

www.csiro.au

Our Future World

Trends, Risks and Scenarios

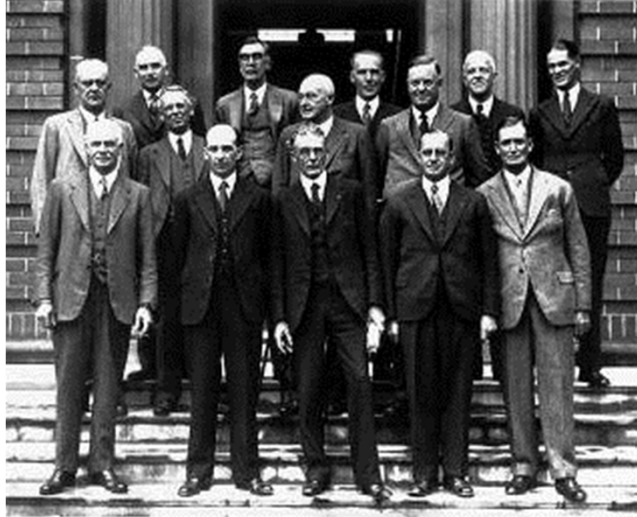
Stefan Hajkowicz, James Moody, Anna Littleboy, Frank Jensen, Lisa Wilhelmseder

With input from over 50 CSIRO scientists and business analysts



Thinking about the future in the past...

A CSIR Council Meeting in 1935



How would their world change?

