Report Structure

- Executive Summary
- Energy
- Transport
- Education and training
- Justice and emergency services
- Cultural, civic, sporting, recreational and tourism
- Agriculture, science and environment
- Health and human services
- Water and waste
- ICT
Infrastructure Capability Assessment
Executive Summary
Infrastructure Victoria
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1. Introduction

Infrastructure Capability Assessments

One of Infrastructure Victoria’s (IV) primary functions is the preparation and publishing of a 30-year infrastructure strategy detailing short, medium and long-term infrastructure needs and priorities. To support the evidence underpinning the development of this strategy, and to meet its legislative obligations to undertake an assessment of the current state of infrastructure in Victoria, Deloitte and Aurecon were engaged by IV to deliver infrastructure capability assessments (assessments) across nine sectors.

Each of the nine sectors and the supporting subsectors are detailed overleaf. The purpose of each assessment is to:

- Identify the major assets in each sector and provide the wider context in which assets operate, including the interconnections between assets, identification of key stakeholders and current industry trends in the sector
- Provide a base of quantitative data as a foundation from which to start developing the strategy. This data will outline asset value, historical and forecast investment, infrastructure performance and current/future capacity in each sector
- Identify the future challenges and opportunities associated with each sector, specifically related to how existing infrastructure can be used to accommodate future demand.

Uncertainty around future demand and requirements makes infrastructure planning a complex challenge. A number of forces are going to shape the State and its need for infrastructure in the coming years. It is important that long term infrastructure planning in Victoria is cognisant of a range of contingencies going forward to better understand possible pathways and how they may affect Victoria. Therefore, the result of these assessments is an initial view on the sector’s capacity and the infrastructure’s capability to meet existing and future service needs.

Importantly, there are varying degrees of private sector, local government, State government and Commonwealth government involvement in these sectors. Assessments are included in these sectors (for example, in the regulated electricity sector) despite a limited role for the Victorian government in the ownership, management or delivery of the infrastructure.

Infrastructure Definition

A definition of Infrastructure is not specified in the Infrastructure Victoria Act 2015. As such, infrastructure assets have been considered in a broader sense than the standard financial definition. For example, though emergency services radio networks are not strictly considered infrastructure assets, we have considered this in the assessment of the justice and emergency services sector’s asset base as it contributes to service delivery.

Limitations of the Report – Ongoing Stakeholder Engagement

Each assessment is desktop based and has been prepared based on information that is publicly available or has been provided by the stakeholders engaged. In preparing the assessments we acknowledge and understand that there is likely to be additional information available that could help influence future thinking. Therefore, the findings and analysis through each assessment are an initial starting point and are subject to change as alternate views and information is identified. It is the intention that this work is one of the platforms for further engagement and refinement of Victoria’s infrastructure needs as IV progresses its 30 year infrastructure strategy development further.
2. Sector Overview

The figure below provides a sector classification overview and identifies the sub-sectors for each of the nine sectors. The detailed discussion of each sector and its sub-sectors is presented in the relevant assessments. Some of these sectors reflect Victorian government departmental portfolios (for example, education and training) or areas of confluence (for example, cultural, civic, sporting, recreational and tourism).

- **Justice and emergency services**
  - Police
  - Court Services
  - Correctional Facilities
  - Emergency Communication Services
  - Emergency Co-ordination
  - Fire Services

- **Education and training**
  - Early childhood education (0 to 8 years)
  - School education (5 to 18 years)
  - Tertiary education (15 to 65+ years)

- **Transport**
  - Rail (light, heavy, freight)
  - Roads
  - Ports
  - Airports
  - Buses
  - Cycling and walking
  - Taxis

- **Energy**
  - Electricity: generation, transmission and distribution
  - Gas: supply, transmission and distribution
  - Hydrocarbons

- **Water**
  - Wastewater, drinking water (potable), irrigation, waterways and drainage

- **Waste**
  - Waste treatment process
  - Collection
  - Resource recovery
  - Reprocessing
  - Disposal

- **Agriculture**
  - Grain, brewery, forestry, on and off farm processing, meat and seafood and green house industries

- **Science**
  - Fixed infrastructure ranging from health, medical and bio-technology, food/fibre and manufacturing

- **Environment**
  - Biodiversity, environmental water and coastal preservation infrastructure, parks and marine and environmental monitoring stations

- **Health**
  - Hospitals
  - Emergency services
  - Mental health
  - Primary health
  - Aged care
  - Medical research

- **Human Services**
  - Disability
  - Child, family and youth
  - Social housing

- **Information and Communication Technology**
  - Mobile services
  - Telephone (land-line) services
  - Internet services
  - Radio and television assets

- **Cultural, civic, sporting, recreational and tourism**
  - Museums, performing arts centres, memorials and libraries

- **Civic**
  - Town halls, and Government Houses

- **Sport and Recreation**
  - Stadiums, racecourses and parks

- **Tourism**
  - Victoria’s major attraction assets
3. Assessment Approach

Each of the assessments analyses the 19 key issues across the 6 key areas presented in the chart below.

Assess:
1. Key findings, challenges and opportunities
2. The current major infrastructure assets of the sector and who owns and/or manages them
3. Recent investment in assets by government and the private sector
4. What major infrastructure projects are being implemented
5. How infrastructure is currently planned and operated/maintained
6. Relevant regulatory and pricing regimes

Assess:
7. The annual operating expenditure
8. The current condition of assets
9. The level of effort required for asset renewal
10. Whether the infrastructure is maintained against prescriptive standards or outcome-based service levels

Assess:
11. Performance of the assets e.g. utilisation and reliability
12. How performance targets or service levels are set and do these align with stakeholder and community expectations
13. ICT requirements and fitness for purpose

Assess:
14. The operational criticality of the infrastructure and how resilient the sector is to sudden shocks which severely effect performance
15. The key drivers of demand
16. Forecast future demand
17. The gap between demand and supply of infrastructure
18. How well the assets in the sector match the activities or services they support. Whether there any assets underutilised or any assets surplus
19. The pricing of assets

The analysis in each of these assessments is based on the evidence collected through comprehensive desktop research and broad stakeholder engagement across government. Data collection has been based on consolidation of existing and available information as opposed to new primary research. The level of detail is dependent on the availability of information and varies between assessments, particularly where key information resides with the private sector. Stakeholder consultations have been undertaken to address critical information gaps, where data is still limited or incomplete, this has been highlighted in the assessments and will be the subject of future consultation between IV and key stakeholders.

For this reason, this report assesses infrastructure from a sector wide service-delivery lens, rather than the condition of individual assets. Analysis is not necessarily concentrated on overall asset quality or general asset performance, but rather the degree to which the asset is capable of satisfying current and future demand.
4. Drivers for Change

Each assessment covers the current state of infrastructure and how it is performing, utilised, managed and maintained, and discusses the drivers of future infrastructure demand. The assessments are of course interdependent with a number of themes (or mega trends) of key importance across all sectors, as summarised below. The interdependencies necessitate a systems thinking approach to infrastructure planning to be mindful of unintended consequences or benefits.

**Population growth**

Population growth, especially in Melbourne, will see higher demand for social services and infrastructure, increased congestion and pressure on the natural environment, and intensifying competition for land use. Choices need to be made around how to accommodate Victoria’s growth.

**Climate Change**

Extreme weather results in greater demand for emergency services, utilities, and agricultural output. Climate change will affect productivity in many sectors, put more pressure on the natural environment (particularly biodiversity and water), while reducing the lifespan of infrastructure. Changing climate also see a range of health impacts for Victorians. Mitigation actions and policies have the potential to slow the rate of climate change.

**Ageing population**

The ageing population will see Victoria have a higher dependency ratio, putting pressure on government tax revenue. Our tax system makes it expensive to move house, leading to a misallocation of housing. Ageing of the population will also see increasing demand for government services, such as health and public transport.

**Global economy**

Victoria’s economy is impacted by global and local trends, including geopolitical developments, environmental pressures, the emergence of Asia as the centre of the global economy, demographics such as population ageing and migration, information and capital flows, and technological developments.
5. Infrastructure Findings

The benefit of IV providing a mandate to take a broad view across Victorian infrastructure is that a number of important infrastructure findings that apply across a range of sectors have arisen. A series of common challenges and opportunities have been identified and are summarised below.

