy and resources.



**Figure 1** Composition of Australia's Exports in 2006  
Source: World Trade Organisation (WTO 2007)

## EMISSIONS TRADING

By 2012 Australia will have a national emissions trading scheme (Australian Government 2007). This will create many challenges and opportunities. Broadband will underpin the systems required to measure emissions and carbon sinks for the national inventory system. Broadband will also enable software development companies to develop solutions and offer these products across the world and in remote locations (such as mining centres).

## LOW EMISSIONS TECHNOLOGIES (CLEAN TECHNOLOGIES)

The introduction of market-based incentives for carbon emission reductions will encourage investment in research and development into low emissions technology. Clean technology includes products, services, and processes that harness renewable materials and energy sources; dramatically reduce the use of natural resources; and cut or eliminate emissions and wastes. Broadband will be central to the development and growth of the clean technology sector in terms of research and development and opportunity.

## BUT WHAT ABOUT THE IMPACT?

When considering the potential application of broadband for environmental sustainability, the environmental impact of the delivery mechanism for broadband – ICT – must be considered. ICT often receives a bad rap in terms of its environmental performance. Like all resources, in-



formation technology and electronic goods must be produced, used and disposed of in the most environmentally friendly way possible. Electronic goods contain many toxic elements, which must not be allowed to enter landfill. Governments across the world have legislated against the disposal of electronic goods to landfill and export to developing countries. Internationally, the United Nations has lobbied to prevent the transfer of disregarded electronic goods (e-waste) from richer to poorer nations (through the Basel Convention).<sup>17</sup> Many countries have also established Producer Responsibility Schemes (PRS), making manufacturers of electronic goods responsible for the disposal of their products. Australian State and Federal Governments are currently negotiating with manufacturers to implement a PRS in Australia (Department of Environment 2006). These are steps in the right direction and are important when discussing the potential contribution of broadband to environmental sustainability.

Energy use is also cited as a compelling reason why the increased use of information technology is environmentally harmful. In 2005, computers and their peripherals accounted for 9 per cent of total domestic electricity use in the UK. The Energy Saving Trust predicts that an increase in energy intensive games and software will elevate energy consumption by 30 per cent between 2006 and 2020 (Energy Saving Trust 2007, 8). There are many things that consumers can do to reduce the energy use associated with ICT, such as turning equipment off when it is not being used and purchasing energy efficient equipment. Research into increasing the energy efficiency of electronic products and subsidies (through reduced taxes or other market incentives) should also be put in place to help bring less energy consuming products to the market. Action is already underway in Australia. Initiatives to improve the power consumption and efficiency of data centres (Mullins 2007; see also Green Grid 2007) and to provide tools to assess the environmental performance of ICT products are currently being developed by ICT industry bodies (Dix 2007).

Finally consumers must make environmentally conscious decisions. People need information on the environmental performance of the electronic products and should be encouraged to purchase durable products rather than cheap alternatives that may only last a few months.

## **CONCLUSION**

Sustainability is dependent on a global response. ICT and broadband are the key drivers of a global community and underpin the social and economic drivers of change. Broadband contributes to environmental sustainability on many different levels. It increases access to information, improves international accountability, provides a platform for lobby groups and concerned individuals to raise awareness and creates new markets for sustainable products. Broadband will be central to international activity to reduce carbon emissions, manage the risk that changing environmental conditions will bring and to the growth of the clean technology industry. The application of broadband to these purposes is the true value of the infrastructure. The key to ensuring a sustainable society will be dependent on ICT developments adhering to environmental sustainability principles and committing to a 'life cycle' management approach.

## **DISCLAIMER**

This paper has been developed for discussion purposes only. It does not express South Australian Government policy or the views of any member of Government.

## ACKNOWLEDGEMENTS

I would like to thank the Information Economy Directorate, Department for Further Education, Employment, Science and Technology for their input to this paper. I would particularly like to thank Teresa Zielinski (Project Officer, Broadband SA) for her research assistance and support.

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## ENDNOTES

- 1 Wikipedia, 'sustainability', accessed June 2007: <http://www.en.wikipedia.org/wiki/Sustainability>.
- 2 The IPCC predict that the complete melting of the Greenland ice sheet and the West Antarctic ice sheet would lead to a contribution to sea-level rise of up to 7 m and about 5 m, respectively.
- 3 As an example refer to *Fox Attacks the Environment*, accessed July 2007:  
<http://www.youtube.com/watch?v=gnt3FWToSWs>.
- 4 <http://truths.treehugger.com/>.
- 5 'Blog': a website where entries are written in chronological order and commonly displayed in reverse chronological order. Blogs provide commentary or news on a particular subject such as food, politics, or local news; some function as more personal online diaries. A typical blog combines text, images and links to other blogs and web pages. Source: <http://www.en.wikipedia.org/wiki/Blogs>.
- 6 'Wiki': a collaborative website which can be directly edited by anyone with access to it. Source: <http://www.en.wikipedia.org/wiki/Wikis>.
- 7 'VoIP': is the routing of voice conversations over the internet. Source:  
[http://www.en.wikipedia.org/wiki/Voice\\_over\\_Internet\\_Protocol](http://www.en.wikipedia.org/wiki/Voice_over_Internet_Protocol).
- 8 Zero Waste SA date unknown, *E-Waste (electronic waste)*, accessed May 2007, online available at:  
<http://www.zerowaste.sa.gov.au>.
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- 10 E-business guide, date unknown, accessed August 2007., available online at:  
<http://www.e-businessguide.gov.au/improving/catalogue>
- 11 South West Investment Group, date unknown, *Environmental Sustainability Case Study*, accessed April 2007, available online at: <http://www.southwestinvestmentgroup.co.uk>.
- 12 Video conferencing permits non-physical human communication across distance. Source: SATSIG, South Australia's Broadband Strategy, 2004, p. 8.
- 13 'Kbps': a unit of data transfer rate equal to 1000 bits per second.
- 14 NewSat date unknown, *Video Conferencing*, accessed August 2007, available online at:  
<http://www.newsat.com.au>,
- 15 Teleworking or telecommuting is the act of performing work away from the traditional centralised office environment (Shore 1999).
- 16 This estimate is based on the calculation that in the US approximately 32,000,000 Americans could telecommute for at least one day per week reducing the need for them to drive a total of 1,260,800,000 miles. Source: The telework coalition, *Environmental Information and Fact Sheet*, accessed August 2007, available online at: <http://www.telcoa.org/id27.htm>.
- 17 The Australian Government has not legislated for the prevention of electronic goods to landfill but has banned the export of disregarded electronic goods overseas through the *Hazardous Waste (Regulation Of Exports And Imports) Act 1989*.

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Cite this article as: Dodd, T. 2007. 'The role of broadband in the quest for environmental sustainability'. *Telecommunications Journal of Australia* 57 (2/3): pp. 28.1 to 28.12. DOI: 10.2104/tja07028.