



ENGINEERS
AUSTRALIA

Submission to the Plan Greater Bendigo Initiative

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Submission to the Plan Greater Bendigo Initiative

Engineers Australia, welcomes the opportunity to provide a submission to the Plan Greater Bendigo initiative. Plan Greater Bendigo aims to create a vision of the future of Bendigo and the wider regional area. The Engineers Australia submission is a first step in bringing together knowledge of best practice engineering, in a global and local context, to help shape Bendigo's future.

Background

Over the last 50 years, the City of Greater Bendigo's population has been steadily increasing. There is no sign it will slow down and, if anything, evidence suggests the growth rate might be accelerating. Over recent years the city has been growing by about 1,500 people per year. However, the growth figures for the 2015-16 period show this to be closer to 1,900 people.

Plan Greater Bendigo is a first-of-a-kind collaborative plan for a regional city, which is being prepared jointly by the City and the Victorian Planning Authority. The initiative is based on the assumption that by 2050 there will be close to 200,000 residents living in Greater Bendigo and 300,000 living in the wider region. The current Plan Greater Bendigo initiative represents the first phase of implementing the Loddon Campaspe Regional Growth Plan (formally the Loddon Mallee South Regional Growth Plan).

Engineers Australia identifies Plan Greater Bendigo as an opportunity to plan now for future infrastructure needs. In doing so we must be aspirational, make bold choices, and advocate for projects that have the ability to transform the shape of the city and the broader region.

Engineers Australia is the peak body of the engineering profession, being a member-based professional association with individual members from all engineering disciplines across the country. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

Engineers Australia's nine Colleges set professional standards and provide continuing professional development for members through regular conferences, publications and visiting speakers. The Colleges are a cornerstone of Engineers Australia, broadly cover all areas of practice in engineering and are composed of professionals dedicated to their occupation and the industries encompassed by their area of professional engineering practice.

The Engineers Australia organisation believes that it is essential for the government to have access to impartial engineering expertise. In the local context, this will help ensure the outcome of proposed projects for the Bendigo region is optimised. In preparation of this submission, the Bendigo Regional Group formed a consultative working group to allow for a wide engagement through professional networks, gathering input from relevant Colleges within Engineers Australia.

Within this submission, the Bendigo Regional Group has focused on the Draft Discussion Paper prepared by the City of Greater Bendigo, which sets out a list of 70 proposed projects for community comment and input. It is noted that the project list has been produced through earlier engagements of City of Greater Bendigo staff and feedback from government agencies and key stakeholders.

This submission has been divided in six focus areas as described by the Draft Discussion Paper. An additional seventh section includes what was identified as transformational proposals.

1. General Direction

Engineers Australia recommends:

During the review of the Draft Discussion Paper, the following key aspects were identified:

The selection criteria for the proposed projects are unclear

Having a list of 70 projects to be reduced to 15 projects does not necessarily fill the requirement of having a transformational improvement strategy for Bendigo. The selection criteria for projects are not clear. While some projects undoubtedly have a transformational flavour, the varied nature of projects makes selective comparison challenging.

It is highly recommended to create a framework for decision making and planning. It has been identified that there is a need for an Outline Development Plan (ODP), which would shape the next 30 years of growth around Bendigo. Transport and metropolitan level planning strategies must be aligned to ensure a holistic and long-term approach to infrastructure planning and investment, including the protection of important corridors and precincts for future uses.

A vision of the future of Greater Bendigo is required

The City of Greater Bendigo needs to create a vision of the direction desired for the development of Bendigo and the surrounding areas. It is essential to develop a plan based on Sustainability, Flexibility and Predictability criteria. Such planning should avoid centralisation of jobs and commerce, and instead should create a polycentric city.

Identification of the satellite settlements is needed

During the planning process it is required to identify the satellite settlements within the Greater Bendigo area (i.e., Lockwood, Marong, Ravenswood), and distinguish what is essential to make their growth possible. A leading concept is for satellite cities to be located along the corridor between Ravenswood and Marong, and be planned around three self-contained urban nodes or new suburbs of about 30,000 people each at Ravenswood, Lockwood and Marong. Alternatively, a corridor between Strathfieldsaye and Eppalock could be considered for urbanisation, encompassing any state forest between McIvor Highway and Eppalock Road. The requirement for aggregation of existing small holdings into economic sub-dividable units will retard progress along that axis.