<table>
<thead>
<tr>
<th>Finding</th>
<th>Discussion</th>
</tr>
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<tbody>
<tr>
<td>1. The Victorian Government is central to the planning and delivery of Victoria’s significant infrastructure however the role of the private sector is expected to continue to grow over time.</td>
<td>While the energy and water infrastructure markets already contain a high proportion of private sector provision, increasingly attention will turn to other sectors where the public and private sectors can work together to enable more innovative infrastructure and service delivery, for example in the provision of social housing.</td>
</tr>
<tr>
<td>2. Augmenting existing infrastructure using technology is a key to facilitating greater capacity in existing infrastructure.</td>
<td>There are opportunities to complement existing significant infrastructure with technology solutions to boost network capacity where expansion of the physical asset would be costly or prohibitive due to broader physical constraints. For example the implementation of digital signalling on the rail network or video conferencing in the provision of court services.</td>
</tr>
<tr>
<td>3. Dialogue and co-ordination between organisations responsible for capital investment decisions in infrastructure do not demonstrate broader network thinking.</td>
<td>Asset under-utilisation and over-investment must be avoided in the future. The civic, cultural recreation, sporting and tourism sector provide several examples of this, where broader uses can result in additional utilisation. Another example includes the minor non-educational and broader community use of school assets after hours. Whilst asset investment decision making can be siloed, the opportunity is to broaden the uses of new and existing infrastructure and therefore lower the future cost of additional, stand alone solutions.</td>
</tr>
<tr>
<td>4. There is a dispersed approach to the collection of asset information within Government.</td>
<td>Informed decision making and critical analysis is improved when the accuracy and reliability of the reference or base data is improved. The research conducted as part of this report has identified that there is not a common approach to the recording and availability of asset information. A common, consistent platform and broad scale sharing of asset information (including future planning) would potentially greatly improve decision making, particularly where multiple sectors of the economy are directly involved and impacted.</td>
</tr>
<tr>
<td>5. The increased competition for scarce funding means capital expenditure needs to be compared and evaluated consistently, not on a sector by sector basis.</td>
<td>Even if population projections over-estimate the growth in Victoria over the next 30 years, there is compelling evidence that demand will broadly exceed supply for example in the provision of public education, social housing and public transport and road networks. Future investment must be evaluated across these competing priorities to optimise service delivery with the revenue base available.</td>
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## 5. Infrastructure Findings cont.

<table>
<thead>
<tr>
<th>Finding</th>
<th>Discussion</th>
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<tbody>
<tr>
<td>6. Recurrent investment requirements are greater than current planning</td>
<td>There is a need to develop both a long term plan to meet recurrent expenditure requirements in a consolidated way and ensure an appropriate maintenance expenditure target is set. Further the costs are likely to be higher than the funding available from Victorian and Commonwealth Governments and therefore trade-offs and strategic decision making will be required.</td>
</tr>
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<td>and budgeting suggests.</td>
<td></td>
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<tr>
<td>7. Service performance and service outcomes are not easily identifiable.</td>
<td>In many instances consistent service performance indicators are not available. This is in part due to dispersed asset ownership for example in the agricultural sector. In other instances, for example the justice sector, clear infrastructure performance indicators do not exist across a range of government entities.</td>
</tr>
<tr>
<td>8. Sustainability and protection of the natural environment are a mandatory requirement for Victoria.</td>
<td>Investments will be required to protect Victoria’s natural environment. The costs for protecting the environment (e.g. transport route selection) will add additional pressure to new investment decisions.</td>
</tr>
<tr>
<td>9. Asset conditions vary greatly, with clear examples where maintenance has been deferred in order to prioritise new infrastructure.</td>
<td>Social housing and education are two sectors that clearly demonstrate the short-comings of historical infrastructure expenditure models to deliver on required routine maintenance. This failing has significant long term consequences for asset dereliction and service performance. Future project decision making must consider the long term whole of life costs of ownership to ensure appropriate service delivery and asset performance can be achieved.</td>
</tr>
<tr>
<td>10. ‘Pinch-points’ in infrastructure performance have significant consequences at peak times.</td>
<td>Historical infrastructure investment demonstrates that infrastructure solutions cannot simply seek to add capacity without considering how isolated, but predictable peaks in demand will be managed. Actions that unlock (or spread demand) may provide a better solution in some instances than new infrastructure investment.</td>
</tr>
<tr>
<td>11. ICT infrastructure speed, capacity and reliability are significant issues to be addressed in response to rapidly changing technology applications.</td>
<td>Clarity over the NBN roll out is needed to support the forecast continued exponential increases in data usage across all sectors. Service provision gaps (particularly in regional areas) need to be addressed particularly where improved productivity can be achieved (e.g. connectivity along regional train lines or for the agricultural sector).</td>
</tr>
<tr>
<td>12. Several key assets are not resilient to potential shocks.</td>
<td>Negative shocks to key infrastructure assets like the Westgate Bridge, airport roads connections and major energy assets have the potential to cause significant lost productivity. Alternative infrastructure solutions need to be assessed in the context of the probabilities and magnitudes of potential disruptions.</td>
</tr>
<tr>
<td>13. The construction and delivery of new infrastructure should be integrated where possible.</td>
<td>The delivery of key infrastructure, particularly in heavily populated areas requires significant disruption to businesses and the community. Delivery of infrastructure should give consideration to adjacent needs, for example, where construction involves underground works how can the future provision of energy, water, waste and telecommunications infrastructure be co-ordinated.</td>
</tr>
<tr>
<td>14. To improve asset utilisation, service delivery agencies are implementing or exploring new service delivery models.</td>
<td>Many sectors are looking to a more networked approach to service delivery to enable better asset utilisation and reduce duplication in service delivery. For example the courts sector has already adopted a networking capacity while police are considering alternative service delivery models.</td>
</tr>
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</table>
5. Sector Findings, Challenges and Opportunities

A range of key findings, challenges and opportunities for each sector have been derived from the evidence in each assessment.

- Energy
- Transport
- Education and training
- Justice and emergency services
- Cultural, civic, sporting, recreational and tourism
- Agriculture, science and environment
- Health and human services
- Water and waste
- ICT
Energy
Key Findings

1. Victoria's energy sector is almost entirely under private ownership.
2. At a high level, energy infrastructure in Victoria is considered to be in reasonable condition and has been performing within acceptable limits.
3. Energy infrastructure is critical for Victoria. Networks and generation are planned within the National Electricity Market to provide resilience.
4. Under a medium growth forecast, it is anticipated electricity reserves will not meet the Australian Energy Market Operator (AEMO) reliability standard by 2024-25.
5. There is no significant impact on the energy demand forecast that can be attributed or being influenced by other sectors.
## Future challenges and opportunities

The key challenge for Victoria’s energy sector is migrating from an abundant, low cost, easily accessible, brown coal fuel source for electricity energy generation to low carbon, environment encompassing, renewable energy sources. An integral challenge is to encourage the innovation required to develop a dynamic grid which facilitates, both technically and commercially, emancipated consumers as energy producers.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Challenges</th>
<th>Opportunities</th>
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| **Thermal Generation**      | • Ageing power generation assets: the average age of Victorian coal fired power stations is more than 34 years. As plants approach their end-of-life, either significant expenditure is required to refurbish ageing plant or replacement plant must be built. Reserved funding for site remediation is unclear.  
• High carbon dioxide emissions from brown coal presents environmental challenges.                                                                                                                                                                                                                                                                                                                                                      | • Victoria has one of the world’s largest reserves of brown coal. These resources combined with carbon capture and storage (CCS) offer an opportunity for the State to identify and pursue a course of action that could provide an alternative competitive advantage in a low carbon economy. The realisation of this opportunity is contingent on the commercialisation of CCS, bringing with it substantial technical challenges.  
• Existing strong grid connections from the Latrobe Valley to Victoria’s major loads would make the development of new generation in this area easier and less costly as it can utilise the existing grid.  
• Augmenting existing gas generators (open cycle configurations) to achieve greater efficiency (combined cycle configurations) could assist in replacing brown coal generation.                                                                                                                                                                                                                     |
| **Liquid Fuels**            | • The jet fuel supply to Melbourne Airport is currently constrained.  
• Australia’s stockholding for liquid fuels is currently less than the International Energy Agency (IEA) requirements (of which Australia is a member).  
• Commercial justification of additional liquid fuel import facilities.                                                                                                                                                                                                                                                                                                                                                                     | • Expansion of liquid fuel import facilities to Victoria.                                                                                                                                                                                                                                                                                                                                                                             |
| **Electricity Transmission**| • Opportunities for augmentation of grid interconnections with neighbouring states to facilitate growth in large scale renewable from other states.  
• Grid connection restricts future or proposed development of large-scale renewables in the western part of Victoria.                                                                                                                                                                                                                                                                                                                                                     | • Using smart grids to develop ‘self-healing’ networks.                                                                                                                                                                                                                                                                                                                                                                               |
| **Electricity Distribution**|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                       |
| **Renewables**              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | • Enabling and utilising the full capabilities of advanced metering infrastructure (smart meters) and extension to gas and water utilities.  
• Continued focus on the implementation of the power-line bushfire safety program resulting from the Victorian Bushfire Royal Commission.  
• Facilitate development and uptake of electrical energy storage technologies.                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                       |
| **Gas supply and transmission** | • Ensuring LNG export opportunities do not threaten domestic supply. At present Victoria is exporting gas for conversion to LNG for international export via Queensland.                                                                                                                                                                                                                                                                                                                                                     | • Facilitate development and uptake of further gas storage.                                                                                                                                                                                                                                                                                                                                                                           |
Transport
Many parts of the Transport Networks are underutilised outside of peak periods, providing significant opportunities if demand can be managed effectively, although some key locations (Burnley Tunnel, Bolte Bridge) are at capacity across the day.