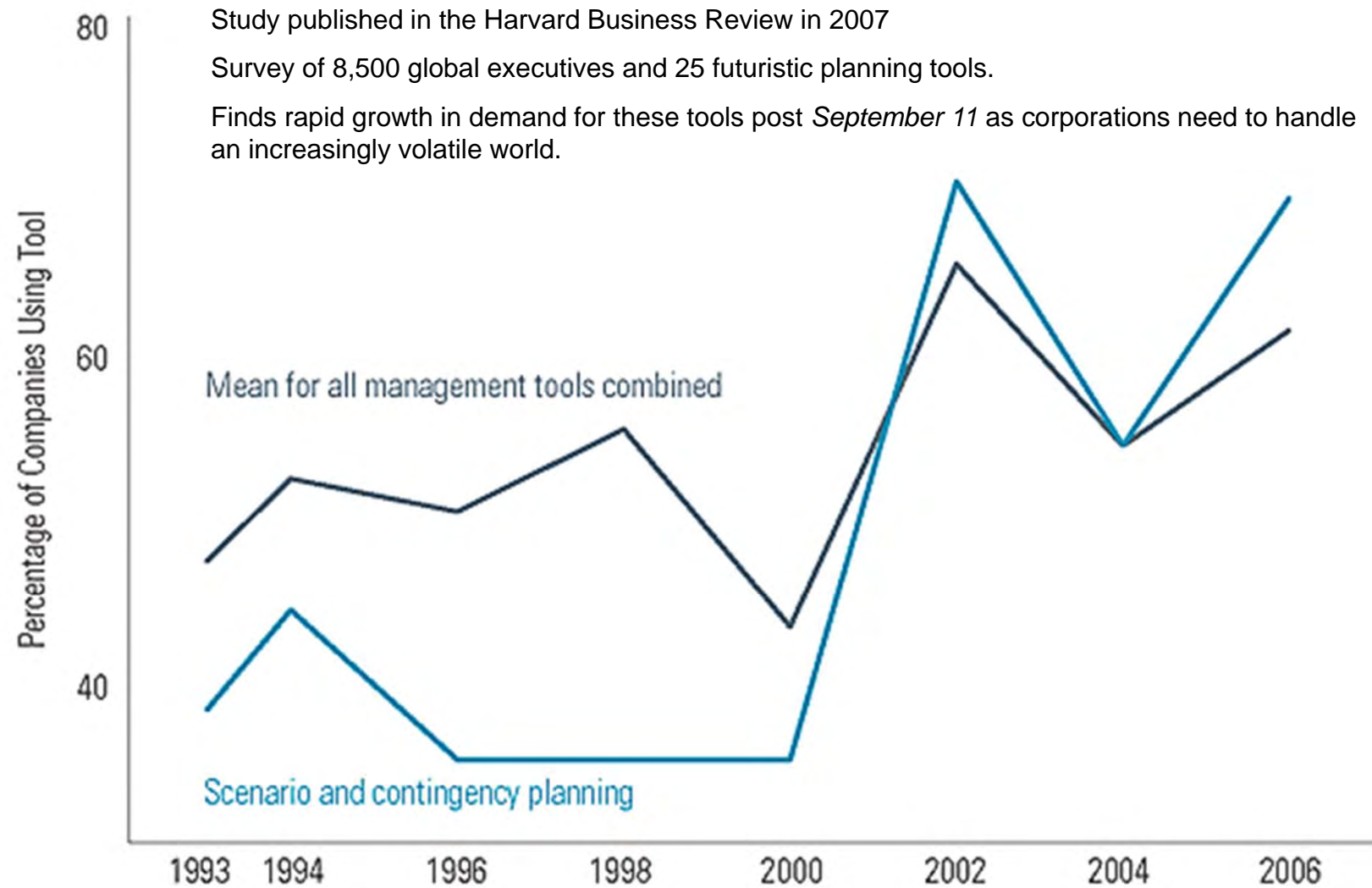
Darwin, 19 February 1942



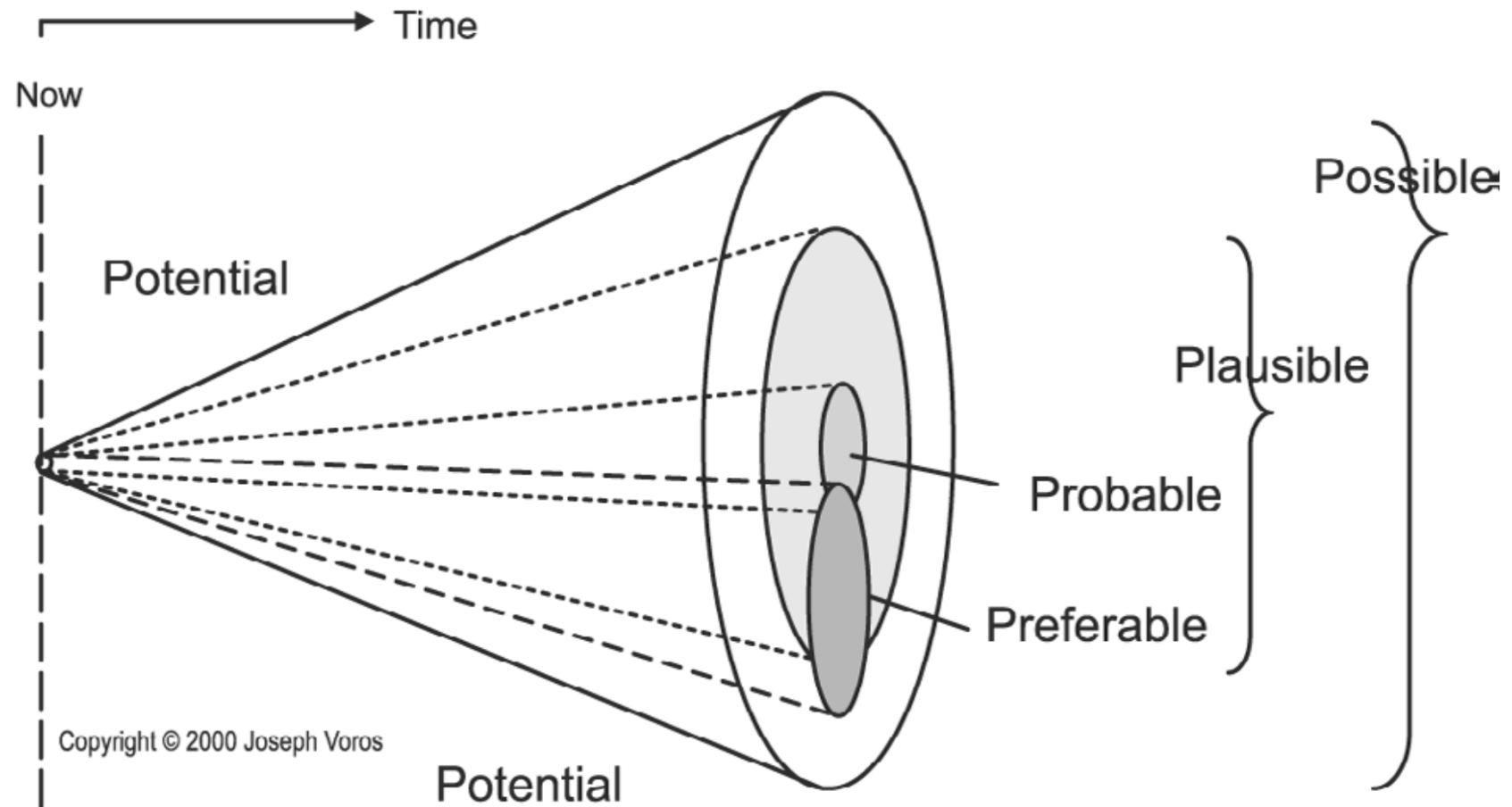
Australian War Memorial www.awm.gov.au



Everyone wants to know

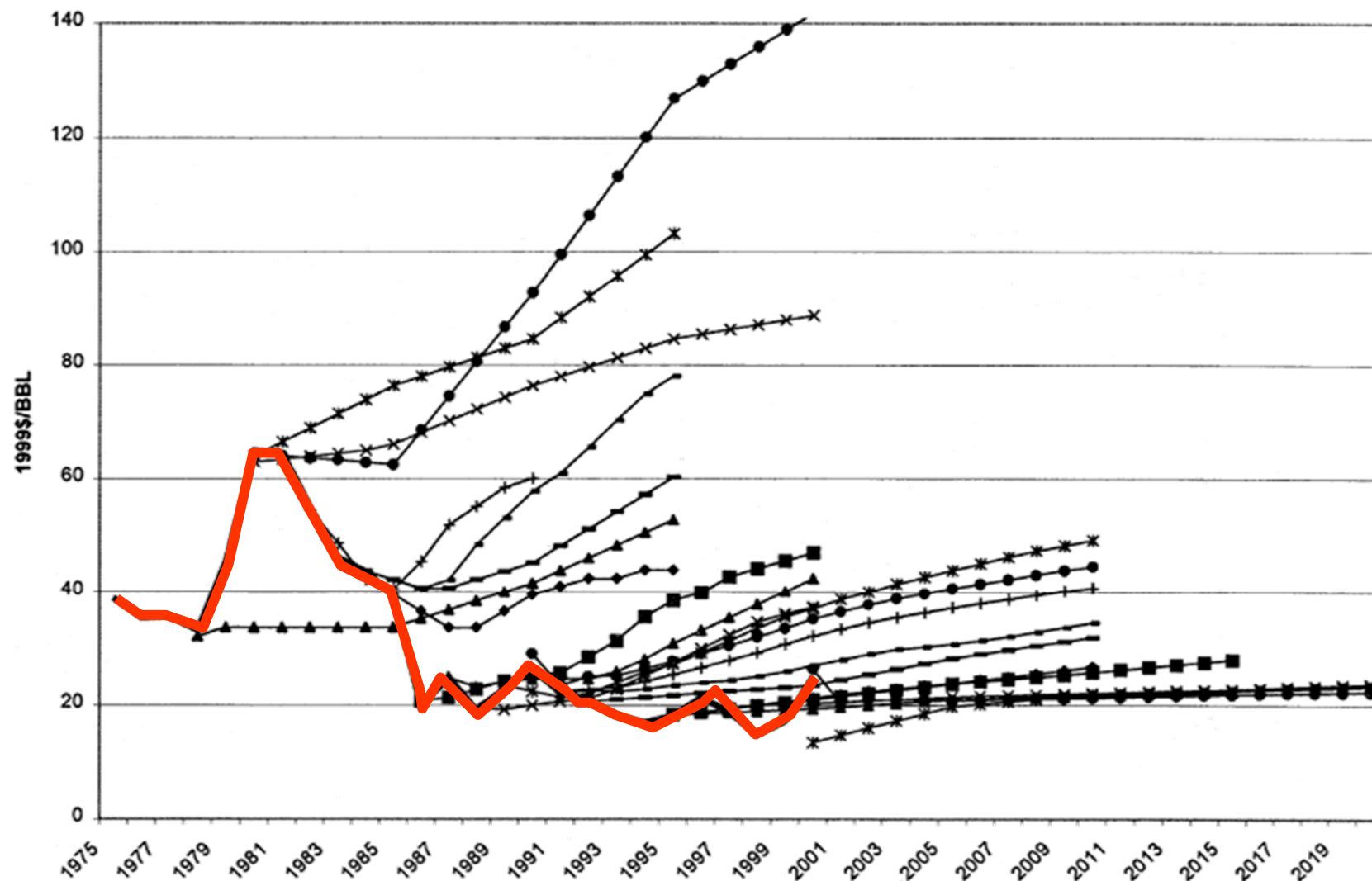


Different futures



Voros (2003) adapted this diagram from Hancock and Bezold (1994) in the Healthcare Forum Journal

More than forecasting...



Lynch, 2002. The Quarterly Review of Economics and Finance.

— Actual oil price (other lines show predictions)



In the 1920s we controlled prickly pear



In the 1930s we solved coast disease – deadly to sheep



Darwin, 19 February 1942
Australian War Memorial www.awm.gov.au

In the 1940s we helped win the war – radar and repellent for malarial mossies



In the 1950s we CSIRO developed the first permanent press pleating in fabrics.