Any expansion needs to be planned, and zoning needs to be reserved, to ensure that future development follows Council's plans. It is recommended to avoid concentration of growth within the current urban development boundaries, as it promotes congestion, is unsustainable, and conflicts with the concept of "10 minute neighbourhoods". Projects such as light rail connections to include Harcourt and Castlemaine, connection between Marong and Bendigo by light rail on the existing railway tracks, augmentation of the water treatment plant at Big Hill or provision of a second treatment plant along Bullock Creek, north of Marong, and provision of package sewerage plants until a connection to the treatment plant in Epsom is justified, are a few mandatory developments for the identified satellite settlements.

Each satellite settlement would have schools and recreation facilities, and other social infrastructure according to their population growth. These new suburbs are within easy reach of the existing regional services such as the New Bendigo Hospital and La Trobe University. It is expected that over time the combined regional growth is likely to demand augmentation of current regional service facilities.

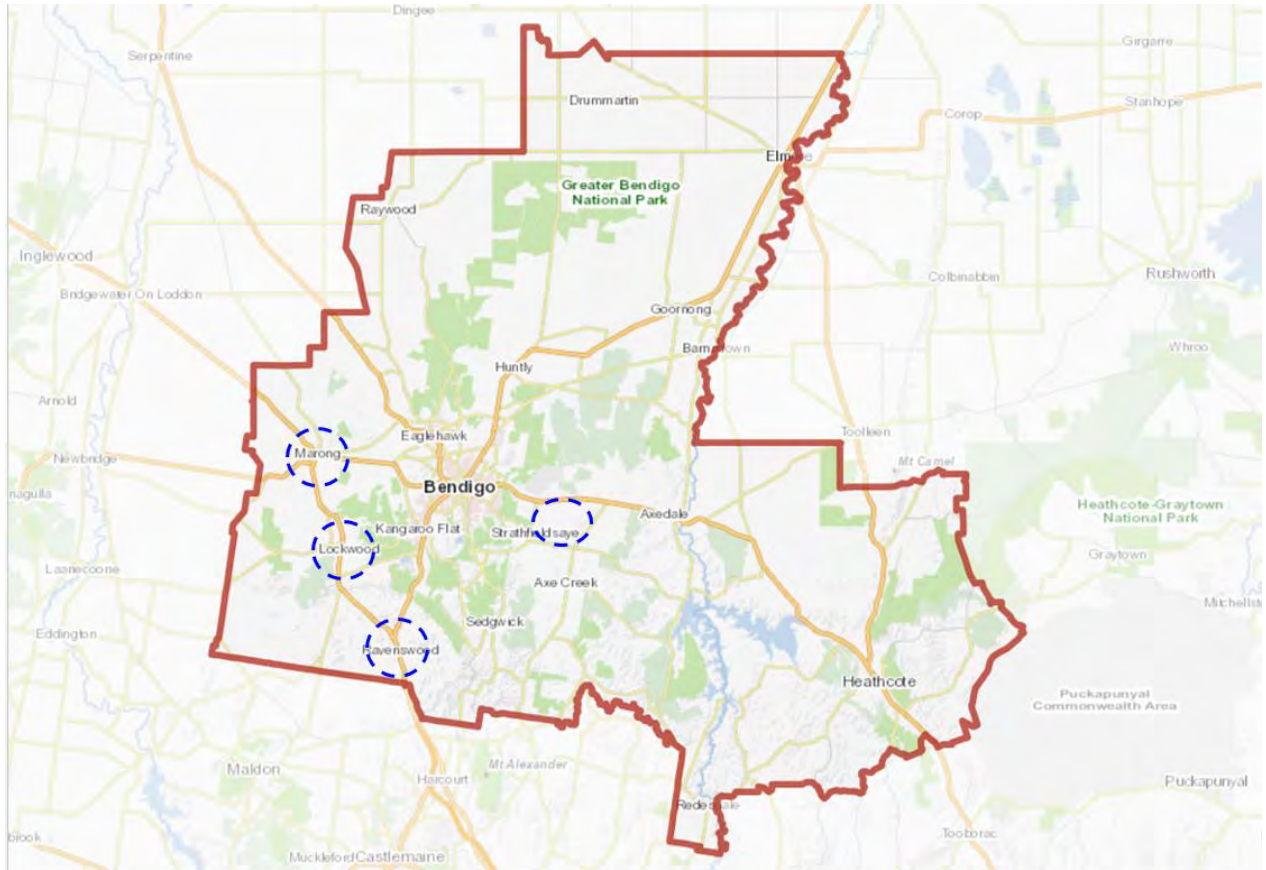


Figure 1. Potential location of the satellite settlements

Connectivity is very important for any development

A key factor to the development of clusters or satellite cities is good connectivity and provision of transportation alternatives/choices. Therefore, Engineers Australia recommends serious consideration of a Bendigo Metro System, where light carriage can be utilised. This has potential to reduce the need of parking and reduce congestion in the CBD. Mixed modal transport options, with an outlook to future intelligent and autonomous transport systems, should be considered from a global engineering best practice focus.

The satellite cities along the corridor between Ravenswood and Marong can be connected to rail services from either the southern end or northern end via light rail services on the existing railway track or the upgraded existing infrastructure. Efficient bus services can connect Ravenswood to Lockwood and Marong.

Employment zones should be provided within, or close to, each node. In the future, additional modules or clusters can be located along the railway line to include Harcourt and Castlemaine. Marong and Bendigo would be connected by light rail, utilising the existing rail tracks in the area. Also, a vehicular road can be expanded utilising the existing road corridor on Allies Road, with a future connection to Epsom.