Demand is primarily driven by where people live, work and play and activity centres have a large role to play in how demand is both created and developed through strategic land use planning.

Utilising policy levers such as road pricing, congestion charges and time of day pricing could have significant impacts to peak demand levels and travel patterns generally.

Allocation of road space will become increasingly important to the capacity, performance and use of the Transport Networks including growth in public transport mode share.

Increasingly ICT will be used to optimise the use of existing infrastructure.

The Transport Networks are critical to Victoria and although within Melbourne are generally able to cope with short term incidents, albeit with corresponding short term disruption, have points of weakness that if fail regularly or are unavailable for long periods of time would materially impact the operation of the city.

It can be expected that climate change will impact our Transport Networks, such as heat related issues on the Train Networks and storm related flooding across the transport networks, with more frequency than before.

Critical assets within the Transport Networks include unique assets with no easily substitutable alternatives, such as the Port of Melbourne and Melbourne Airport; material disrupters, such as Flinders St Station, the West Gate Bridge and the Burnley Tunnel; and key ICT systems such as the train signalling and road traffic management systems.

The assets comprising the transport sector should be considered as interconnected Transport Networks facilitating the movement of people and goods between activity centres, residential areas and key economic assets.

The performance of our Transport Networks are comparable with other States, and in general sufficient investment is being undertaken to meet short term requirements.

Left unchecked, long term demand will create significant challenges to the ongoing performance of the Transport Networks. For example there is strong forecast population growth in the west of Melbourne, where transport networks are currently underdeveloped.

Land use planning, particularly to the west and north of Melbourne, requires an integrated approach as to how this will impact the future design and requirements of our Transport Networks.

The Transport Networks are generally performing well, however constraints are beginning to show in some areas.

As our Road Network becomes more congested, this is having negative impacts to travel times and reliability for all road users, including declining average speeds of our trams.

Major projects are underway, such as Western Distributor and a programme of level crossing removals to boost capacity and reduce congestion.

Landside access constraints are some of the biggest threats to the ongoing performance of Melbourne Airport and the Port of Melbourne.

The Metropolitan Train network is currently capacity constrained in peak periods with new projects such as Melbourne Metro, Signalling Upgrades and New Generation Trains being planned to lift capacity and performance.

At the time of writing, acute operational issues are impacting regional rail services.

The Transport Networks in Melbourne are generally in good condition, able to meet current capacity needs and fit for purpose. However, Transport Networks in regional areas are often inadequate (e.g. HPV routes), and some parts of the metropolitan area have problems now and other locations will have issues in the future.

Some areas of the Transport Networks, in particular Train and Tram, could be considered as not fit for purpose in relation to disability access and train signalling.

Growing community expectations (such as Wi-Fi on trains, disability access, extended hours of operation) will require significant investment.

ICT is becoming a major component of our Transport Networks, and will need to respond to future requirements in new areas such as driverless cars and real time information.

The Transport Networks are governed by complex responsibility matrices that result in coordination challenges (e.g. cycling priority and implementation of clearways on roads) and complex relationships with land use planning.

Centralised transport planning is critical to ensure that challenges across the Transport Networks are appropriately prioritised and addressed.

Private sector involvement in the Transport Networks will continue to grow and be a major part of how the sector is funded, financed and operated.

Opportunities exist with the pending expiry of the Train, Tram and Metropolitan Bus Contracts to align new public transport arrangements with government policy objectives.

Infrastructure service performance

Key Findings

1. The assets comprising the transport sector should be considered as interconnected Transport Networks facilitating the movement of people and goods between activity centres, residential areas and key economic assets.

2. The performance of our Transport Networks are comparable with other States, and in general sufficient investment is being undertaken to meet short term requirements.

3. Left unchecked, long term demand will create significant challenges to the ongoing performance of the Transport Networks. For example there is strong forecast population growth in the west of Melbourne, where transport networks are currently underdeveloped.

4. Land use planning, particularly to the west and north of Melbourne, requires an integrated approach as to how this will impact the future design and requirements of our Transport Networks.
## Future challenges and opportunities

The key challenge for the Transport Sector is to ensure that broader community and land use needs are integrated with the planning and development of the sector. Plan Melbourne provides a framework for addressing the transport needs of Melbourne. Transport demand will also be impacted by key city shaping directions, such as the "poly-centric city" and "20 minute neighbourhoods". Co-ordination of these activities is not as well defined nor centrally planned for Regional Victoria, which may lead to challenges for Regional Transport planning.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Challenges</th>
<th>Opportunities</th>
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</table>
| Road (including cycling and walking) | • Improvement in road safety to get to “zero deaths”  
• Addressing congestion at peak times and at bottlenecks  
• Managing the environmental impact of road use while catering for increasing demand  
• Planning of road maintenance and improvements  
• Ensuring efficient and safe use of shared roads (automobiles, trams, bicycles)  
• Increased access for heavy vehicles on road network (metro and regional)  
• Access to key gateway infrastructure (Port of Melbourne, Melbourne Airport)  
• Access to new growth areas  
• Provision for High Productivity Freight vehicles which require strengthened bridges and in some cases, pavement widening  
• Declining road conditions to meet user needs | • Coordinate road developments with city shaping initiatives  
• Manage demand to improve utilisation of existing assets (roads) during off peak periods  
• Control traffic movements by leveraging new technologies (such as co-ordinated traffic management systems and real time information for users)  
• Ensure road planning complements other modes of transport (e.g. integration with intermodal hubs for both people and freight)  
• Facilitate more effective road sharing systems for alternative users (e.g. dedicated lanes for trams, cars, bicycles and access for pedestrians)  
• Road space allocation from parking to vehicle use |
| Heavy Rail (Passenger and Freight) | • Congestion on Metro system, ageing rolling stock, meeting DDA requirements  
• Land planning for the future rail network in growth areas in both Melbourne and Regional Victoria and for access to gateways (e.g. Avalon and Melbourne Airport Link)  
• Access to key gateway infrastructure (Port of Melbourne, Melbourne Airport)  
• Maintaining regional rail performance standards  
• Urban growth and development creating issues for freight operators with pressure on noise abatement, dust control, and restrictions on hours of operation | • Manage demand to improve utilisation of existing assets during off peak periods  
• Continue to expand and upgrade existing network  
• Leverage new technologies to improve train operations and provide real time customer information  
• Dis-aggregate rail lines to implement a metro style system that will improve capacity and reliability  
• Co-ordinate land planning to ensure freight precincts are preserved now and for future growth  
• Improving transfer between modes for both people and freight |
| Trams and Buses | • Declining tram travel speeds (particularly in the CBD and strip shopping areas)  
• Service frequency during peak and non peak times (particularly where there are shared right-of-way)  
• Integration of tram and buses with other modes of transport  
• Ageing rolling stock  
• Meeting DDA requirements | • Connectivity with other modes of Transport  
• Share road planning for tram, bus, bicycles and pedestrians  
• Bus services that continue to be optimised, simplified, easier to use and better integrated with other modes of transport |
| Ports | • Improving interface connectivity between rail, road and ports while protecting the surrounding urban amenity  
• Ensuring sufficient port capacity to meet Victoria’s long term forecast demand  
• Changes in international shipping that may require significant new infrastructure at Victoria’s ports | • Improve landside access to ports including a larger role for rail for both regional and metropolitan freight  
• Development of regional ports to handle other goods  
• Leverage new technologies to support marine and land side operations (stevedoring, supply chain co-ordination) |
| Airports | • Congestion on landside access (roads) to Melbourne Airport  
• Ensuring curfew restrictions are not placed on Melbourne and Avalon Airports  
• Ensure that airside and landside capacity at Melbourne Airport continues to expand to accommodate growth  
• Ongoing viability of regional airports in the face of the requirement for new investment to maintain assets | • Co-ordination of rail and road linkages with Melbourne Airport’s Master Plan  
• Increase use of Avalon Airport for both domestic and international services  
• Development of co-located activities e.g. freight precincts |
Education and training
Demand for Education Services are growing:
- Population growth to 9.6 million by 2046, of which approximately 2.2 million will be under 19 years old, will place the sector under significant future stress
- Lifelong learning and transitioning to a knowledge based economy are expected to increase demand on post school education providers with resultant infrastructure pressures
- Government schools and TAFE’s are currently underutilised and present an opportunity.

