

2025 2026 2027 2028 2029 2030



Picture the Future: Australia 2030

Productivity

Innovation for generations.

SIEMENS

Picture the future



Water
Availability



Energy
Sustainability



Environment
Preservation



Healthcare
Prevention



Productivity
Competitiveness



Mobility
Accessibility



Safety
Assurance



Security
Protection



ure



where Australian made is the global mark of quality and innovation

where Australia's freight and communication networks seamlessly connects us

where Australia's economy thrives off green industries

where technology improves productivity and promotes a work/life balance for all Australians



2010 2011 2012 2013 2014 2015 2016 2017 2018

The future *starts now.*

Join us on a journey into the future
of productivity in Australia.

In this century, the global megatrends of climate change, demographic change, urbanisation and globalisation are creating our greatest challenges. These four megatrends are changing our world.

As Charles Darwin said, "it is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change."

To maintain our high standard of living and strong economic growth, we need to change our ways and become globally competitive by improving our productivity.

Our future is our choice.



2018 2019 2020 2021 2022 2023 2024 2025 2026

Opportunities for a bright and positive future.

In the midst of our most pressing challenges caused by the global megatrends, technology is providing us with new opportunities for a better future. As the provider of technology-based solutions in eight of the most pressing areas of concern for Australia – being water, energy, environment, healthcare, productivity, mobility, safety and security – we at Siemens, have embarked on a unique project to present our vision of the future through a technology blueprint to 2030.

What challenges do we face now?
What solutions currently exist?
What kind of future would we have if we implemented these solutions today?

Picture the Future: Australia – Productivity

Combining our global expertise and local market knowledge, our research presents a technology blueprint to tackle Australia's most pressing issues. This research is supported by our local presence in Australia and New Zealand of nearly 140 years and our R&D investment of over \$5 billion (2010) and over 30,000 R&D employees in 150 locations worldwide.

How can we better connect Australia to the rest of the world?

How can we keep Australia competitive in an increasingly globalised world?

- **Technology** – Australians need to implement the latest and best technology; a great source of competitive advantage.
- **Collaboration** – Australia needs to grow its innovation effort, which requires local and global collaboration as well as strengthening our education system. Successful commercialisation is critical for retaining and capturing the value of our human talent.
- **Long term commitment** – Industry and government need long term commitment towards reform and infrastructure investment in order to promote productivity improvements.

Why do we need to improve productivity?

Today and into the future, the impact of the four global megatrends means Australia must increase productivity to prosper in an increasingly competitive world.

As Australia is becoming more connected to the world, our industries are operating in an increasingly competitive global market. Import and export trade volumes will continually increase due to reducing trade barriers. Container movement through our ports today is around three times greater than 1995 and will more than double again by 2030¹. We are struggling to compete against cheap imports; our products and services need to be innovative and export focused if we are to prosper.

Australia is a highly urbanised nation with 89 percent of the population living in

urban areas and 65 percent in cities, resulting in huge pressures on our urban infrastructure². By 2030, at least an additional 4.5 million will live in capital cities adding further pressure. Congestion is impacting our competitiveness; in 2005 urban congestion cost Australians \$9.4 billion in the form of wasted fuel, increased maintenance and lost time. This is expected to increase to \$20.4 billion by 2020³. We need to increase the productivity of our urban transport networks to cope with urbanisation.

Climate change will place significant pressure on Australia's economy. Australia's economy is highly emissions intensive, being the third highest emitter of CO₂ among developed nations due to our reliance on coal and other fossil fuels

for energy supply. Carbon mitigation policy is required to reduce emissions but will introduce a significant cost to our economy. Australia needs a cleaner energy supply and energy efficiency improvements to negate this cost impact on productivity.

Australia's population is getting older. This means less workers to support retirees and proportionally fewer tax payers in the population. Today, for every person aged over 65, there are five people of working age supporting them. By 2030 this ratio will reduce to around three to one⁴. To fund the ageing population, the best solution is to increase productivity to get more output from each worker, using less resources.

2015 2016 2017 2018 2019 2020 2021 2022 20

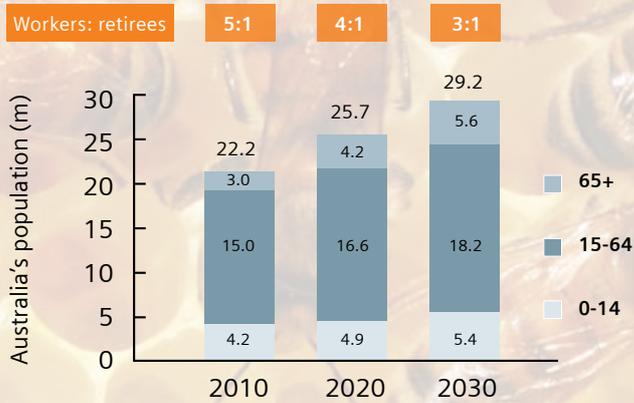
Productivity challenges

What are our productivity challenges?

In recent years, productivity in Australia has been steadily declining. There are many reasons for this which is a topic of much debate. Regardless, this decline is hurting the competitiveness of our economy and Australia must focus on achieving continuous productivity growth. This will ensure:

- Strong and sustainable economic growth
- An enviable quality of life and standard of living

Australia's ageing population



Source: Intergenerational Report 2010, Treasury – Commonwealth of Australia

Definition of productivity

Productivity is the measure of output per unit of input.

“Productivity is not everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.”

Paul Krugman – Nobel Prize-winning economist

¹ BITRE 2009, 'Australian maritime activity to 2029–30'

² ABS 4613.0, Jan 2010, 'Australia's Environment; Issues and Trends'

³ BITRE 2007, 'Estimating urban traffic and congestion cost trends for Australian cities'

⁴ Commonwealth of Australia 2010, 'Intergenerational Report'

Technology and innovation are essential to improving productivity. Australians must...

- adopt automation and digitalisation within industry to improve quality, flexibility and agility, and increase labour productivity
- shift to a “more from less” culture where environmental sustainability will create long term productivity benefits
- completely integrate our freight, transport and communication networks to minimise costs and maximise output from existing and future infrastructure
- collaboratively innovate, to connect Australia’s greatest talents with global networks and convert this into sustainable local value for future generations
- embrace the latest information and communications technologies to enable digital productivity solutions



2018 2019 2020 2021 2022 2023 2024 2025 2

Improving the productivity and competitiveness of Australian industries

Since 2003-04, Australia’s productivity performance has been in steady decline, due primarily to issues in our mining, manufacturing and utility industries. Australia must address this decline if it is to prosper in an increasingly competitive world. This requires behavioural, technological and legislative changes across all levels of society.