In the 1960s we helped track the Apollo missions with the Parkes Telescope



In the 1970s we developed fire resistant textiles – this helped reduce incidents of children with serious burn wounds



In the 1980s we, in conjunction with the Reserve Bank, released the first non-fibrous, polymer (plastic) banknote.



In the 1990s, we developed the AXcessaustralia low emission vehicle.

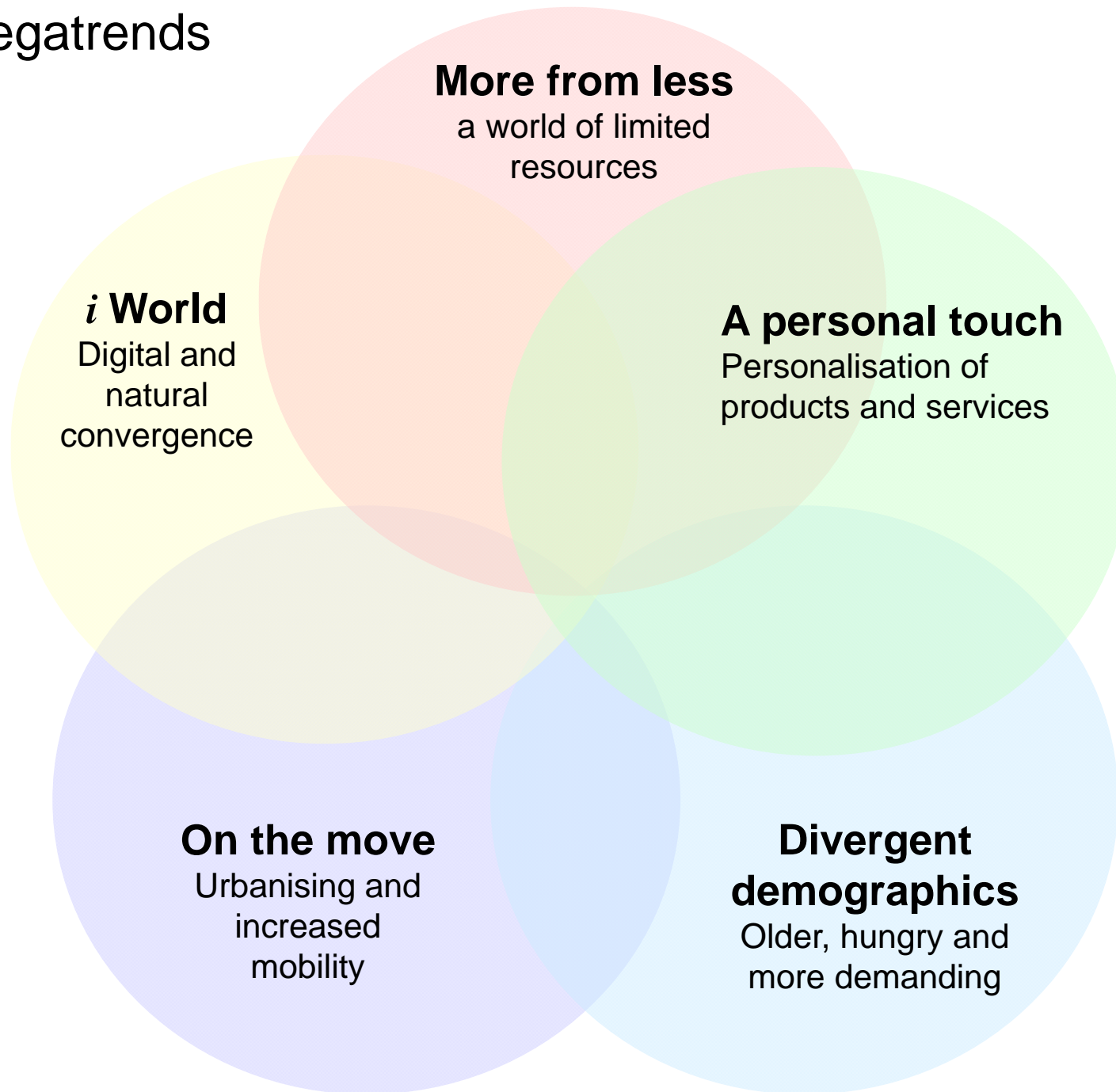


In the 2000s we worked out how much water was in the Murray Darling – allowing new markets to operate



In the 2010s we're (currently) working out how to deliver welfare services and break cycles of entrenched poverty