The Education and Training sector is a broad network, servicing a number of Victorian communities and is resilient to risk of failure

Whilst significant issues exist for localised stakeholders in the event of a failure (asset closure such as a school, ECE or even a University) the network is able to ‘flex’ to accommodate reasonable major demand changes.

Significant regulation for government and non-government providers. Government contributions account for the majority of total funding across the sector

Sector currently accommodates over 1.7 million students

2015-2016 State Budget allocated additional funding of approximately $2.9 billion across the sector. This includes slightly over $1 billion in infrastructure investment across the state

Private assets are independently managed.

Government regulation of the sector is focused on registration and quality of service delivered, infrastructure is typically not assessed.

Whilst the education and training sector is a heavy user of ICT systems, systems leveraged are not mission critical for the operation of the sector. ICT is fragmented with little to no interaction between the public and private sector.

Early Childhood Education is perceived as being short on supply and convenient access to quality services. The introduction of the National Quality Frameworks provided a framework for quality assessment on which Victoria receives the highest quality assessment ratings across Australia. There are increasing cost pressures on the ECE sector due to the introduction of stricter regulations.

Across the Education and Training sector 75% of the assets are in reasonable condition. However, this is based on data in excess of 5 years and it is assumed significant investment is required to bring elements of the portfolio up to appropriate standards.

- Asset management plans are utilised but not standardised or prevalent across the entire sector
- Victoria is competitive across the sector with other states
- Physical Condition and fit for purpose of the sector overall is satisfactory in the short-term.
# Future challenges and opportunities

The sector is challenged by long term underinvestment in maintenance and asset renewal. Regulation requirements and increasing quality and service expectations of consumers has created localised demand challenges for long term planning. This coupled with an ageing portfolio of assets, increases the levels of funding required to maintain and improve asset condition and functionality. Generally the sector is expected to grow as the emphasis on education and training across all ages increases. Changing technology and flexible work practices creates opportunities for increased asset utilisation within and across the sub-sectors.

<table>
<thead>
<tr>
<th>Sub-Sector</th>
<th>Challenges</th>
<th>Opportunities</th>
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</table>
| **Higher Education**               | • Aging infrastructure, Victorian Universities range from 42 to a 163 years old, infrastructure is reaching the end of its serviceable life and requires renewal or replacement  
                                 | • Growing demand of both domestic and international students  
                                 | • Changing teaching pedagogy influenced by growth of technology  
                                 | • Managing demand and utilisation of assets  
                                 | • Regulation changes to funding models  
                                 | • Management of backlog maintenance                                                                                                                                                                      | • Transition to knowledge based economy increasing demand for qualifications  
                                 | • Growing demand of both domestic and international students  
                                 | • Life long learning  
                                 | • Technological advances create opportunities to increase asset utilisation                                                                                                                                 |
| **Vocational Education and Training (VET)** | • Regulation in a restrained and uncertain funding environment  
                                 | • Systemic underinvestment in maintenance  
                                 | • Market based funding  
                                 | • Adapting to industry qualification requirements                                                                                                                                                        | • Current asset base is under utilised and can respond quickly to demand increases  
                                 | • Transition to knowledge based economy increasing demand for qualifications and retraining  
                                 | • Technology assisting in delivery of multiple courses resulting in increased asset utilisation                                                                                                           |
| **RTOs**                           | • Quality and recognition of qualifications in industry  
                                 | • Meeting the demands of changing consumer requirements  
                                 | • VET funding for courses under review                                                                                                                                                                    | • Transition to knowledge based economy increasing demand for qualifications and retraining  
                                 | • Technology assisting in delivery of multiple courses resulting in increased asset utilisation                                                                                                           |
| **Non-Government**                 | • Information asymmetry with government demand and forecasting  
                                 | • Maintaining current levels of Commonwealth government funding                                                                                                                                           | • Servicing demand in growth and established areas  
                                 | • Facilitate sharing of best practice asset management guidelines                                                                                                                                       |
| **Government**                     | • Systemic underinvestment in maintenance  
                                 | • Intense localised demand in growth and established areas  
                                 | • Ongoing maintenance of underutilised assets  
                                 | • Capacity of existing permanent school infrastructure to meet demand  
                                 | • Value for money on maintenance funding                                                                                                                                                                | • Technological advances create opportunities to increase asset utilisation across a network of schools  
                                 | • Best practice asset management guidelines  
                                 | • Strategic approach to localised areas of under utilised assets  
                                 | • Geographically based maintenance and/or facilities management service contracts                                                                                                                     |
| **Early Childhood**                | • Changing regulation that affects staffing and infrastructure requirements for service offerings  
                                 | • Responding to localised demand increases and flexible work practices                                                                                                                                 | • Demand for services to compliment flexible work practices through co-location  
                                 | • Facilitate sharing of best practice asset management guidelines  
                                 | • Simplification of funding arrangements                                                                                                                                                                |
Justice and emergency services
Significant investment in ICT across the sector could improve the effectiveness of agencies and support their future state service delivery. In some instances, significant investment is required to ensure that the condition of infrastructure across the sector is not fit-for-purpose. The system would benefit from an infrastructure strategic plan that recognises the interdependencies between services.

In 2014, Emergency Management Victoria became responsible for the strategic planning of the emergency management sector’s capital and ICT assets. There is considerable scope for Emergency Management Victoria to continue to optimise the capacity and use of the sector’s capital and ICT infrastructure, to build capability and drive interoperability.

Key Findings

Justice System
1. The justice system is highly integrated, with increased demand for services across any component of the justice system having a direct flow-on effect, boosting demand for services throughout the system. Key drivers of service demand are changes in the population’s demographics and policy and legislative environment.
2. Whilst there has been capital investment from the public sector, more is required to boost the capacity of the sector’s physical and ICT assets to meet increased demand for services. Currently, some critical infrastructure across the sector is not fit-for-purpose.
3. The system would benefit from an infrastructure strategic plan that recognises the interdependencies between services.
4. Investment in ICT across the sector could improve the effectiveness of agencies and support their future state service delivery models.

Emergency Services
1. Historically, emergency management entities have planned and operated their own infrastructure, resulting in fragmentation. In 2014, Emergency Management Victoria became responsible for the strategic planning of the emergency management sector’s capital and ICT assets.
2. Victoria’s emergency services are becoming increasingly integrated as entities progressively collaborate to develop and leverage major capital and ICT assets to build capability.
3. There is considerable scope for Emergency Management Victoria to continue to optimise the capacity and use of the sector’s capital and ICT infrastructure, to build capability and drive interoperability.

Infrastructure use
- Individual Justice and emergency management services have identified capacity constraints additional analysis research would be required to establish a sector-wide view.
- Demand for services continues to grow. Whilst service demand levels are highly dependent on population growth, they are also significantly impacted by the policy and legislative environment, and hence can alter quite rapidly. Increases in service demand can also be encouraged for economic purposes e.g. an increase in the number of civil matters heard in Victorian courts is considered good for the Victorian economy. This can make it difficult for the sector to manage its capital infrastructure portfolio, increasing its reliance on driving performance efficiencies through strengthening its ICT infrastructure.
- Capital assets are not always located based on service demand patterns and hence restrict the entity’s service delivery model.
- The sector is broadly pursuing colocation of capital and ICT infrastructure consolidation opportunities, enabling it to leverage expertise and infrastructure to boost capacity and drive consistency.