How can technology improve our productivity and competitiveness?

Technology and innovation will greatly assist in improving productivity as they will allow us to do things faster, with less effort and waste. In particular, the following approaches can be used:



2026 2027 2028 2029 2030 2031 2032 2033 2034



Digitalisation and automation



Freight and logistics optimisation



Environmental sustainability



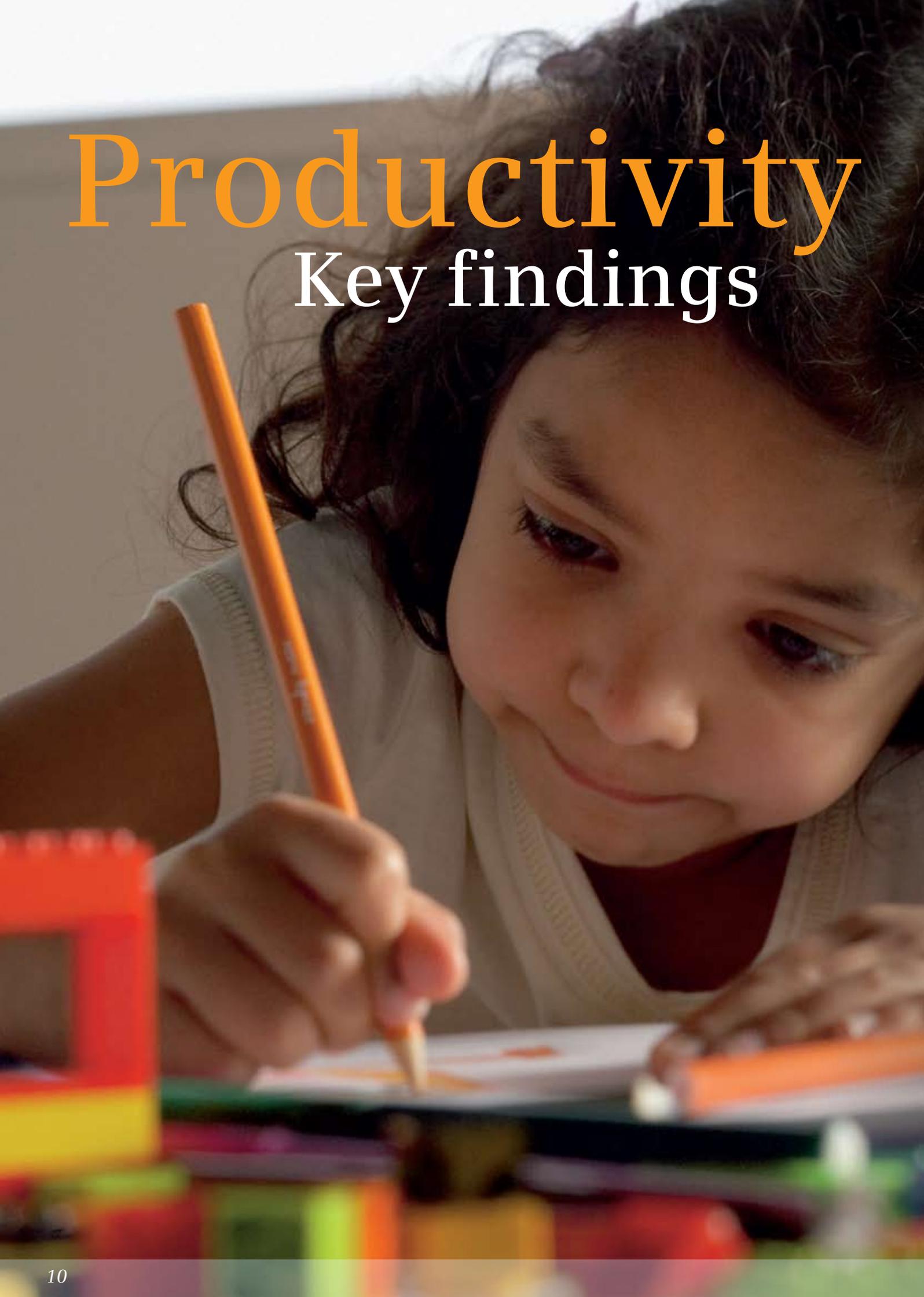
Collaborative innovation

Information and communications technology



Productivity

Key findings



1. Despite being one of only three advanced economies to record positive growth during the Global Financial Crisis, Australia's productivity has declined at 1.2 percent per annum since 2003-04. Productivity growth is essential for Australia's long term economic prosperity.¹
2. The success of our mining industry is masking our productivity decline. This is not sustainable in the long term. In addition, the mining boom is boosting our exchange rate, making imports cheaper, exports more expensive and creating real challenges for other industries. Australia must create innovative sustainable industries that prosper beyond the mining boom.
3. In 2010, each person aged over 65 was supported by five people in the workforce. By 2030, around three workers will support each retiree. This means proportionally fewer tax payers. We must improve productivity to fund the burden of an ageing population without impacting on our living standards.²
4. Despite opening our doors to global trade in the 1970's, Australia is still relatively protected, ranking 55th in the world for trade tariffs, which discourages efficiency and competitiveness. Our local industries need to improve productivity in order to be competitive as we continue to engage in world trade.³
5. Australia emits the third highest emissions per dollar of gross domestic product in the Organisation of Economic Collaboration and Development (OECD), which is above the world and OECD averages. A carbon price will increase the cost of energy and reduce our competitiveness unless we invest in cost effective alternative energy sources and energy efficient technologies.⁴
6. Australia is falling behind in innovation, ranking last in industry collaboration with universities within the OECD, 18th in the global innovation index and below the OECD average for expenditure on research and development. We are struggling to commercialise our ideas locally, and losing the battle to retain our innovation talent.⁵
7. Compared to the Asia Pacific region, the cost of labour in Australia is very high. Furthermore, we are experiencing major skills shortages, especially in technical fields. For example, by 2015, the mining industry will experience a shortfall of 36,000 skilled tradespeople.⁶
8. The cost of domestic freight in Australia is high compared to countries in Asia Pacific. Improving the productivity of freight and logistics will significantly increase the competitiveness of Australian industries. This includes:
 - a. Correcting the imbalanced use of rail and road transport by investing into rail infrastructure and improving the interface between the two
 - b. Establishing a common pricing framework for all freight modes
 - c. Standardising the national rail industry
 - d. Investing in our bulk and container ports to ensure we meet future demand and increase their productivity
9. The cost of urban congestion in 2005 was \$9.4 billion and is expected to more than double by 2020 to \$20.4 billion. This cost includes many avoidable factors such as time wasted in traffic, maintenance, fuel and emissions.⁷ Our capital cities need to become more efficient if they are to accommodate at least an additional 4.5 million people by 2030.
10. The Australian market is small and to achieve economies of scale, we must be export focused. Our markets are also highly dispersed and separated by vast distances amplifying the issue of an inefficient and high cost freight network.
11. Small and Medium Enterprises (SME), that make up 73 percent of Australian businesses, find it difficult to fund innovation. Therefore, our industries must collaboratively innovate to reduce the cost and increase the output from our innovation effort.¹
12. Productivity performance and management quality are strongly linked. Australian managers are ranked 'average' in the OECD with only 44 percent possessing a tertiary qualification⁸. Improving management practises is one of the most cost effective ways of increasing productivity and output.