The Megatrends

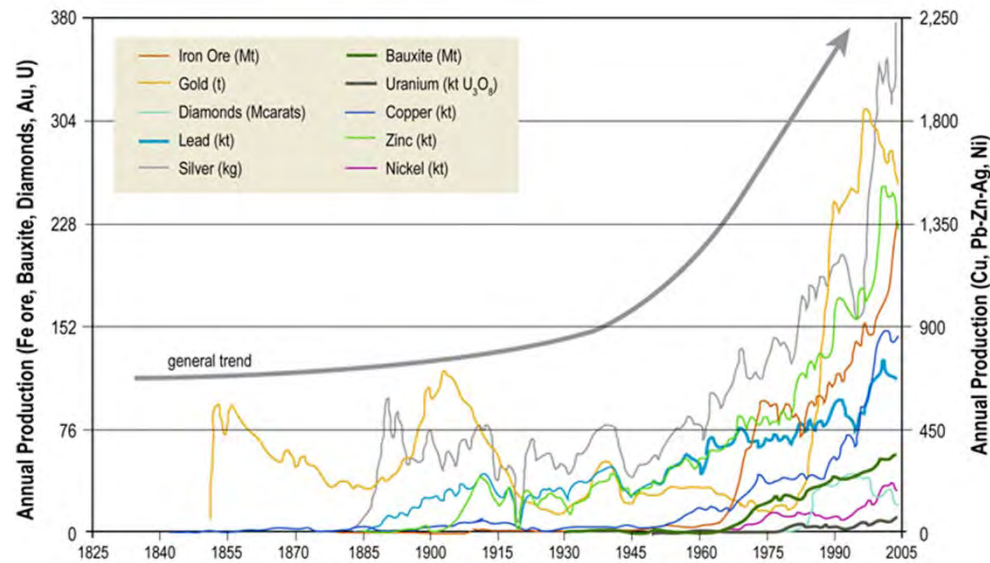


More from less
a world of limited
resources

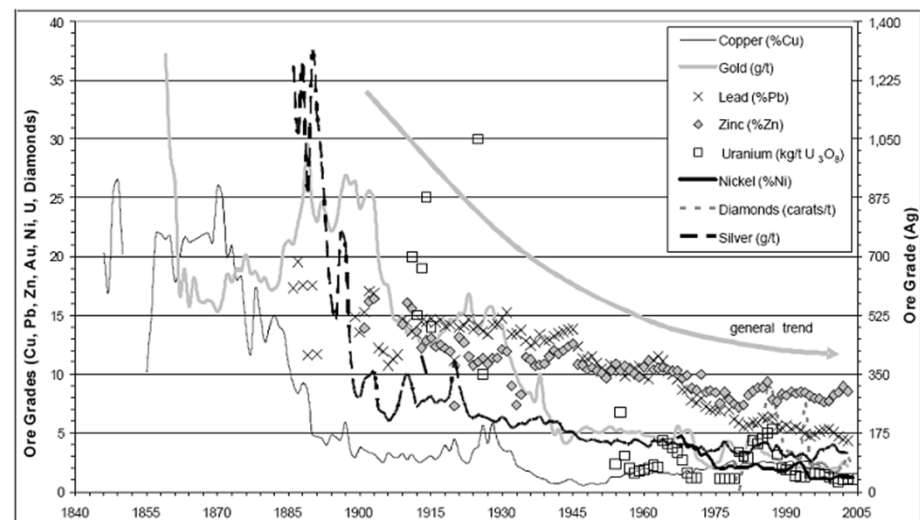
More from less

Declining ore grades

Production of ore



Grade of ore



Source: Mudd GM, 2009. The Sustainability of Mining in Australia: Key Production Trends and Their Environmental Implications for the Future. Department of Civil Engineering, Monash University and Mineral Policy Institute.



Expenditure on offshore petroleum exploration has been rising at 20% per year for 30 years

And more quickly in recent years jumping from A\$857 million in 2005 to \$2.89 billion in 2008.

Data Source: Australian Bureau of statistics 2009 (Cat No., 8412.0)
Image source: Microsoft clipart

Evening shadows, backwater of the Murray, South Australia
H J Johnstone, Britain/Australia, 1835-1907, 1880, London
Source: The Art Gallery of South Australia



Some of the world's leading coral reef scientists estimate that by 2030 60% of existing coral reefs will be destroyed.

Data source: Hughes et al. (2003) *Science*, Vol 301
Image source: Microsoft Clipart



World energy consumption is forecast to increase from 472 quadrillion Btu in 2006 to 678 quadrillion Btu in 2030 - a total increase of 44 percent.

Data source: International Energy Outlook 2009, Chapter 1. US Government, Energy Information Administration
Image source: Microsoft Clipart



Countries which share rivers have a statistically higher probability of military disputes. If the river basin is under drought stress the chances of war a higher again.

Source: Gleditsch *et al.* (2006) Political Geography Vol 25.
Image source: Microsoft Clipart

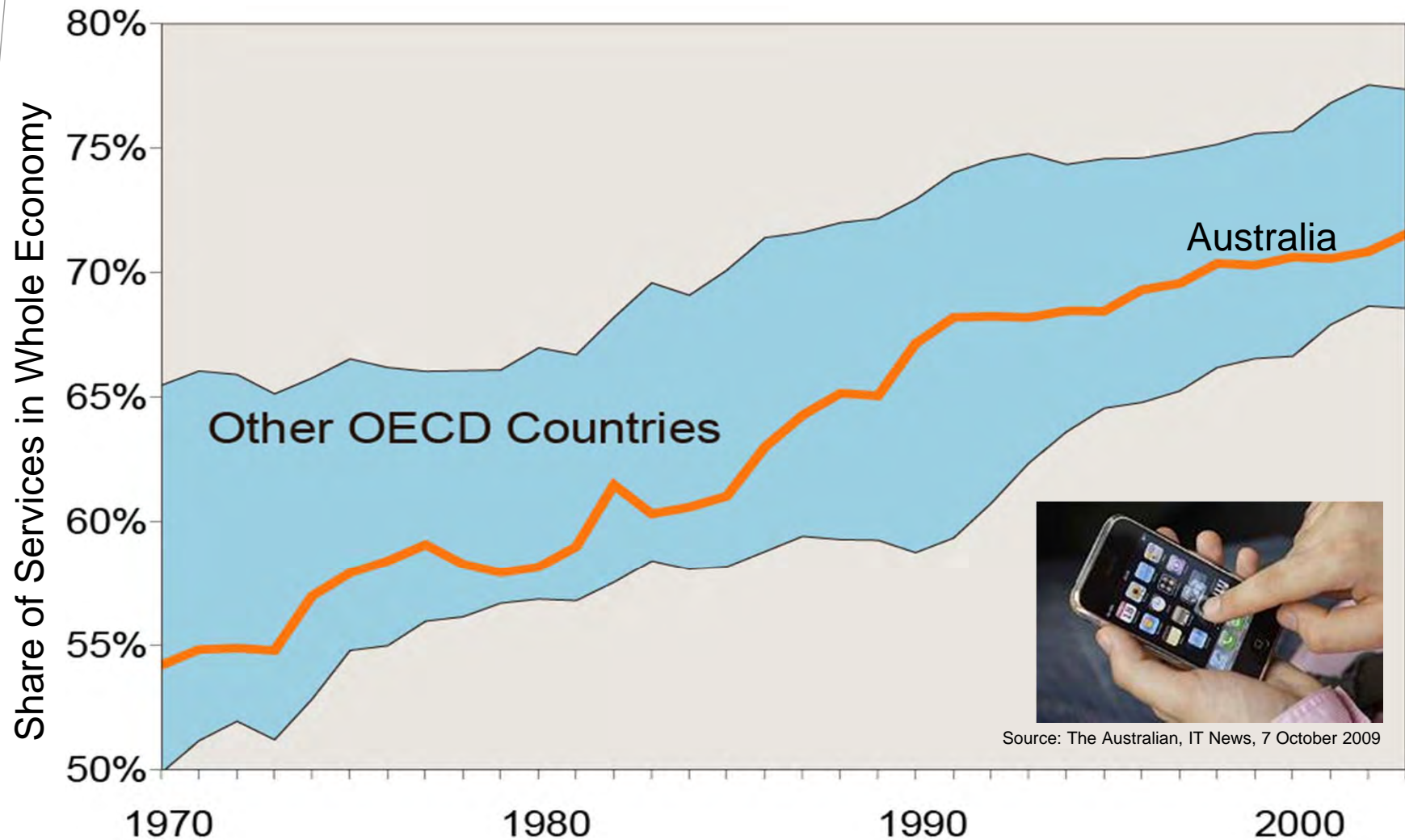


A personal touch

Personalisation of
products and services

A personal touch

Personalisation of products and services



Source: PMSEIC Report on Services Innovation

Source: The Australian, IT News, 7 October 2009

It is estimated that 30% of a typical workday is lost processing irrelevant information.

And 42% of people admit to using the wrong information at least once a week.

Source: Basex survey, published by Xerox

Image source: Microsoft Clipart



The debt to asset ratio rose from 9% to 19% from 1990 to 2008. Australians now hold A\$1.1 trillion worth of debt.