Operational criticality & resilience
- Justice and emergency services infrastructure is critical to the state of Victoria.
- Given the delivery model for justice and emergency services, it is expected that there would generally be sufficient capacity within the sector to manage isolated capital infrastructure failures. In rural areas, isolated failures can have a much larger impact on service delivery as there are fewer replacement assets (redundant capacity) and the distance between service delivery assets is greater.
- Generally, the sector has resilience and emergency response plans in place.
- This sector is highly reliant on core ICT systems and infrastructure. The failure of core systems or ICT infrastructure within the sector could have a significant impact depending on its function.

Assets, expenditure & governance
- Victoria’s justice and emergency services manage their capital assets through a range of different ownership models including public ownership, private ownership and PPPs. For example, Court Services Victoria predominantly owns its assets. Corrections Victoria leverages a number of ownership models and VICSES leases a number of its capital assets from local councils.
- EMV is responsible for the strategic planning of the emergency management sector’s capital and ICT assets and has recently completed a 10 year investment strategy for emergency services.
- The Department of Treasury and Finance (DTF), as Shared Service Provider, is responsible for centrally managing a proportion of the DJR’s asset portfolio including lease management, site acquisition and asset maintenance.

Infrastructure service performance
- Capital assets are required to be fit-for-purpose against a suite of building and operational standards.
- In some instances, significant investment is required to ensure that capital infrastructure is operationally fit for purpose e.g. a number of Victorian courts and associated facilities do not meet service performance standards.
- Emergency services should review the location of some critical capital assets to ensure they are operationally fit-for-purpose e.g. ESTA’s network is vulnerable as its Ballarat headquarters is in a high fire danger area.
- Significant investment in the justice and emergency services’ ICT infrastructure is required, as generally, systems do not meet the needs of the business, are on aging platforms or are not shared. This particularly impacts Victoria Police and Court Services Victoria.
- Emergency services are reviewing and investing in ICT infrastructure to maximise its capacity and to facilitate multi-channel communication between entities and the public.

Infrastructure condition
- Information on the condition of individual items of infrastructure was only available through Victoria Police, Court Services Victoria, VICSES and MFB. For the other entities, analysis was done based on the age of the facility and the last recorded upgrade, which has limited available findings.
- The condition of infrastructure across the sector varies. Long term strategic planning is required to ensure maintenance investment, which could be costly, is appropriately aligned with operational and business outcomes.

Please note: the capacity of the sector has been estimated based on discussions with individual entities. However, this should be confirmed through further quantitative analysis being conducted at a system level, led by the Department of Justice and Regulation.
Future challenges and opportunities

The key challenge for the justice and emergency services sectors is to ensure that infrastructure is fit-for-purpose and has the capacity to meet future demand for services, in alignment with future state service delivery models. Investment in entities’ capital and ICT infrastructure will be required to assist them in achieving their strategic visions, whilst coordinated strategic planning across the system would enable more effective use of system-wide capacity.

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| Justice        | • Infrastructure across the system is not always fit-for-purpose and may limit entities’ ability to achieve their long-term strategic visions  
- Capital infrastructure does not always meet current functional requirements, nor does it always have sufficient capacity to meet an increase in service demand in the short term  
- ICT infrastructure is, in some instances, beyond end-of-life and is unsupported. This limits the ability of entities’ to achieve their long-term strategic vision.  
• Current infrastructure may not support entities’ future state service delivery models, nor enable them to meet demand for services in the long-term. Demand for services is shaped primarily by two drivers:  
  - Demand due to population growth and changing community demographics is relatively predictable  
  - Demand due to legislative and policy change can be much more difficult to predict and to plan for due to the shorter timeframes with which they are introduced.  
• Entities have developed or are developing their future state visions and service delivery models, which will in turn drive shared and unique infrastructure requirements. Entities acknowledge the importance of an integrated service delivery model to meet citizens’ expectations. There are examples of integrated service delivery models that have been deployed. However, cross sector planning is in its infancy. | • Further investment in the sector’s infrastructure is required to boost system capacity, ensuring that capital assets are fit-for-purpose and that ICT infrastructure is sufficiently leveraged to improve service delivery, build capacity and reduce reliance on capital assets to deliver services where appropriate.  
• The justice sector is an integrated system. Therefore, system-wide benefits can be derived through ensuring that the flow-on impacts of infrastructure planning undertaken by one entity are understood and provisioned for by the system more broadly. This also enables entities to more easily co-locate where community benefits can be derived.  
• It is important that 'one-size-fits all' infrastructure solutions are not proposed across the system. Entities will have differing strategies for ensuring that service delivery models provide coherent, accessible and high-quality services. This may vary from reducing the volume of capital infrastructure, to reviewing the location of capital infrastructure, to co-locating services based on the needs of the local community. |
| Emergency      | • Demand for emergency services continues to increase with a growing population, changing community habits leading to increased urban density and increasingly severe weather patterns leading to a higher number of incidents requiring support from the emergency services sector.  
• Historically, each entity has pursued its own capital and ICT infrastructure strategies. In 2014, Emergency Management Victoria became responsible for the strategic planning of the emergency management sector, supporting the emergency services sector to become increasingly responsive and resilient by promoting the integration of capital and ICT infrastructure, as well as the interoperability of equipment used across entities.  
• As a result, emergency services is increasingly pursuing capital and ICT infrastructure consolidation opportunities, enabling it to leverage expertise and infrastructure across the sector to boost capacity and to drive consistency. This will support specific entities as they assess fitness-for-purpose of their infrastructure. | • There is considerable scope for Emergency Management Victoria to continue to optimise the use of the sector’s capital and ICT infrastructure, to build capacity to meet current and future service demand.  
• The role of Emergency Management Victoria should continue to be supported as it continues to drive coherent strategic planning across emergency services, driving increased integration and interoperability across the sector’s infrastructure. This is supported by the sector as it will assist emergency services to continue to meet an increase in service demand and delivery expectations. |
Cultural, civic, sporting, recreational and tourism
1. Enhance cultural, civic, sport and recreation infrastructure efficiency to strengthen operators ability to fund asset maintenance and renewal, without impeding community/visitor amenity.
2. Improve culture, civic, sport and recreation and tourism (CCSRT) infrastructure capacity and flexibility to provide services that are equitable and inclusive – enabling broad based community participation.
3. Expand the State Collection storage capacity to reduce escalating and long-term operating costs generated from higher environmental controls (due to age and condition of storage facilities) and increasing leased storage arrangements, whilst ensuring the preservation of the State Collection.
4. Strengthen and further diversify major event programming to maintain Victoria’s market leading status as a major events destination.
5. Upgrade the amenity and quality of regional community infrastructure to meet changing community demographics and address growing funding constraints of local government.
6. Invest in regional tourism product development to increase visitor spend and strengthen the state’s regional tourism proposition relative to competitors such as New South Wales (NSW) and Queensland (QLD).
## Future challenges and opportunities

Significant CSSRT and supporting infrastructure and services will continue to be key enablers of Victoria's liveability and visitation. Collectively, these sectors are vital to keeping communities socially connected, healthy and attractive to visitors.