¹ ABS 2010, Catalogue 5260.0, 'Experimental Estimates of Industry Multifactor Productivity, 2009-10'

² Commonwealth of Australia 2010, 'Intergenerational Report'

³ World Economic Forum 2010, 'Global Competitiveness Report 2010-11'

⁴ Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States. 2007 'Emissions intensity of GDP, 2005 \$US, PPP'

⁵ Commonwealth Government 2009, 'Powering Ideas An innovation agenda for the 21st Century, INSEAD & CII 2010, Global Innovation Index 2009 - 10.'

⁶ Orchison, K 2010, 'The bust side of the gas boom' Business Spectator 21 July

⁷ BITRE 2007, 'Estimating urban traffic and congestion cost trends for Australian cities'

⁸ LSE & McKinsey 2007, 'Management Practise and Productivity'

In 2010

Population: 22 million
Aged dependency ratio 5:1
Cost of urban congestion: \$12.5 billion

Despite the wide range of advanced **automation and digitalisation** technologies available today, such as those relating to product design and process optimisation, the uptake is relatively slow. Furthermore automation systems are not integrated well and based on a myriad of protocols. Only few businesses can truly see advanced technology as a source of competitive advantage and are globally successful as a result.

A healthy **freight and logistics** network is vital to our productivity through the efficient movement of goods. However, ageing infrastructure, over regulation, insufficient investment and a lack of modal integration reduces its efficiency. An unhealthy percentage of interstate freight is moved by road, rather than rail, the more efficient option. Furthermore, port productivity has stagnated for the past decade. The majority of freight transport is powered by fossil fuels.

Businesses are starting to recognise the importance of **environmental sustainability** towards reducing costs and improving productivity. The uptake of combined heat and power systems, energy metering, regeneration and efficient lighting is accelerating in an attempt to reduce energy costs. Products are generally designed for single use with no regard for its lifecycle environmental impact; only half our waste is recycled.

Innovation is crucial in improving productivity, and collaboration increases its effectiveness and efficiency. Currently Australia is not realising its full potential through **collaborative innovation** due to cultural, financial and administrative barriers. Many opportunities to retain talent and create new industries are lost due to challenges in commercialisation of ideas and the lack of financing for start-ups. Our innovation effort is poor, with only one third of businesses innovating.

In 2020

Population: 25 million
Aged dependency ratio 4:1
Cost of urban congestion: \$20.4 billion

The fast adoption of the latest **automation and digitalisation** technology has boosted the global competitiveness of our industries. Advanced design, simulation, testing and commissioning of products and processes in the digital world enables significant cost and time savings. Virtual reality is being used to control systems remotely. Advanced predictive maintenance, fuelled by comprehensive real-time data is widely used and reduces unplanned downtime by half.

A national **freight** agenda and a standardised pricing framework have significantly improved our **logistics** network, reducing rail inefficiencies and driving a shift from road to rail for interstate movements. Intelligent traffic management, real time scheduling and integrated logistics systems reduce congestion and increase productivity of existing infrastructure. Port productivity has increased through wide adoption of automation technologies. Clean fuels, hybrid technologies and further rail electrification are slowly building a carbon free **freight and logistics** network.

A culture of 'more from less' is providing Australian businesses with significant cost savings while starting to redefine our reputation as a high quality producer. Smart management systems reduce energy use in industrial processes and buildings in real time. Increasingly, products are designed for recycling and minimal lifecycle **environmental** impact.

Australia has established a framework for **collaborative innovation**, supported by virtual environments. Start-ups and SMEs have better access to financial resources and are supported by private sector, research institutions and government bodies. Innovation hubs are starting to flourish as a result of this collaborative effort.

Picture the future

In 2030

Population: 29 million

Aged dependency ratio 3.3:1

Cost of urban congestion: \$10 billion

Australian products are world renowned for quality and ingenuity driven by our desire to be at the forefront of **automation and digitalisation** technologies. Artificial intelligence and augmented reality assists humans in complex tasks, reducing errors and costs significantly. All automation systems are completely standardised, wirelessly integrated and modular with decentralised intelligence. All industries have a digital shadow – a comprehensive, real-time database for products and processes – enabling superior system management and optimisation.

All modes of transport within the **freight and logistics** network are seamlessly connected and operate as one integrated system. Rail is now the most common mode of interstate transport, being highly clean and efficient. Advanced wireless communication and accurate GPS enable driverless freight and real time flow optimisation for lower costs and higher throughput. The development of regional freight hubs reduces land requirements in urban ports and dramatically reduces congestion in major cities.

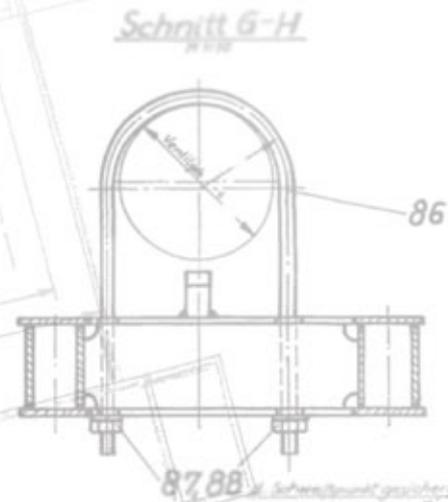
Australian industries are highly efficient in their use of energy and raw materials. This continued focus on **environmental sustainability** is providing significant competitive advantage and is the foundation of our industries' global success. Innovative new industrial processes and autonomous systems continuously optimise energy and raw material use. Renewable and clean energy sources contribute towards 40 percent of our power supply, reducing carbon and energy costs. All products are designed with ease of recycling a key priority.

Collaborative and open **innovation** is the foundation of sustained productivity improvement. Risks are spread,

intellectual property is shared and experts, amateurs, scientists and large organisations work together to create new innovations. Australian innovation hubs are world renowned, attracting and retaining global and local talent. Our ideas are commercialised in Australia, developing into globally successful businesses and created through collaboration in local and global innovation spaces.