Source: Australian Bureau of Statistics (2009; Cat No 4102.0)

Image source: Microsoft Clipart



Evicted 1887

Blandford Fletcher, England 1858–
1936, Queensland Art Gallery



On the move

Urbanising and
increased
mobility

China needs to build 3 cities larger than Sydney every year until 2030 to accommodate rural to urban migration.

Shenzhen 1982



Shenzhen 2007



Image source: The Chinese UPLA urban planning network, <http://www.upla.cn>

Statistic derived from analysis of the United Nations, World Urbanization Prospects, The 2007 Revision Population Database

Jet aircraft passengers worldwide travelled 4,621 billion kilometres in 2008 and this is forecast to rise to 12,090 billion by 2028.

This represents growth of 5% per year compared to global GDP of 3% per year.

Data source: Boeing Current Market Outlook 2009-2028

Image source: Stefan Hajkowicz



Divergent demographics

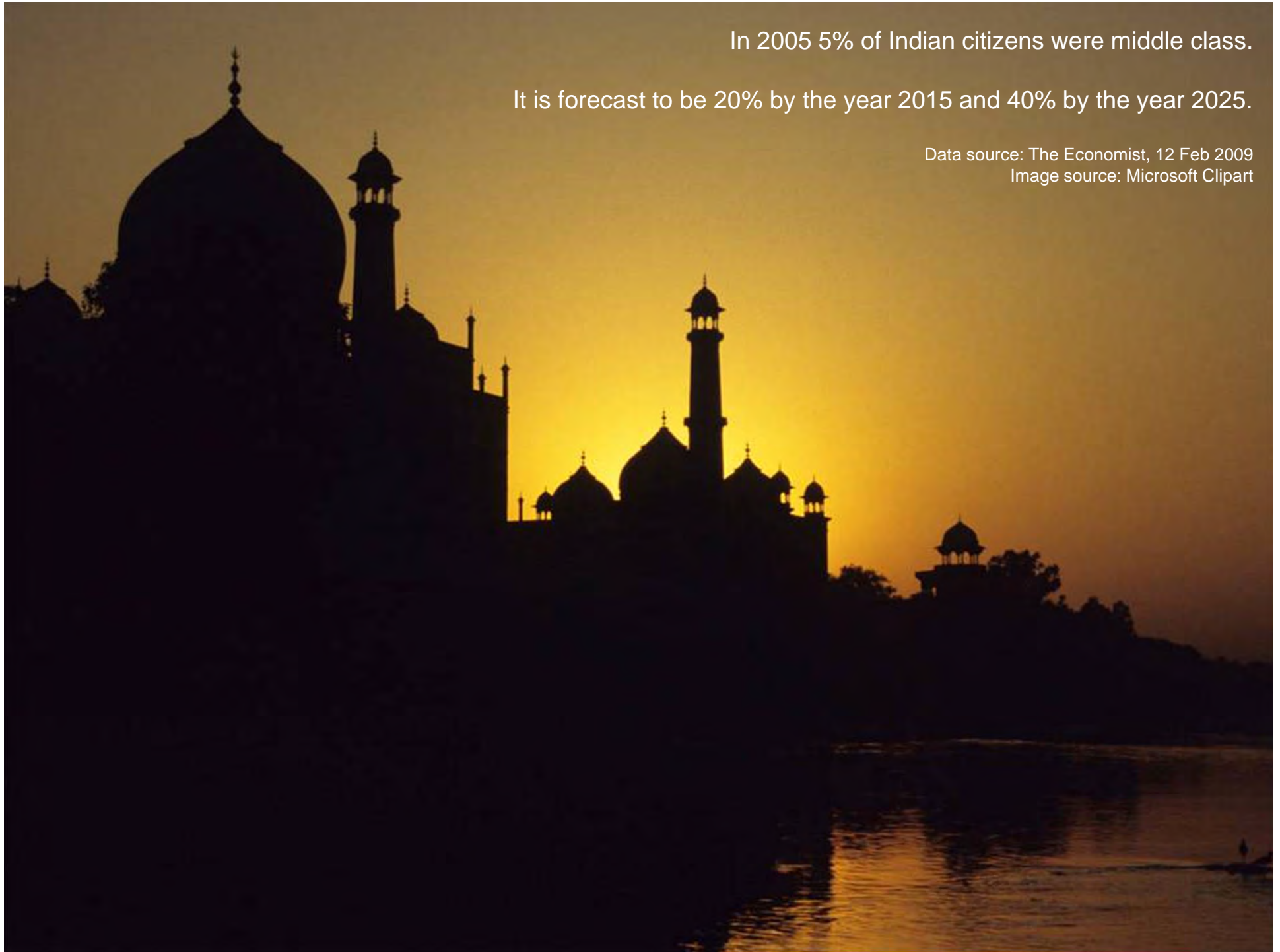
Older, hungry and
more demanding

In 2005 5% of Indian citizens were middle class.

It is forecast to be 20% by the year 2015 and 40% by the year 2025.