### Sector

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| Cultural, Civic, Sport and Recreation | • Victoria's major cultural, civic and sport and recreation sectors require a level of subsidisation to fund both asset maintenance and renewal. This reinforces the need for coordinating Government agencies and infrastructure operators to continually question how to achieve cost efficiencies, without impeding community amenity or access. This includes strengthening existing and developing new partnerships between both Government agencies and with private sector operators to manage service delivery and achieve administrative efficiencies.  
• Across Victoria, 48 regional councils own and operate a large amount of community infrastructure and open public spaces. Collectively, this infrastructure (and enabling facilities and services) plays a critical role in promoting community cohesion as well as economic prosperity through employment. To ensure regional community infrastructure and associated services remain at a standard that meets changing local community expectations and needs, State and Local Government need to continue to give consideration as to how investment in infrastructure upgrades and new infrastructure can be coordinated so community amenity and equitable access can be maintained. | • Enhance cultural, civic and sport and recreation infrastructure efficiency to strengthen operators’ ability to fund asset maintenance and renewal, without impeding community or visitor amenity.  
• Upgrade the amenity and quality of regional community infrastructure and open public spaces to meet changing community demographics and address growing funding constraints of Local Government. |
| Cultural, Civic, Sports and Recreation and Tourism | • Melbourne and Victoria's regional CCSRT infrastructure is recognised as being a nexus point for community and cultural engagement. With diversity driven by increased migration, gender participation and an ageing population, investment needs to be directed toward ensuring enabling infrastructure facilities and services are equitable and inclusive. The Victorian Government’s commitment to invest $10 million (outlined in Victoria's Regional Statement, 2015) in increasing the number of women’s change rooms and facilities in regional sport and recreation venues exemplifies this needed investment.  
• Victoria is recognised as having a distinct and internationally leading major events program. Increasing rates of cultural diversity, driven by growth in migration and visitor markets such as Asia, will require operators of CCSRT infrastructure to increasingly focus on programming diversification and targeted visitor market promotion. This includes strengthening existing and developing new strategic Government and private sector partnerships to ensure the state’s events calendar remains relevant, accessible and a point of differentiation between Victoria and its jurisdictional competitors. | • Improve CCSRT infrastructure capacity and flexibility to provide services that are equitable and inclusive. This will enable broad based community participation.  
• Strengthen and further diversify major event programming to maintain Victoria's market leading status as a major events destination. |
| Cultural | • Victoria has a State Collection of cultural artefacts worth more than ~$5 billion (Creative Victoria 2014), currently stored in a number of locations in Melbourne as well as at a regional site in Ballarat. Limited and ageing storage infrastructure is impeded by inadequate maintenance funds for preservation and this is affecting ongoing access to this important Collection. Given the value of the State Collection to both Victoria’s visitor economy and local community, capital investment needs to be directed toward increasing onsite and offsite storage capacity and consideration given to how economies of scale can be maximised between the six operating agencies that have responsibility for preserving the State Collection. | • Expand the State Collection storage capacity to reduce escalating and long-term operating costs generated from higher environmental controls (due to age and condition of storage facilities) and increasing leased storage arrangements, whilst ensuring the preservation of the State Collection. |
| Tourism | • Although Victoria’s regions do benefit from domestic and international tourism, the level of regional visitation spend is lower than key competitors, specifically NSW. Directing investment toward enabling tourism accommodation and services around Victoria’s unique national parks will help to improve the current visitor experience and perception of regional Victoria as a tourism destination. Given the current immaturity of tourism infrastructure in these areas, further consideration needs to be given toward how the Government can strengthen the commercial business case for regional investment, increasing the level and quality of private sector interest in developing and operating tourism products and services. | • Invest in regional tourism product development to increase visitor spend and strengthen the state’s regional tourism proposition relative to competitors such as NSW and QLD. |
Agriculture, science and environment
1. The overarching challenge posed by analysis of this sector is that it encapsulates three distinct and diverse sub-sectors that are not typically drawn together as a single grouping.

2. The in-scope infrastructure definition for each sub-sector is important (see following slides). The three sectors are heavily dependent on infrastructure in other sectors. For example, the most critical infrastructure identified for agriculture was infrastructure in other sectors – principally transport, energy, water, and ICT - rather than within agriculture itself.

3. With the exception of agricultural research, agriculture is a mostly commercial sector; science is semi-commercial; and environment is entirely non-commercial, with the exception of tourism infrastructure that protects natural environments. These differences result in significantly variable availability of information for the three sectors in the public domain.

4. While infrastructure in each sub-sector is clearly distinct, key areas of intersection include agricultural and environmental research, biosecurity, and environmental waterway health.

5. Information in the public domain for environmental infrastructure often does not reflect underlying and latent pressures. Condition assessments are difficult to assess through desktop research, making findings reliant on anecdotal evidence and consultation. Sometimes, these do not match the findings of desktop research. To reconcile these differences, a more comprehensive assessment of the condition of environmental infrastructure is required.

6. Future demand for these infrastructure classes is expected to be driven by changing tastes, the impact of climate change, rising wealth, and the maintenance of Victoria’s success in the production of scientific knowledge (particularly in areas co-determined with business).
### Future challenges and opportunities

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| Agriculture | • Primary challenges tend to lie outside agricultural infrastructure, in other sectors. Victoria’s 2015 submission to the Commonwealth's Agricultural Competitiveness Green Paper, for example, makes reference to infrastructure requirements in water, transport, research and ICT – but not to agricultural infrastructure per se.  
• Flexibility of the infrastructure to support agricultural output, particularly its supply chain, pose a significant challenge. Given an expectation that climate change will drive geographic changes in agricultural output in coming years – for example, with the southern movement of the grain belt – there will be a need for supply chains to adapt relatively quickly over time.  
• The interrelationship of risks to agricultural production – for example from population and urbanisation growth, climate change and competing land uses – mean that policy responses need to be multi-faceted and coordinated.  
• It is expected that creating stable and demand responsive markets for road construction, maintenance and use, as well as for agricultural water resources will be important means of assisting transition. | • Access to knowledge and information infrastructure (including big data) will drive agriculture for the next 20 years. The importance of this is emphasised in recent regional reviews, the 2015 Food and Fibre Sector Strategy Discussion Paper and innovation policies. Innovation partnerships and collaboration are needed to drive innovation in Victoria’s agricultural output in coming decades.  
• Victoria’s agriculture future is firmly vested in the thriving and competitive global marketplaces of Asia and the Middle East. Rapid growth in Asia’s middle class is particularly driving demand for high quality food and fibre. Population and personal income growth will see the global demand for food significantly increase over the coming decades. Victoria’s food sector can position itself to benefit especially from the rapid growth in discretionary spending of Asia’s consumers. Asia will represent two-thirds of the global middle class by 2030.  
• Agricultural research is undergoing distinct generational change, from field-based assets and capabilities to laboratory and research centre based science. This involves controlled environments, rapid computer simulations, data capture, integration, mining and storage, and often global collaborations, partnerships and public-private co-investments. It also uses a multidisciplinary approach involving converging science disciplines such as biotechnologists, agricultural scientists, IT specialists, mathematical modellers and spatial scientists.  
• Succession planning – with demographic change over the next 10 or so years, the long running trend towards agribusiness consolidation of smaller family farms will largely come to completion. This will increase investment in on-farm infrastructure. |
| Science | • A 2014 Australian Bureau of Agricultural and Resource Economics and Sciences report found that “most of the productivity wins that can be gained from removing market distortions have already been achieved, and instead the productivity gains of the future will need to be driven by effective and efficient research and development (R&D) investment and reducing the regulatory burden.” | • New opportunities are emerging from innovations in science and technology, for example, the application of biotechnology to plant and animal genetic improvement and the use of remote sensing to better manage and monitor production inputs and natural resource conditions. Rapid and real-time access to global scientific information and expertise is fundamental for food and fibre producers to effectively manage risks and uncertainties and capture new opportunities to increase productivity. |
| Environment | • The provision of stable maintenance funding sources would go a long way towards addressing many risks to environmental infrastructure and outcomes.  
• Rigorous analysis of the economic costs of tourism to national parks and coastal reserves, including the costs that are avoided through strong natural asset management, would help to set appropriate, forward-looking prices for access to national parks.  
• Despite a strong rise in conservation agreements on private land in recent years, the area is still very small compared to that on public land. A renewed focus on this in coming years may have a large pay-off in economic, social and (without doubt) environmental terms.  
• Climate change is expected to place increasing pressure on environmental infrastructure through the frequency and intensity of extreme weather events. |
Health and human services
Key Findings

1. The most significant concern for this sector is the escalating cost of health and human services associated primarily with population growth and ageing.
2. While existing infrastructure has some capacity, it is not necessarily the right type or in the right place.
3. Investment will be needed in growth corridors and to realign demand and supply.
4. Infrastructure will need modification over time to support innovation in services, respond to the changing profile of disease and remain fit for purpose.
5. Investment in technology will be needed to enable improved system integration, better asset utilisation and treatment in the home and community.
6. Mechanisms will be needed to support service and asset optimisation across the system, in this highly regulated, complex and rapidly changing sector.
7. A significant investment lies ahead to sustain, renew and increase the capacity of infrastructure, with technology investment being a key part of this.

Infrastructure use
- Demand and health expenditure is growing at a greater rate than our population and Gross Domestic Product (GDP).
- Regulatory, funding and pricing reform is likely to be needed to sustain affordability of health and human services into the future in this complex sector.
- While existing infrastructure has some capacity, it is not necessarily the right type or in the right place. This is particularly true for social housing and public hospitals. Increased capacity will be needed to accommodate demand in growth corridors. Existing infrastructure will need modification over time to respond to advances in healthcare and technology, changing cohorts of disease, meet consumer expectations and to remain fit for purpose.