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of *Productivity*

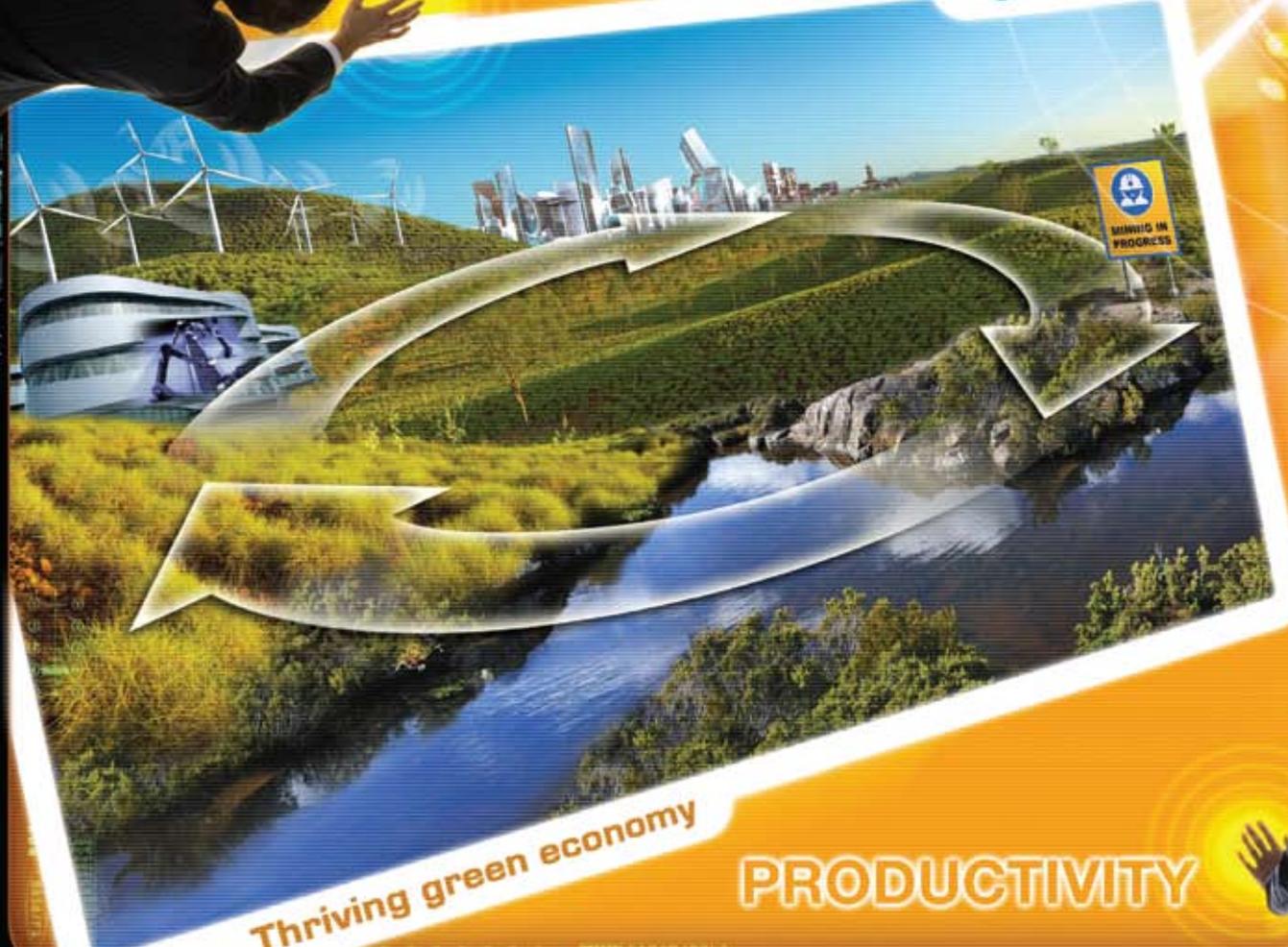
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Australia - world innovator

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Thriving green economy

PRODUCTIVITY

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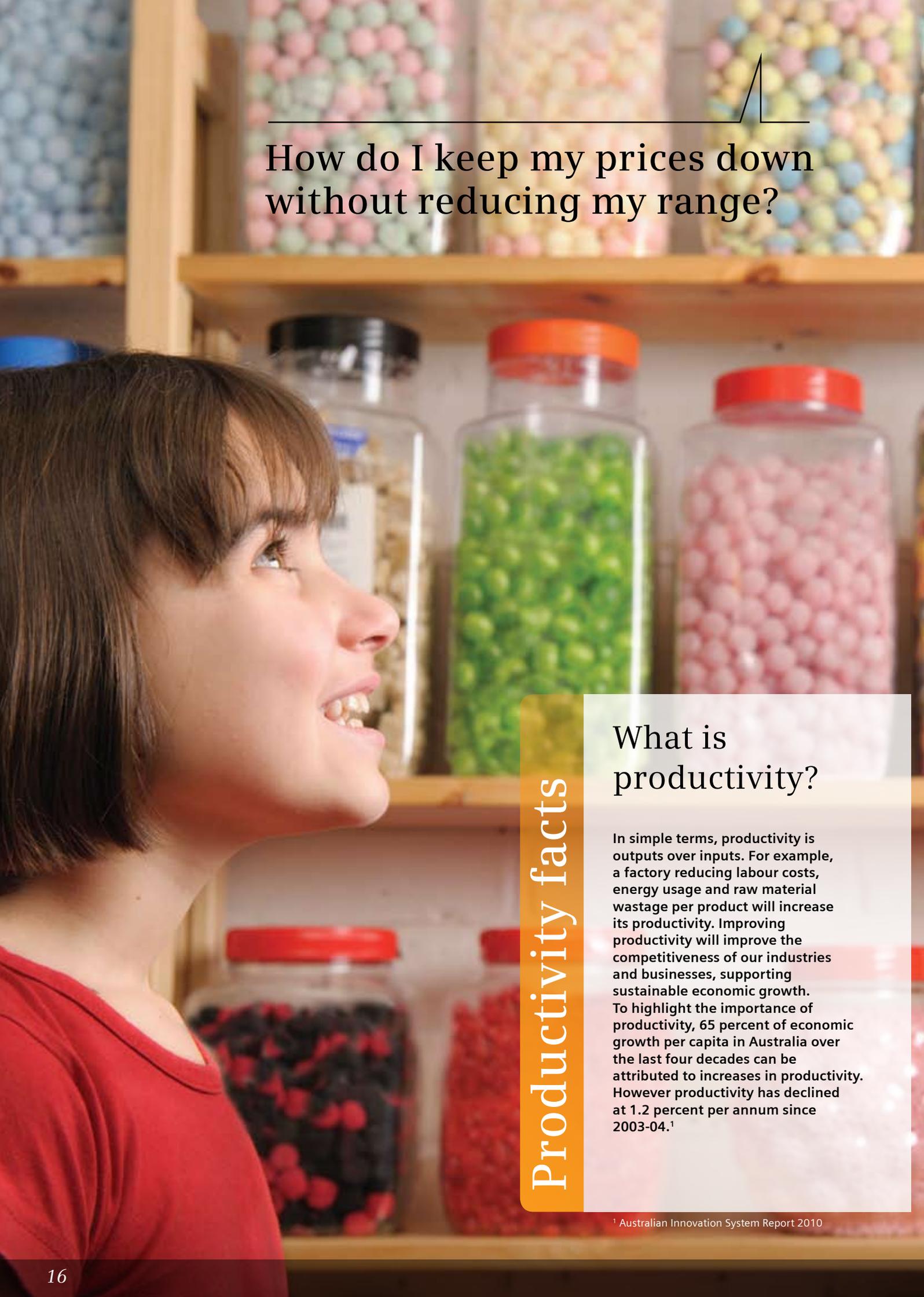
Seamlessly connected