Data source: The Economist, 12 Feb 2009

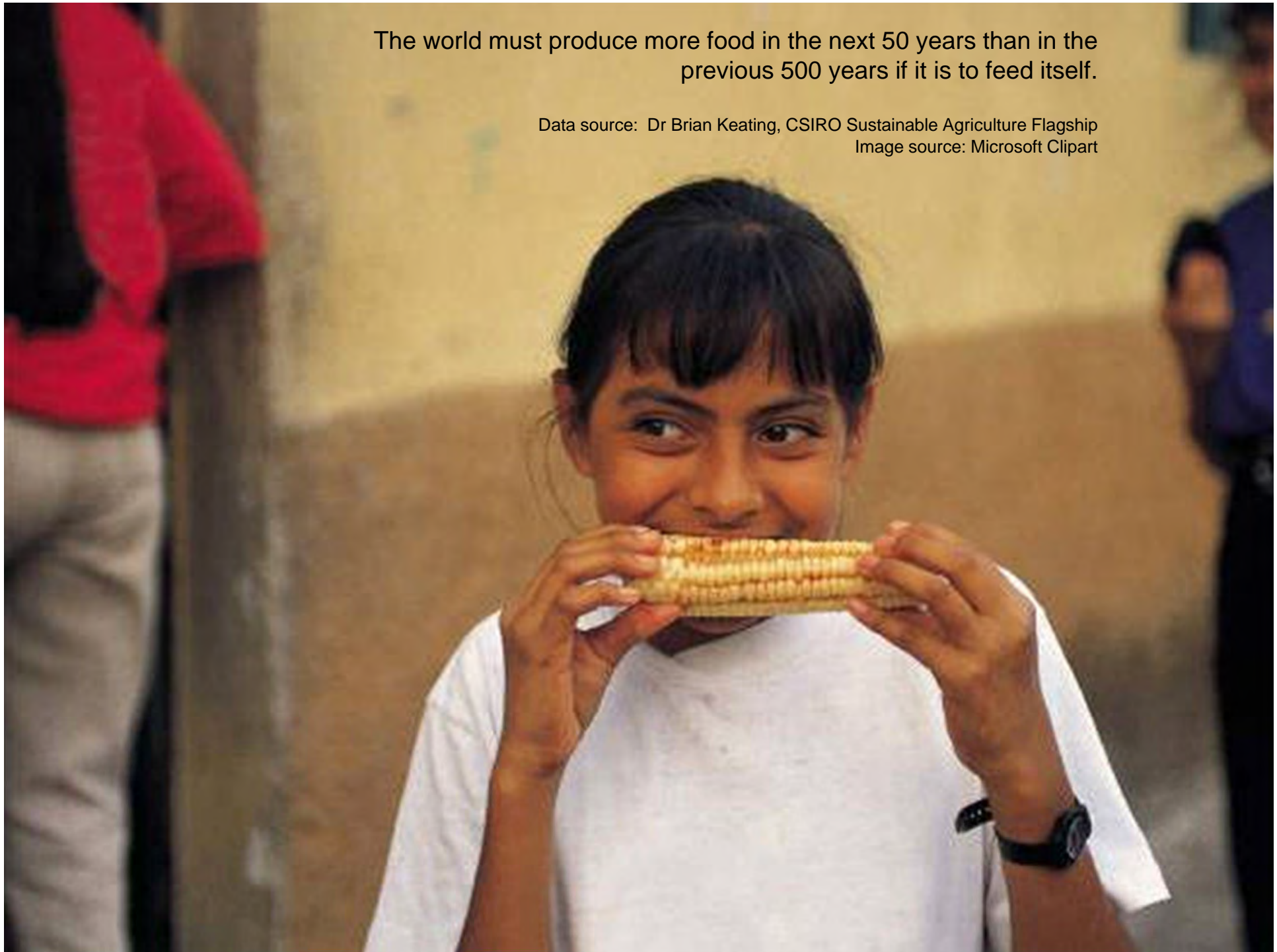
Image source: Microsoft Clipart



The world must produce more food in the next 50 years than in the previous 500 years if it is to feed itself.

Data source: Dr Brian Keating, CSIRO Sustainable Agriculture Flagship

Image source: Microsoft Clipart



In 2002 13% of Australians were over 65 years old.

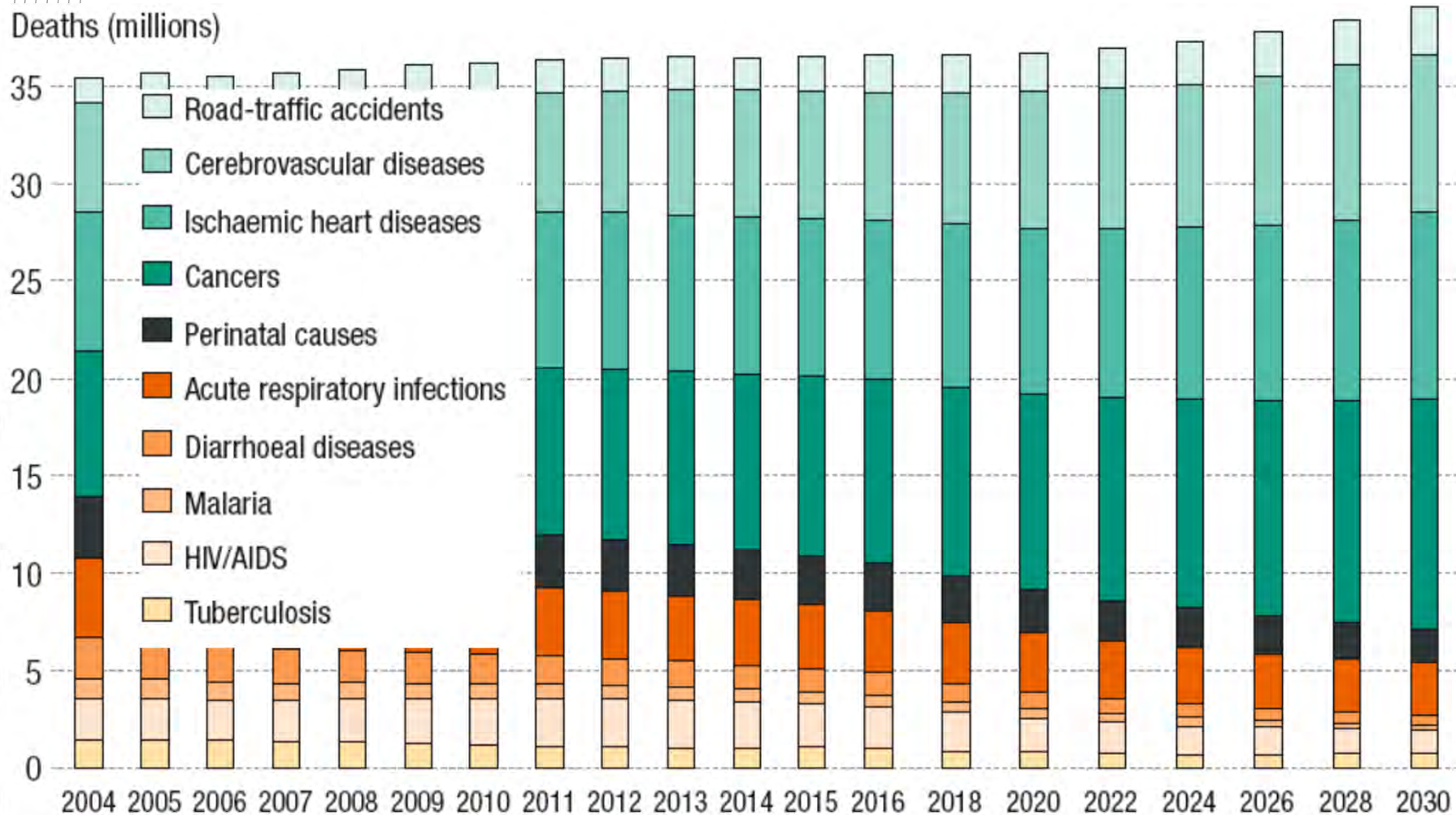
It will be 27% by 2051.