Potential exists to connect Huntly and Epsom by light rail, as most of the infrastructure is already in place. Also, modern practices such as Communications Based Train Control (CBTC) should be considered where needed.

Important to maximise the use of existing infrastructure

It is critical to maximise the use of existing infrastructure and provide flexibility and connections for future layout of Bendigo. Rejuvenation of rail has the ability to play a crucial role in reducing road traffic congestion within key commuting corridors.

Also, intelligent technologies and customer ease of use of the transport network should be considered when transport solutions are developed. Implementing a light rail connection to the train station at Kangaroo Flat combined with shuttle buses to Lansell Square will encourage economic growth in the area. Ideally, a new train station should be provided at the back of Lansell Plaza, for easy access to the commercial facilities, with potential of expansion of the plaza to provide for the increasing demand.

Fire risk associated with the “City in the Forest” concept

Another key concern that Engineers Australia wishes to highlight is the fire risk associated with the “City in the Forest” concept. A reminder that the last big fire reached close to 1.5 km from the CBD raises great concern. It is understood that the new developments will be required to meet the new Bushfire Management Overlay Planning Requirements. However, the existing developments do not have such buffer and are at high risk during a bush fire. It is therefore, paramount that the Council takes the lead in creating the relevant buffer around the existing housing to ensure the safety of its inhabitants.

Maintenance

One thing to remember is that while the development of new infrastructure is important, it is also vital to provide adequate maintenance for existing infrastructure in order to use it to its full potential. Furthermore, modern intelligent systems must be fully explored in terms of maximising the capacity of different types of infrastructure.

2. Transport that Builds Connections

Engineers Australia recommends:

Like many regional communities, Bendigo region is faced with increased traffic, local congestion, noise pollution and parking demands while trying to ensure accessibility to all services and facilities within its area. Identifying the origin and destination of the trips, and composition of traffic will enable provision of sustainable solutions and efficient transport strategies for the current and future demand. The key components identified by Engineers Australia are listed below.