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Technology promotes a balanced life

Picture
the Future



How do I keep my prices down without reducing my range?

Productivity facts

What is productivity?

In simple terms, productivity is outputs over inputs. For example, a factory reducing labour costs, energy usage and raw material wastage per product will increase its productivity. Improving productivity will improve the competitiveness of our industries and businesses, supporting sustainable economic growth. To highlight the importance of productivity, 65 percent of economic growth per capita in Australia over the last four decades can be attributed to increases in productivity. However productivity has declined at 1.2 percent per annum since 2003-04.¹

¹ Australian Innovation System Report 2010

Productivity performance in Australia

Mining – 5.2 percent per annum

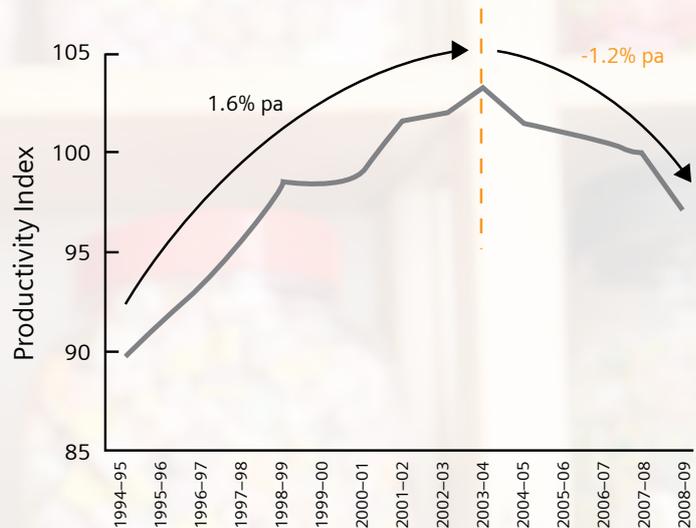
Australian ore grades are declining in quality and we have to dig deeper to reach them. High ore prices mean that mining is very profitable, but there is no incentive to improve productivity.

Manufacturing – 1.8 percent per annum

Manufacturing has seen a decline in output due to import penetration and the global financial crisis. Although there has been an increase in labour productivity, there has been a large expenditure on capital reducing multi-factor productivity*.

Electricity gas and water – 4.2 percent per annum

The utilities have invested heavily in capital and labour for future demand.



*Multi-factor productivity: Output per unit of labour and capital utilised

2030 2031 2032 2033 2034 2035 2036 2037

How can Australians improve productivity?

Productivity improvement is critical for enhancing our living standards. It is up to each individual to improve productivity. This means working smarter, not harder.

We need to focus on:

Collaboration – Working together beyond normal boundaries. Collaboration spreads skills and builds critical mass which is important for a small economy like Australia. It is the driver of successful innovation.

Education – Australians need to develop our mental worth, if we are to prosper beyond our mineral wealth. Education is important for addressing skills shortages and creating more highly valued services.

Technology – is critical for productivity growth. Australians must embrace technology to help us do our jobs better.

Challenge the status quo – We need to continually look to improve the way we do things.

How is productivity measured in different industries?

Rail freight	Tonne-km / locomotive
Container port	Containers / year / crane
Mining	Tonnes ore produced / labour hour
Factory	Bottles produced / labour hour / unit of energy consumed
Services	Services value over process costs
Agriculture	Crop yield / km ²

Can productivity improve environmental sustainability?

Yes, by

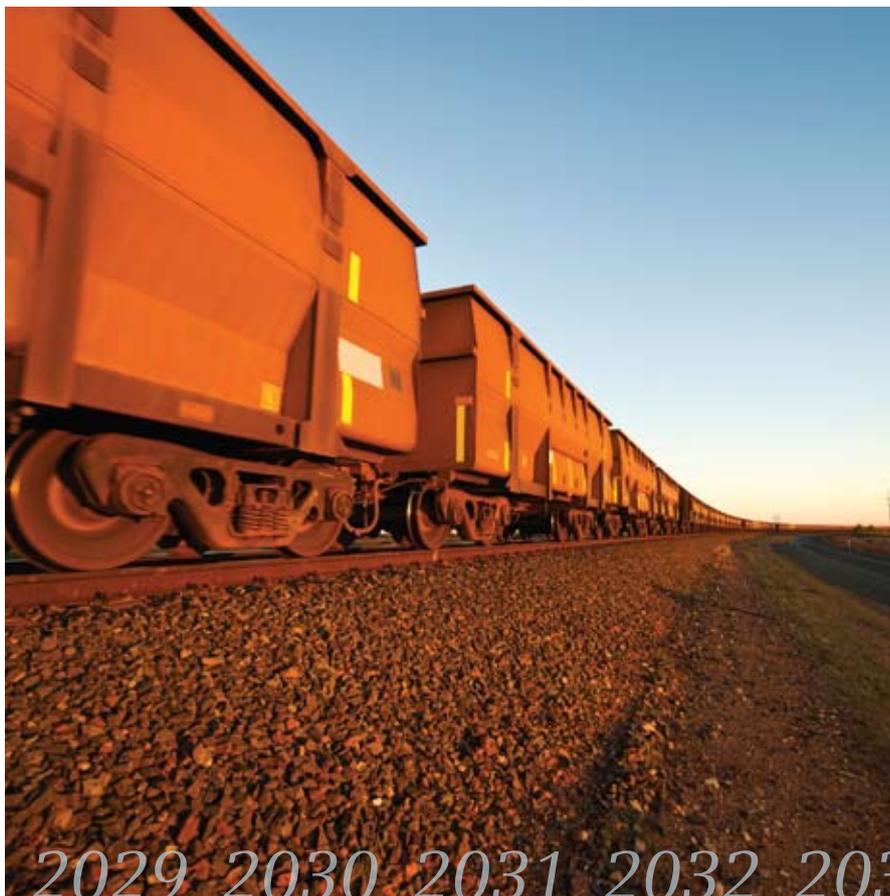
Improving raw material efficiency

- Minimising waste in production process
- Designing products to be recycled
- Using less raw material and better designs
- Increasing our national recycling effort

Yes, by

Improving energy efficiency

- New industrial processes and technologies consuming less energy
- Intelligent control of existing systems
- Lighter materials for mobility
- Regeneration for heavy machinery



2028 2029 2030 2031 2032 2033 2034 2035 20

A positive future for productivity in Australia is now in our hands.