Data source: Australian Bureau of Statistics (Cat. No. 3222.0)



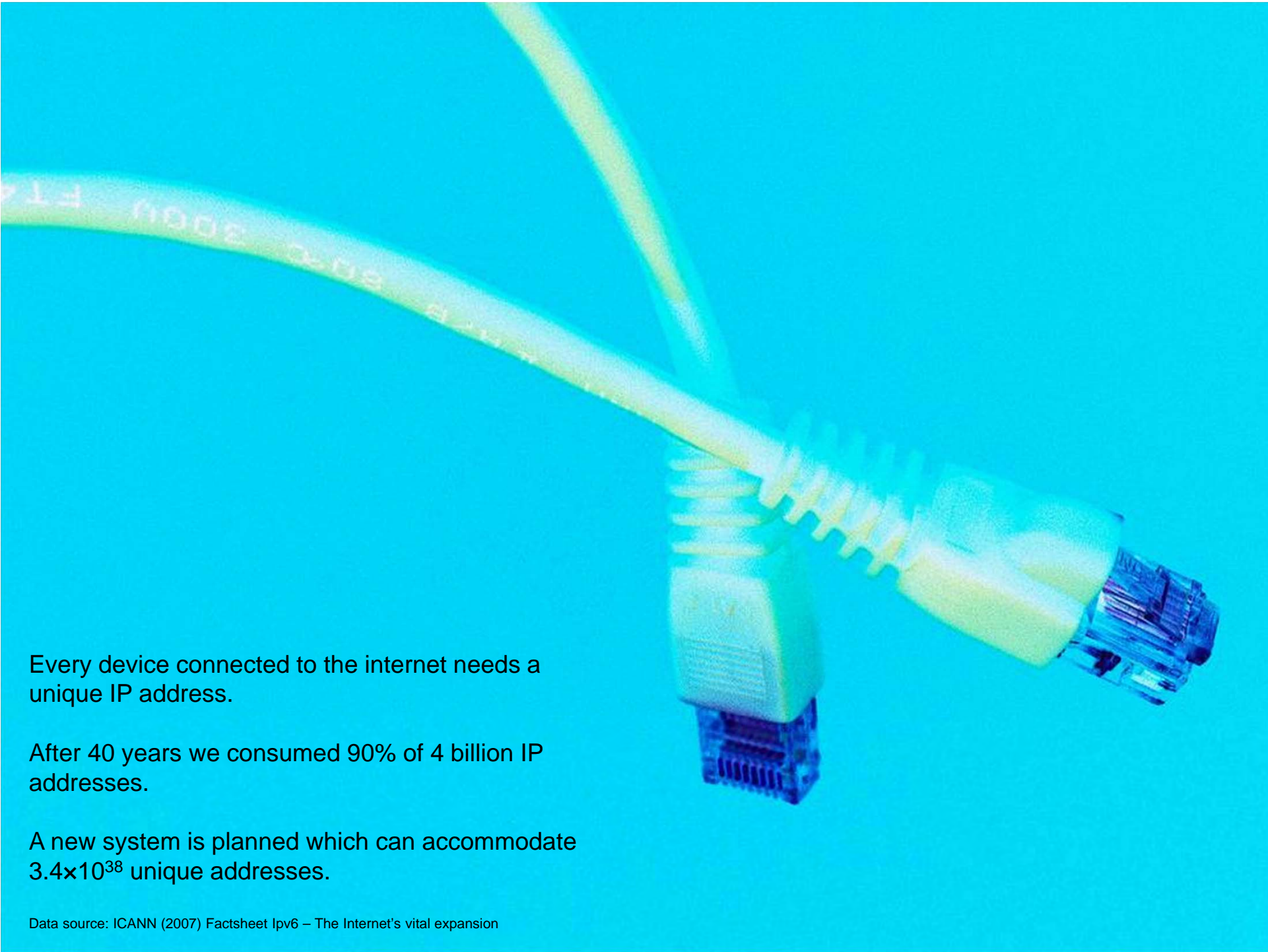
Divergent demographics

Shift towards chronic illness



Worldwide cause of death is shifting towards non-communicable diseases and accidents and away from infectious disease (Source: WHO, 2008; p8)

***i* World**
Digital and
natural
convergence



Every device connected to the internet needs a unique IP address.

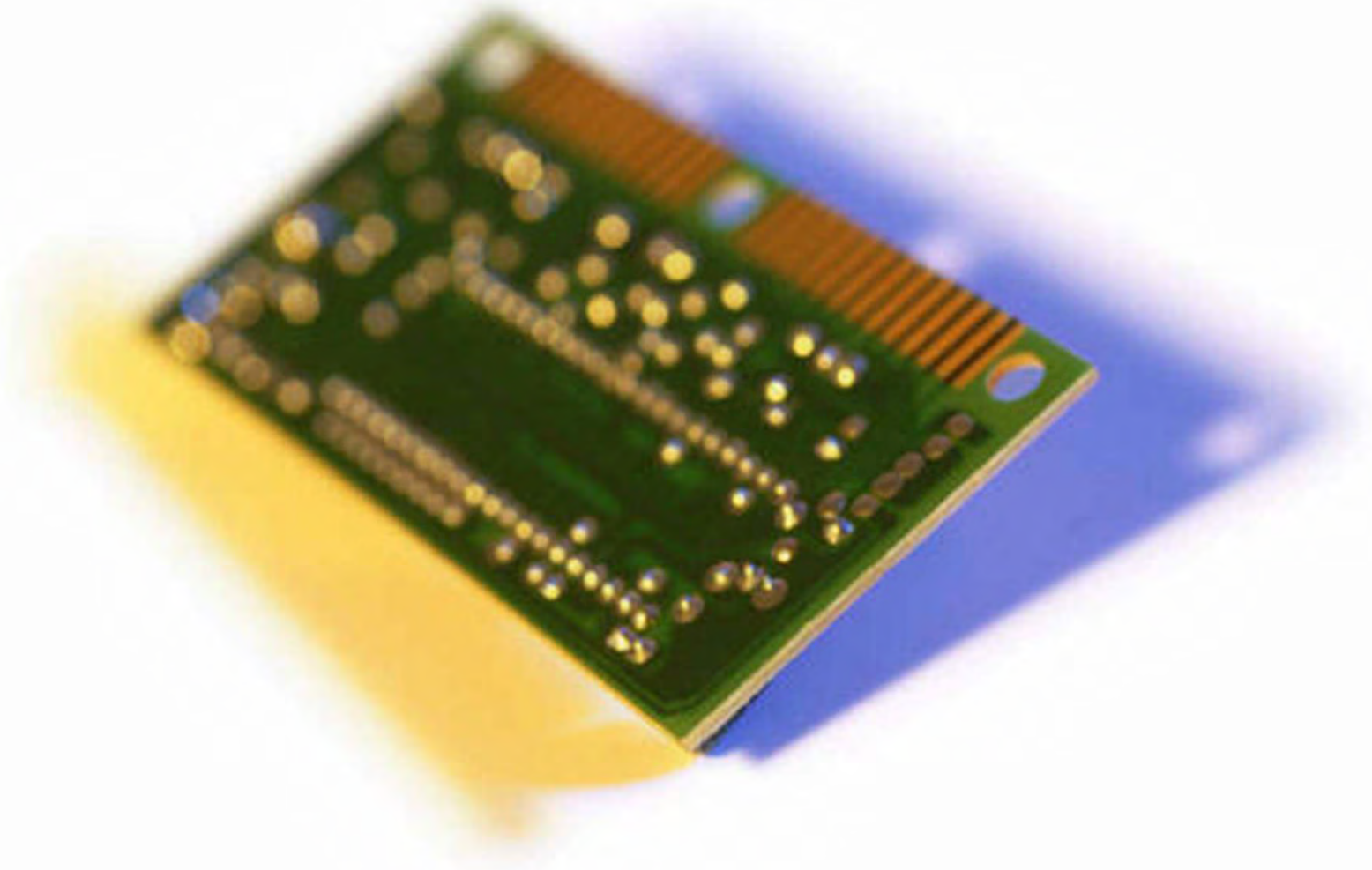
After 40 years we consumed 90% of 4 billion IP addresses.