Operational criticality & resilience
- Health services, public hospital and emergency services in particular, are critical in times of disaster. The major trauma centres of the Alfred Hospital and Royal Melbourne Hospital are key and available data suggests both are in need of upgrade.
- Resilience is inherent in service networks due to the geographic spread of assets and minimal reliance on any single asset. However, capacity issues may arise in a major emergency event.
- Regional areas are reliant on a smaller number of key assets increasing the risk profile and impact potential of a sudden shock.
- In a disaster, human services assets are not as likely to be impacted as severely or be as critical as health.

Assets, expenditure & governance
- Assets are diverse, numerous and geographically dispersed, with both government and the private sector playing significant roles. Governance and ownership of assets in health is distinctly different to human services, albeit both fall within the Department of Health and Human Services (DHHS). Public hospitals are State owned and operated by 87 autonomous health and hospital services.
- The Royal Children's Hospital is an example of the major investment to sustain and grow assets over the past decade, which will need to continue to meet demand. Some concerns exist that there has been insufficient investment in ICT infrastructure to allow development of future ready ICT solutions.

Infrastructure service performance
- Victoria has a relatively efficient health system. Both outcomes and efficiency compare favourably internationally. The public hospital system generally meets current demand but will struggle to support the ageing and growing population. Wait times are an area of concern for specific public health services (including aged care) and social housing. Ambulance service response times are not meeting targets and emergency departments are stretched, with performance generally worse in rural areas.
- Indications are that there is some mismatch between demand and supply geographically.

System and state wide planning that integrates services and infrastructure (including technology), and matches demand and supply, is needed. A 20 year state-wide Strategic Health Service and Infrastructure Plan has been commenced by DHHS.

Infrastructure condition
- Government owned health assets are managed autonomously by Health Services, with minimal oversight by DHHS. Human Services public assets are managed against prescriptive standards. Private enterprise assets are maintained according to their own standards.
- An aggregated, current view of asset condition is not available. However, based on information accessible, Infrastructure Condition is considered just below the mid-point of 3 on a 1 to 5 scale. Some maintenance and fit-for-purpose issues have been identified.
- VAGO has recommended a number of asset management improvements and identified a number of maintenance deficits to be addressed.
### Future challenges and opportunities

The major challenge of modern health and human services is the affordability of high quality services in the face of rising costs and demand, driven by the growing and ageing population, the rise of so-called “life-style disease”, as well as advances in treatment and technology. The sector will be unable to sustain current models of funding, delivery of services and infrastructure.

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| Health                | • A significant investment lies ahead to increase the capacity of infrastructure to meet the projected increase in demand. This includes a significant demand for aged care services and infrastructure. Investment is also needed to better align supply and demand for services, both in type and location. While there is some capacity in the current infrastructure it is not necessarily in the right place or the right type.  
  • Infrastructure will need to change over time to support innovation, new models of care, technological change, advances in treatment and to suit predicted changes in disease ahead. Adaptable infrastructure will be needed to minimise the cost of change.  
  • New technology and treatment has the potential to both increase efficiency but also drive demand, for example as new or less invasive procedures become available, so this is both an opportunity and challenge.  
  • This is a sector with diverse assets, with ownership shared between the public and private sectors and public assets are owned and managed autonomously by 87 health services. This makes asset and health service optimisation challenging.  
  • Climate change poses threats to the health and wellbeing of the population. The resilience and adaptability of the Victorian health and human services system to climate change is unclear and warrants attention. | • Funding and structural reform in the sector has the potential to enable more efficient use of assets. There is opportunity for better integration across the system to optimise asset utilisation, increase efficiency and improve outcomes. Improved statewide planning of health services and infrastructure would support this. Greater public and private sector collaboration could also help optimise infrastructure planning, delivery and operation.  
  • Technology and digital health have the potential to help reduce infrastructure requirements, increase productivity and improve outcomes. Better health information access and management, enabled by technology, should enable advances in research, along with the provision of more personalised treatment and reduced waste along with other benefits.  
  • Alternative models of care such as “health in the home” have the potential to alleviate pressure on hospital infrastructure. More generally there is the opportunity for innovation in health services to enhance the utilisation of assets, improve outcomes and lift productivity.  
  • Encouraging preventative health and reducing risk behaviours that are linked to chronic illness promise to reduce healthcare demand. Promoting wellness through infrastructure planning and design could support this e.g. promoting walkability in communities.  
  • The Victorian Government provides a higher volume of residential aged care places than other states. This suggests there may be potential for reallocation of government resources. |
| Human Services        | • Homelessness is a significant challenge. Population growth, lack of affordable housing and a changing tenant profile is placing increasing pressure on the social housing system. Demand for public housing is already exceeding supply making it difficult to respond to this future demand. Public housing stock is ageing, compounding the challenge of addressing an existing maintenance backlog.  
  • There is increasing demand for disability services as a result of the increasing and ageing population. Victoria is struggling to keep pace with demand for residential care places for those with disabilities and additional residential care places and home care support with specialised equipment provision will be required. There is uncertainty around the impact of the imminent implementation of the National Disability Insurance Scheme (NDIS) on social housing for people with disabilities.  
  • With the forecast increases in population and family breakdowns, the child, family and youth sector is also expected to grow in criticality, creating a further challenge for this sub-sector.  
  • The fundamental challenge is the ongoing affordability of human services and the infrastructure needed to support it. | • Alternative models of infrastructure provision, ownership and management including increasing private-sector involvement present opportunities for optimisation of infrastructure planning, delivery and utilisation.  
  • There is the potential for increasing access to support services through innovative service delivery models.  
  • Supporting people to access private rental is an opportunity in mental health, e.g. as evidenced by the successful Doorways program operated by Mental Illness Fellowship. Increasing availability / stock of housing which better suits the needs of people with a mental illness, particularly single units. There is also the potential to increase colocation of services to reduce infrastructure burden.  
  • NDIS should provide the opportunity for the private and not-for-profit sectors to meet market demand and individuals with disabilities to choose services appropriate to their needs. This provides the Government with the opportunity to improve efficiency in the allocation of resources to disability services. |
Water and waste
Urban water use has fallen significantly over the last 10 years. Despite upgrades currently underway, rural water systems typically have high losses and require significant ongoing renewals and maintenance spending. Some regional towns are susceptible to low rainfall events.

Reductions in water use in recent years means growth is generally not a major driver of infrastructure need – most capex spending is on renewals, new recycled water systems, and sewerage treatment plant upgrades.

Climate change poses a threat to the sector in the medium term. Much work on the subject has been done and is reflected in Sustainable Water Strategies and Water Supply Demand Strategies. However, with the long-term impact of climate change unclear, the capacity of infrastructure outside Melbourne to deal with events such as lower average rainfall, bushfires and flood events is uncertain.

There is a growing waste and resource recovery industry which has played a pivotal role in reducing the volume and types of waste to landfills.

The Victorian water sector is well-governed and benchmarks well with interstate peers on efficiency indicators. The system of price setting and regulation enables businesses to recover sufficient revenue to maintain and build new assets.

Prices have increased recently, particularly in Melbourne, but are now stable or declining.

Capex in the sector is around $1.5 billion p.a., less than half that at the end of the Millennium drought.

The majority of the $2.2 billion waste industry in Victoria is privately owned and operated. In some regional areas local governments are the owners and operators.

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The majority of the $2.2 billion waste industry in Victoria is privately owned and operated. In some regional areas local governments are the owners and operators.
The water sector will be challenged by the reducing availability of water outside of the Melbourne region. Climate change and usage reductions required under the Murray Darling Basin Plan mean that infrastructure needs to become more efficient, and greater connectivity and climate independent sources are required. At the same time, conditions are good for investment in the sector at the moment. In the waste sector the long term viability of resource recovery and reprocessing is heavily influenced by market dynamics, which are somewhat (but not totally) out of government’s sphere of influence. Good planning, in relation to landfills and other essential facilities, is critical.