As a technology-based solutions provider, Siemens can support you with the latest innovations in technology to help achieve Australia's goals for productivity. We are committed to research and development to find solutions for a world with strong, sustainable economic growth and a high quality of life. We will continually share our knowledge to empower you, the people of Australia, to make the right decisions.

What is left now is for all of us to take the next step. If we want a future of sustainable economic growth and enhanced community well-being we need to start working together today to improve our productivity and competitiveness. As Australians, it is now time to take actions to address the challenges of the four global megatrends. It is now time to explore all the opportunities presented through current and emerging technologies, in order to create a better world for future generations.

Together, we can picture the future of sustained productivity growth for Australia.

2036 2037 2038



Picture
the **Future**
Productivity

What will the future of our industries look like in a highly automated, digital world?

Innovation for generations.

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2030	Real time, comprehensive data collection or digital shadows allow continual optimisation of systems and enhanced life-cycle management. Products and production processes are completely designed, tested and commissioned in a digital environment and comprehensively linked with the real world for continuous optimisation, fast re-design, high quality production and excellent process flexibility.	
	Digital environments	Every aspect of engineering design across all products and processes are completed simultaneously and collaboratively in a digital environment, enabling full optimisation of input costs and reducing time-to-market by half. Production systems are able to self-learn, optimise, diagnose and configure.
	Industrial automation	Human-machine communication is revolutionised, seamlessly integrating operators with the digital world through highly intuitive, ergonomic, low complexity human interfaces. All automation systems are completely standardised, wirelessly integrated and modular with decentralised intelligence.
	Lifecycle management	Intelligence and networking capabilities are embedded in all objects enabling cost effective tracking and management of assets. All industries and products have a digital shadow where information is stored and constantly updated in a common database. Augmented reality simplifies complex maintenance tasks.
2020	Majority of production processes have shifted to a modular design aided by highly secure, high bandwidth wireless technology. Automation systems are integrated and no longer stand alone. Mechanical, electrical and automation engineering design is done collaboratively within the digital world. However, this is just the beginning with increasingly more tasks occurring in the digital world.	
	Digital environments	What were once real world engineering and testing tasks are now moving towards being completed in the digital world. Virtual collaborative design is becoming more and more popular enabled by high bandwidth communication technology.
	Industrial automation	Automation systems operate on a common protocol and components are interchangeable. Widespread adoption of virtual reality is being used to control systems remotely.
	Lifecycle management	All industries have a digital image, providing real time data and a common database for products and production. This allows for fast change, accurate fault diagnosis and advanced predictive maintenance, reducing unplanned downtime by half.
2010	Most production processes are automated to a degree. However the majority of complex tasks are still left to humans. Generally, automated systems are stand alone and industrial communication is mainly hard wired and inflexible. System transparency is poor and components fail without warning, causing forced and extended downtime.	
	Digital environments	Digital engineering of products and processes is widely adopted, but this is a highly segmented and iterative process, with designs requiring significant physical testing.
	Industrial automation	Automation systems are based on a myriad of protocols and are poorly integrated. Each system requires specific and highly specialised training. Industrial communication is generally hard wired and inflexible
	Lifecycle management	Asset management is generally completed using a 'fail and fix' mentality. Different databases are used for production and processes with low data transparency. Highly skilled engineers are required to complete complex maintenance tasks.

SMEs – Small and medium enterprises

OECD – Organisation of Economic Collaboration and Development

Digitalisation and automation

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From virtual to real in one adrenalin rush

A Siemens product lifecycle management software solution has helped Red Bull Racing capture and manage knowledge throughout the innovation process, ultimately increasing the productivity of the engineering and design team. This highly efficient digital backbone allows Red Bull Racing's development team to see their proposed changes in 3D, make modifications rapidly, significantly cut manufacturing time and receive supplier parts quickly. All of this leads to this pioneering company's ultimate goal of superior racing performance on the world stage.

During the brief periods between races, around 100 engineers at Red Bull Racing work under tremendous pressure to improve the performance of these vehicles. The software essentially allows engineers to work within a concurrent and virtual world throughout the entire innovation process, thus integrating design and manufacturing within a single digital environment. Engineers are able to develop the entire vehicle, design new components, assemble all 4,000 individual parts and test its paces – all while sitting at a computer. Significant reductions in physical prototyping and limited material waste have been achieved and the elimination of tedious and repetitive tasks has saved up to 75 percent of design and manufacturing time.

Meeting global demands through improved automation

Rio Tinto Iron Ore has achieved higher productivity and improved product quality on their Further Fines Processing Plant (FFPP) in the Pilbara region, thanks to an innovative solution which combines the world leading Siemens SIMATIC process control system with the Profibus communications protocol. The plant processes approximately 22 million tonnes of raw iron ore per annum. This includes increasing the concentration of iron and simultaneously reducing the amount of alumina, phosphorous and silica.

With a booming resources sector and unprecedented customer demand, the company decided to implement the Siemens solution in order to increase the reliability and productivity of their plant. The goal was to reduce the risk of failure and ensure sustained operations into the future. The Siemens solution provided Rio Tinto with a common platform for control, instrument and electrical devices while providing an intuitive engineering environment for simplified implementation and maintenance. These advanced control methodologies have delivered increased productivity, improved production quality and reduced maintenance, while achieving significant financial returns.



What will the future our freight and logistics networks look like?

Innovation for generations.