A new system is planned which can accommodate 3.4×10^{38} unique addresses.

Data source: ICANN (2007) Factsheet Ipv6 – The Internet's vital expansion

The number of transistors that can be placed on an integrated circuit, at the same cost, doubles every 1.5 years.

Data source: Moore's Law, Moore (1965) Electronica, Vol 38
Image source: Microsoft clipart



i World

Digital and natural convergence

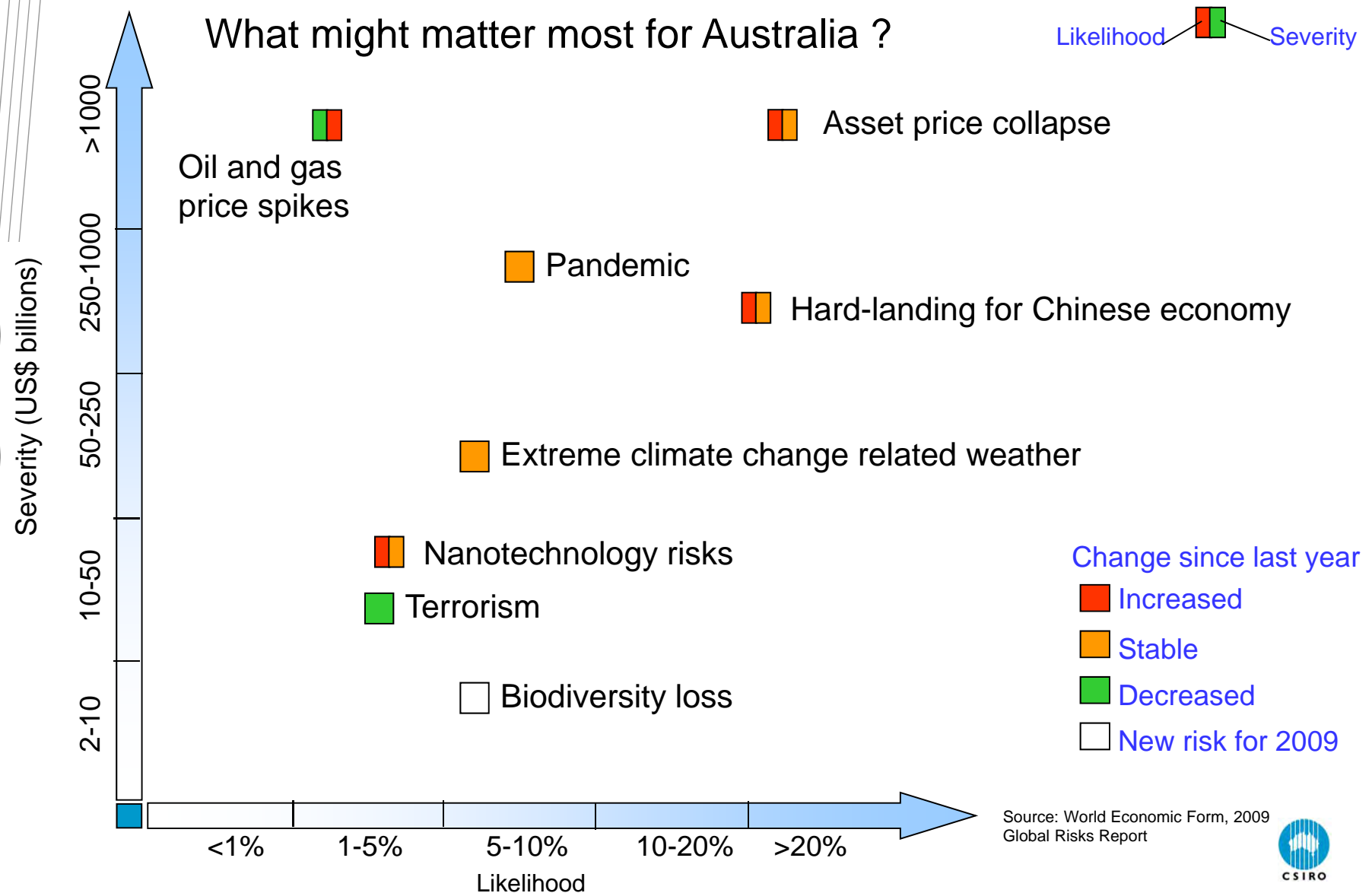


Megashocks and Disruptive Technologies

Megashocks

Sudden, hard-to-predict, major consequences

What might matter most for Australia ?





1. Automated mining



2. Electric travel



3. Energy efficient desalination



4. Smarter Smartphones



5. Augmented reality



6. Systemic risk analysis



7. Telomerase (biological cell immortality)



8. Deep brain stimulation

9. Artificial Intelligence



10. Natural language processing

Foresight Products



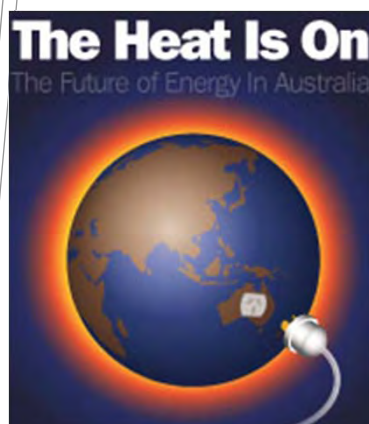
Our Future World

Identifies five global megatrends, megashocks and scenarios relevant to Australian industry and society over coming years.



Fuel For Thought

"In response to these challenges, the Forum believes Australia's fuel mix will shift in the near term to include the expanded use of diesel, gaseous fuels such as LPG and hybrid electric vehicles, with even greater diversity beyond 2020 that might include hydrogen, synthetic fuels from coal or gas and advanced biofuels that will not impact food production."



The Heat is On

After two years of this experimental project the Energy Futures Forum has released its 120-page final report titled The heat is on: the future of energy in Australia.



Australian Government
Department of Foreign Affairs and Trade



Queensland University of Technology
Brisbane Australia



AUSTRALIAN
INSTITUTE OF SPORT

BIG
IDEAS



Australian Government
Department of Innovation, Industry, Science and Research



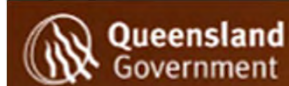
AUSTRALIAN STEEL INSTITUTE



COOPERATIVE RESEARCH CENTRES
ASSOCIATION

mccrindle
research

Downer



ZOO
AQUARIUM
ASSOCIATION



Local Government Association
of Queensland



ATSE



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Thank you

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