Re-instatement of duplicated railway to Melbourne

One of the main recommendations is the re-instatement of the duplicated railway track to Melbourne. Creating an express service with fast trains will enable the flow of jobs into Bendigo and growth into the region. Also, it has potential to reduce the current population and infrastructure pressure on Melbourne, by allowing people to live in Bendigo and its surroundings, and commute to Melbourne in a fast way. Furthermore, it facilitates the decentralisation of Victoria, more specifically of Melbourne, by attracting businesses and other infrastructure to Bendigo.

It is understood that the removal of the duplicated railway track to Melbourne was related to considerations of clearance required for high speed trains passing each-other on specific locations associated with older fixed infrastructure along the route (bridges and tunnels). Modern intelligent control systems such as Communications Based Train Control (CBTC) have the potential to eliminate the risk of occurrence of such situations while providing an overall far greater efficiency within the rail corridor.

A major step up in the rail service between Melbourne and Bendigo can bring revenue for Bendigo. Subsequently, this can initiate increase in the housing demand and economic growth.

Connection to other regional towns

Dedicated link services should connect Bendigo to other towns such as Castlemaine, Elphinstone, and Harcourt. Both bus routes, rail services, as well as inter-modal connections should be considered to better link Bendigo with the surrounding towns. The standards and capacity of the existing road and rail have to be upgraded in order to accommodate the additional bus and rail services. Implementation of such dedicated services is expected to ease the traffic on the road network serving Bendigo region, along with minimising the traffic congestion in Bendigo.

Heavy traffic through the city centre

A significant concern of Engineers Australia is the amount of heavy traffic that drives from Kangaroo Flat to Elmore through the city centre. There is no alternative road and the congestion is expected to get worse with the predicted population growth. Proponents of Intelligent Transport Systems, while confident on the benefit of the emerging capability, generally see technology benefits struggling to keep pace with the demand growth. Furthermore, there is a lack of road route continuity across the old boundaries, particularly along the northern corridor.

It is highly recommended to identify an alternative route to bypass freight from the Pall Mall area. Although this route may be controversial initially, it can bring many benefits for the future development of Bendigo. This aspect should be part of the future vision and plan for the region.

It is suggested that the heavy traffic that reaches beyond north Bendigo could use an alternative route that links Kyneton to Goornong. This route would require an upgrade of the existing network infrastructure to a 100 km highway standard to encourage its inclusion into freight trips. For the heavy traffic that reaches to Bendigo north, a by-pass south-east of Bendigo could start at Ravenswood and link with Epsom or Huntly. This solution may prove controversial in the first instance as it will contain a corridor crossing the state forests, though the expected reduction of through traffic makes it worth in-depth consideration. Similarly, where possible the existing infrastructure should be upgraded to keep both the cost and environmental impact to a minimum.