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2030	Freight is completely controlled in a digital world. The freight network is based on cleaner energy sources, reducing its dependence on fossil fuels. Each mode of freight transport is used in an optimal fashion and freight flow is optimised for minimum cost, minimum congestion and fast delivery. Rail is the mode of choice for interstate freight.	
	Integrated logistics	Supply chains and internal logistics are completely integrated, smart and optimised. All transport modes operate on a common pricing framework taking into account emission costs, maintenance and noise. Hub and spoke systems reduce freight transport in cities by 30 to 50 percent.
	Intelligent infrastructure	Advanced wireless communication and accurate GPS tracking enables moving block rail scheduling and driverless trains. This provides a 30 percent reduction in energy and maintenance costs as well as improving track throughput.
2020	Alternative energy sources are becoming commercially viable and are starting to displace fossil fuels. Road and rail pricing is standardised, however there is still competition in some areas due to unresolved bottlenecks in rail infrastructure.	
	Integrated logistics	New pricing measures enable optimal use of road and rail. Inland mega-hubs are in the initial stages of construction to reduce congestion around urban container ports. Ports optimise throughput by implementing advanced automation and integration with road traffic management systems.
	Intelligent infrastructure	Real time scheduling of trains increases throughput on all rail networks. Wireless communication with trains puts rail signalling into the cockpit. Road traffic management systems can distinguish and manage freight and passenger flow separately.
2010	Australia's freight network is predominantly powered by fossil fuels. Road and rail transport compete heavily against each other. Our preference for road freight contributes significantly to congestion and our domestic freight is expensive compared to the rest of the Asia-Pacific.	
	Integrated logistics	Different modes of transport are competing against each other and the interface between road and rail is inefficient. Logistics are generally not integrated due to lack of real-time data.
	Intelligent infrastructure	Road signalling and traffic management systems are not fully optimised. Rail scheduling is based on fixed block methodology in most cases. Signalling is completed via hardwired infrastructure.

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Perth to Mandurah railway electrification project

Siemens has designed, manufactured, installed and tested a traction power supply system for the Southern Suburbs Railway, which is part of the Western Australian Government's 1.4 billion MetroRail project. This project is part of the city of Perth's expansion plans to accommodate their rapidly increasing population as a result of the booming economy. As the largest public transport infrastructure project in Western Australia, the Southern Suburbs Railway has seen an increase of more than 57 percent in passenger rail travel in Perth in just three years. Planners also anticipated that the new electrified rail line would eliminate around 21,000 cars off the Kwinana Freeway every working day which equates to a saving of approximately 73,500 tonnes of carbon dioxide per annum.

Drawing on their international rail electrification expertise, Siemens delivered a traction power supply system that will electrify the 70-kilometre railway line between Perth's city centre and Mandurah. The system included two 132/25 kV traction substations and 25kV feeder stations, 132/25 control and protection panels, 25kV sectioning cabins, booster transformers, emergency supply transformers and protection relays. In addition, Siemens supplied components and materials for the overhead catenary system.

When precision matters – improved safety and productivity for Port of Felixstowe

The Port of Felixstowe is the United Kingdom's largest container port, being home to some 27 ship-to-shore cranes. Faced with the challenge of steadily increasing sizes of container ships, the height of the cranes in the port are relatively high, making container movement more difficult than with smaller cranes. Thanks to a crane management solution provided by Siemens, the Port of Felixstowe can now enjoy improved productivity, safety and reliability in their busy daily operations.

The Siemens solution allows greater support for crane drivers while achieving a significantly higher degree of operational safety and reliability. It provides a semi-automatic driving system which helps compensate for the high level of skill, concentration and responsiveness required from its drivers, resulting in a higher level of safety. Crane drivers are supported by electronically optimised acceleration, positioning and monitoring features which allow them to place the containers on trailers and ships with more precision. In addition, the sway control functionality offers automated camera supervision of the load's motion, providing maximum precision. Even the influence of wind on the load can be detected and compensated for, resulting in reduced cycle times and improved productivity, regardless of weather conditions.



How will our industries contribute to an environmentally sustainable future?

Innovation for generations.

SIEMENS

2030	Australian industries are highly efficient in their use of energy and raw materials, providing a significant competitive advantage. Products are designed to minimise their lifecycle environmental impact, with the added advantage of a high quality image attached. Adoption of innovative low energy processes in industry and metallurgy are well underway. Factories and facilities are integrated with smart grid, continually optimising energy use.	
	Raw material efficiency	All products are designed for ease of recycling, with designers taking a cradle-to-cradle approach, reducing our dependency on non-renewable reserves. Resource extraction is achieved with minimal environmental impact. Production process waste is kept to a bare minimum.
	Energy efficiency	Innovative new industrial processes and facilities save significant amounts of energy. Smart mines / factories / farms are connected with the smart grid and autonomous systems continually optimise energy usage.
	Clean energy	Alternative energy sources have significantly reduced our reliance on fossil fuels and we achieve greater independence from volatile global oil supply. Around 40 percent of electricity is generated by renewables.
2020	Renewables now produce 20 percent of electricity and coal power is being substituted with gas-fired generation. Transport is shifting quickly to alternative energy sources and hybrid vehicles. Old buildings are mandated to achieve minimum efficiency targets. Goods are increasingly designed for minimal lifecycle impact and easy recycling.	
	Raw material efficiency	Goods are increasingly designed for recycling and minimal lifecycle environmental impact. Waste reduction becomes a key focus to reduce input costs to production.
	Energy efficiency	Production processes are designed for low energy consumption and are increasingly connected to smart management systems to reduce usage in real time. All new buildings are six-star energy rated. High efficiency lighting is used in 90 percent of applications.
	Clean energy	Alternative energy sources are in the early stages of adoption for transport. Hybrid technologies are increasingly adopted by freight as an intermediate solution. Ports offer cleaner power supplies to ships to reduce emissions.
2010	Fossil fuels generate 93 percent of electricity with coal being the predominant source. There is a small penetration of hybrid vehicles and the first electric cars are coming on the market. Renewable energy is starting to grow as a result of the renewable energy target and other incentive schemes. Transport is predominately powered by fossil fuels.	
	Raw material efficiency	Products are designed for single use with a cradle-to-grave methodology and not for ease of recycling such as composite materials. Raw material extraction is efficient by today's standards but there are still significant opportunities for improvement.
	Energy efficiency	Uptake of combined heat and power systems, energy metering, regeneration and efficient lighting is accelerating. Industries are acknowledging that energy efficient processes are essential for competitiveness due to rising energy prices.
	Clean energy	Renewables supply seven percent of Australia's electricity. Hybrid and electric vehicles are starting to hit our roads, but the majority of transport is powered by fossil fuels.

SMEs – Small and medium enterprises

OECD – Organisation of Economic Collaboration and Development

Environmental sustainability

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Corex Steel making process cuts emissions and increases energy efficiency

Corex is a technology developed for the production of pig iron by Siemens subsidiary VAI, and is a significant advance over the conventional blast furnace process. In a blast furnace, coke and sinter are required to produce pig iron from iron ore. A Corex plant, on the other hand, can be operated with ordinary black coal. Neither a coking plant nor a sintering plant are required. Not only is resource consumption lower, but investment and production costs are also lower than with a conventional blast furnace.