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| **Water** | • Low rainfall in many areas of Victoria over the last two years means that water security for some regional towns have been declining. Without adequate rainfall over winter/spring 2016, they will be susceptible to restrictions.  
  • The Murray-Darling Basin Plan has reduced the amount of water that can be used for urban and irrigation purposes in the north of the State. Water savings still need to be found to meet the Plan’s targets.  
  • A number of the regional urban businesses arguably remain too small to effectively achieve economies of scale. A relatively narrow geographic focus by these businesses means that there is some risk that regional capital solutions and asset sharing are not being adequately considered.  
  • Despite good asset renewal policies across the sector, some rural water supply systems and drainage assets are ageing and in deteriorating condition.  
  • Climate change poses a threat to the sector in the medium term. Much work on the subject has been done and is reflected in Sustainable Water Strategies and Water Supply Demand Strategies. However, with the long term impact of climate change unclear, the capacity of infrastructure outside of Melbourne to deal with events such as lower average rainfall, bushfires and flood events is uncertain. | • Capital costs are currently low due to few major water sector (or mining) projects being underway in Australia. In addition, low interest rates and the availability of federal government funding mean that it is currently a good time to be contemplating investment in the sector.  
  • Victoria’s water businesses are actively looking to engage and co-operate with each other to examine opportunities for cost reduction. This includes co-ordinated procurement and knowledge sharing.  
  • Several rural water supply systems are in the process of being upgraded, which will reduce water losses and improve security.  
  • Victoria is currently reviewing its strategic approach to the water sector and a Water Plan is expected to be released in March 2016.  
  • Water businesses are generally in sound financial position (although debt is relatively higher in Melbourne) meaning they have the capacity to take on additional borrowings to fund works.  
  • To better engage the community, the EPA could extend its current monitoring to all waste management facilities. This includes all unlicensed landfills and resource recovery facilities. It should monitor (as a minimum) air quality (odour and dust) and soil contamination. The EPA is currently undertaking a scheduled premises review.  
  • There is sufficient supply of material recovery facilities (MRFs) within the metropolitan region that can accommodate improvement in the recovery rates over the short term (10 years).  
  • Consolidation to fewer, larger landfills operated by larger entities can drive improvements in efficiencies, improve environmental outcomes and reduce public health and safety risks.  
  • Further streamlining of administrative processes within the waste sector in Victoria.  
  • Collaborative procurement for services can reduce overall costs within the sector.  
  • Develop a central data repository that stores a comprehensive set of waste data and information about waste data. It will allow Sustainability Victoria to deliver an improved level of waste and resource recovery data, research and publications. |
| **Waste** | • The current policy within the sector does not commit to any quantifiable performance targets against which the sector will be measured. Improvements to the data management systems over the past few years has improved the quality and timeliness of data and will allow for more accurate target setting in the future.  
  • Private sector involvement and investment to date has centred on Melbourne due to higher demand and lower costs than in rural areas.  
  • Collaborative procurement for services could lead to market consolidation.  
  • Quality of service is increasing, but there has been a 105 per cent increase in costs (2002–03 to 2012–03) for kerbside collection services (Sustainability Victoria, 2013) and more generally throughout the sector. Issues include the costs of hazardous waste collection, labour costs, compliance requirements and landfill levies.  
  • The community is generally sceptical of waste management facilities in close vicinity to their homes. Primary concerns relate to odour, health and safety and the long term impact of living close to such a facility.  
  • Residential encroachment on existing and closed landfills will present increasing risks to the long-term viability of those sites and may pose health and safety issues if it is not effectively managed.  
  • Landfill consolidation will increase the distance that waste is transported across the State and increase the dependence of the remaining sites.  
  • The long-term viability of resource recovery and reprocessing businesses is heavily dependent on market dynamics within Australia and abroad.  
  • Growing e-waste management requirements, including hazardous materials. |
Key Findings

1. Growth in mobile data is predicted to increase exponentially over the next five years.
2. Australia’s broadband services are lagging behind the developed world in terms of average speed and affordability. While this will improve with the nbn, the initial top speed of the nbn at 100 megabits per second (Mbps) is significantly slower than the 1 gigabits per second (Gbps) becoming widely available overseas.
3. The copper network is deteriorating; however, it is subject to a high level of regulation to ensure adequate performance levels are maintained.
4. Demand for nbn services has seen a much higher demand for the faster service tiers than originally anticipated.
5. With strong levels of investment, infrastructure is well placed to deal with extreme weather and emergency events.

Infrastructure condition

- Mobile network providers have invested significantly over the last few years and have indicated further large investments will be made (e.g. Telstra has allocated $5 billion for 2014-17).
- Optical fibre will replace parts of the copper network not fit for purpose and be laid in new greenfield developments. However, nbn has outlined that the unknown state of the copper network in future rollout areas is a high risk to the programed rollout.

Operation criticality & resilience

- Infrastructure is susceptible to physical damage and inoperability through power loss in extreme weather conditions.
- According to the AMTA, the existing mobile networks are well placed to deal with extreme weather events.
- Exchanges are single points of failure in the current network, however, the gradual replacement of the copper network with fibre creates an opportunity to redesign exchanges and improve resiliency.
- The resiliency profile of the fixed-line network will change also as the nbn is rolled out, with a reliance on power.

Infrastructure use

- Landline ownership is expected to decline 10 per cent between 2014 and 2019.
- Uptake of nbn services has shown a greater demand for higher tier (faster speed) plans.
- IPTV has proven popular in the US, and is growing (albeit more slowly) in Australia.
- Mobile data has increased by 85 per cent over the past year and is expected to continue to grow.
- This growth in data will place continual pressure on the network infrastructure.
- Mobile affordability is high in Australia, due to strong competition in the sector.

Infrastructure service performance

- The mobile subsector is less regulated than the fixed-line subsector.
- Vodafone’s network issues in 2010-11 highlight the strength of the market forces – over 2 million customers were lost because of the issues. Vodafone responded with a $3 billion network upgrade.
- Coverage in metro areas of Victoria is high, but there are still significant blackspots in regional areas.
- Complaints about mobile coverage to the TIO dropped by 49 per cent over the last year.
- Fixed-line services are highly regulated.
- Australia’s global ranking in average internet speed has dropped over the last year.
- The number of faults and average time to restore fault affected services has increased over the last few years.

Assets, expenditure & governance

- Mobile networks nationally are owned by Telstra, Optus and Vodafone covering 99.3 per cent, 97 per cent, and 94 per cent of the national population respectively.
- The copper network has over 7.4 million fixed-line services, which are progressively being transferred to nbn as fibre is rolled out. Rollout is due for completion by 2020.
- The mobile subsector has a lower degree of regulation than the fixed-line subsector.
- Over the next 30 years the nbn delivered infrastructure will need significant upgrades to become world class.
## Future challenges and opportunities

ICT Infrastructure findings point to significant challenges and opportunities for IV to influence over the next 30 years.

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<th>Major Trends</th>
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<th>Victorian Opportunities</th>
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<td><strong>Significantly increasing demand for data services</strong>&lt;br&gt;Access, bandwidth, data limits and storage are on par with other states, but lagging other developed countries. Right now, supply in Victoria is currently insufficient and is expected to only be ‘adequate’ with the rollout of nbn. When compared to international leaders in the space (i.e. Google Fibre) Victoria is far behind and future rollout investment will not close the gap.</td>
<td>Within 30 years significant investment will be required to ensure supply. Fortunately ICT supply is largely influenced by commercial drivers for most (but not all) citizen consumers; however, this is not always the case within the Research, Health and Government sectors.</td>
<td>• Influence current nbn technology rollout, Optical Network Termination points and exchanges in Victoria&lt;br&gt;• Influence rollout schedule given that commercial drivers do not entirely cover access to regional areas and Research hubs&lt;br&gt;• Make better use of State assets (i.e. VicTrack)&lt;br&gt;• Continue to fund coverage blackspots remediation where commercial drivers inadequate.</td>
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<td><strong>Trend away from fixed line and broadcast services</strong>&lt;br&gt;Businesses and citizens are moving away from traditional fixed line (copper wire) and public broadcast (TV) services in order to access higher quality services and greater efficiencies.</td>
<td>Existing regulations and legislation that ensures residential accessibility to copper services has not kept pace with the increased uptake of mobile, fibre and HFC infrastructure.</td>
<td>• Ensure that legislation around accessibility is translated to fibre and wireless infrastructure&lt;br&gt;• Potentially ensure that commercial providers provide better coverage, battery backup etc.&lt;br&gt;• Legislate for 000 call accessibility on mobile networks, regardless of carrier.</td>
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<td><strong>Sector convergence</strong>&lt;br&gt;Increasingly other sectors are becoming more ICT dependant, in many cases operating data services over their own infrastructure.</td>
<td>In other sectors, data services and related infrastructure (i.e. conduits) are used with little or no consultation or efficiency gains of sharing across sectors.</td>
<td>• Ensure that other sectors like Transport, Emergency, Water, and Energy liaise through a central agency when installing infrastructure that could service ICT needs&lt;br&gt;• Provide a centralised function to ensure sharing and future proofing occurs when ICT related infrastructure is being built across sectors.</td>
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