A blast furnace process produces significantly more sulphur dioxide per tonne of pig iron than does Corex. Emissions of dust and oxides of nitrogen are similarly reduced, and Corex wastewater contains significantly less ammonia, phenols and sulfides. Another major advantage of the process is that the gas produced during the Corex process can be used for gas turbines and thus generate electricity to help cover a steel plant's own electrical power requirements.

The Corex process helps to improve process energy efficiency, reduce CO₂ emissions by up to 30 percent and additionally, does not contribute to the acidification of the environment.

Sunshine renewable energy project produces sweet savings

The New South Wales Sugar Milling Co-operative, trading as Sunshine Sugar constructed two 30-megawatt cogeneration power plants at the Broadwater and Condong Sugar Mill sites (NSW). Called Sunshine Renewable Energy, this project is one of the largest renewable electricity generation projects in Australia, with Condong supplying around 50 percent of Tweed Valley's annual electricity requirements and Broadwater supplying 33 percent of Richmond Valley's annual electricity requirements.

Siemens provided medium voltage variable speed drives (VSD) to control new electric motors which drive the mills at Condong and Broadwater. This increased the throughput from the mills and provided an efficient use of bagasse – a sugar cane by-product and an accredited renewable fuel source – for electricity production. Upgrading the traditional steam driven mills with VSD-controlled motors has also provided additional cost savings as the need for filters has been eliminated. This use of a renewable by-product of the sugar process to increase electricity generation has resulted in economic benefits to the customer, consumers and the environment.

What will the future of collaborative innovation in Australia look like?

Innovation for generations.

SIEMENS

2030	Australia is an innovation powerhouse despite its size. We accelerate the development of new technologies and businesses by opening the doors of our industrial labs, exchanging ideas with universities and external partners and creating a world of synergy. Strategic cooperation of our industries with elite universities provides students with ideal learning conditions. Our ideas are commercialised in Australia, but are created through collaboration in local and global innovation spaces. A highly innovative Australia attracts great minds from around the world.	
	Open innovation and partnerships	Open innovation connects brilliant minds in companies and institutions in Australia and around the world via the virtual cloud. Virtual partnerships are created; risks are spread, IP ownership is shared and experts, amateurs, scientists and large organisations work together to create new innovations. Open innovation is a high percentage of the innovation effort.
	Commercialisation	Australians collaborate to create financial strength, ensuring our ideas are turned into local value. Research organisations, businesses and government pool resources to ensure start-up companies can blossom into globally successful organisations. Our innovation hubs are world renowned.
2020	Australia efficiently spends money on research and development and we increasingly collaborate with each other to achieve innovation of scale and greater connection to the outside world. Our SMEs find it easier to commercialise ideas through collaborative support. Globally recognised innovation hubs are starting to appear throughout Australia.	
	Open innovation and partnerships	Australian's increasingly share ideas through the virtual open innovation cloud. However, the innovation process is still very much siloed. Open innovation is growing in importance but is still only a small percentage of the typical innovation cycle.
	Commercialisation	There is a favourable operating environment for start-ups in Australia. They have access to financial resources and a supportive backbone of the private sector, research institutions and government bodies. Successful commercialisation is helping to develop critical mass in innovation, attracting attention from around the world.
2010	Innovation is key to increasing productivity but Australia's innovation effort is poor. Over 80 percent of innovation-active businesses do not innovate collaboratively. We are ranked last in the OECD for industry collaboration with educational institutions. Australia has a very high proportion of SMEs with small research and development budgets and we are far removed from the world innovation hub of the northern hemisphere.	
	Open innovation and partnerships	The innovation system in Australia is inefficient and sometimes operates in parallel silos. There are significant cultural, financial and administrative barriers to collaborative innovation and we are not fully utilising the power of virtual environments to connect globally.
	Commercialisation	Australia is unable to effectively commercialise our innovations which means we are losing the opportunity to create new highly productive industries and hence capture this value. Australia has a large number of SMEs, who struggle to access financing. The venture capital market in Australia does not support high-tech start-ups very well and is ranked 24th in the OECD.

SMEs – Small and medium enterprises
 OECD – Organisation of Economic Collaboration and Development

Collaborative innovation

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Keeping innovation local

Monash University and Siemens have collaborated in an exciting four-year partnership to advance the progress of medical research in the field of molecular medicine. The partnership aims to provide support to researchers and academics in this field to deliver clinical outcomes which could potentially improve or cure various disease processes.

Siemens has committed resources and expertise towards this grants-based partnership whereby successful applicants can receive contributions and technologies to support their important research work. In addition, Siemens has helped Monash University to implement several world class imaging machines, including a state-of-the-art Magnetic Resonance Imaging (MRI) system, a Computed Tomography (CT) scanner and nuclear medicine systems, which help to make the Clayton Biomedical Imaging Laboratory one of the most innovative laboratories in the world.

Using the expertise of Siemens in the field of healthcare technologies, this collaborative partnership demonstrates how Australia's skills and talents can be engaged in local projects that could ultimately result in new solutions for worldwide health challenges. From professional development to commercialisation, this partnership encourages local opportunities, provides researchers with access to world class equipment and facilitates better communication and knowledge sharing between business and universities.

Australia's unique desalination solution, fully powered by renewable energy

Siemens has partnered with Windesal to deliver on a shared vision to provide water security for local communities in Australia and around the world. The Windesal – Siemens partnership could effectively drought-proof the state of South Australia through wind-powered desalination systems that turn seawater or brackish groundwater into high quality drinking water for local communities. With an annual output capacity of 3 to 5 gigalitres, Windesal's desalination systems can operate even when there is insufficient wind power. Each system is supported by a modified generator which is powered by bio-fuels and other renewable sources.

With the engineering expertise of Siemens, this partnership will support Australian company, Windesal, in its vision to deliver an innovative and unique solution to the challenging issue of water security in Australia as well as other water poor countries. Siemens can provide Windesal with access to their global network of expertise which comprises of over 30,000 R&D specialists and 150 R&D sites across the world, backed by an annual investment of over \$5 billion.



2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

About Siemens

Our world is rapidly changing due to four global megatrends – climate change, urbanisation, globalisation and demographic change. The pressures brought on by these four global megatrends can affect businesses and individuals significantly. Siemens has a portfolio of technology-based solutions to help tackle such challenges. Through our innovative offerings, we can help you find solutions in the areas of water, energy, environment, healthcare, productivity, mobility, safety and security.

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