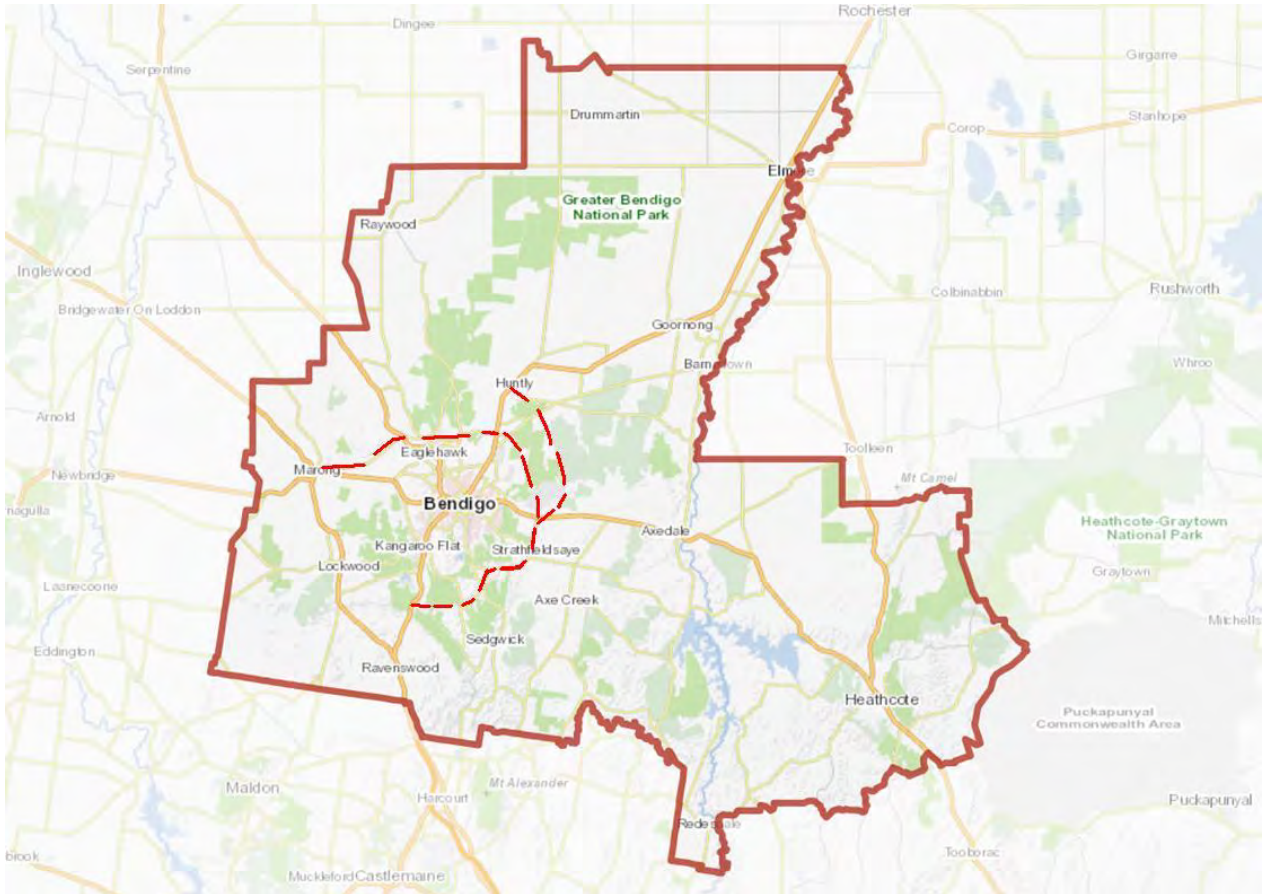


Figure 2. Possible by-pass routes for Bendigo

Connectivity and flexibility

The new suburbs at Ravenswood, Lockwood, and Marong could be connected to either Bendigo or Epsom by light rail, utilising the existing railway tracks. Also, a vehicular road can be expanded utilizing the existing road corridor on Allies Road with further connection to Epsom (possibly via an upgraded Howard Street). Also, there is potential to connect Huntly and Epsom by light rail, as most of the infrastructure is already in place. CBTC technologies should be considered as suggested by the global engineering best practice. Though, it is important to maximise the use of existing infrastructure while providing flexibility and connectivity for the future layout of Bendigo.

Light rail or frequent electric buses to Lansell Plaza from Kangaroo Flat should be considered to increase connectivity and promote economic growth in the area. Intelligent multi-modal coordination can deliver superior functional outcomes to the local population. It is recommended that usability should be a prime criterion in the assessment process of any proposal.

On-demand transport services capability (such as Uber), autonomous transport, and share cars or car-pooling, could provide further flexibility to the system. There is no need to be able to exactly predict the future, however including reasonable assumptions into planning for the future it is a critical aspect of the process. Furthermore, the ramifications of likely technology developments must be investigated carefully.

3. Becoming more Environmentally Resilient

Engineers Australia recommends:

Identifying and addressing any vulnerability that Bendigo region may have with regards to environmental consequences of climate change in addition to the predicted increase in population, should be one of the main concerns of the City of Greater Bendigo. Becoming environmentally resilient encompasses social, economic, technological, and political strategies that need to be implemented at all scales within society.

Water security

A very important aspect of becoming resilient is the security of water for Bendigo and its proposed growth. Australia has cycles of flood and drought, and during times of drought, water becomes very scarce.

It is of high priority to define a strategy of sourcing water for Bendigo. Provision of recycled water and stormwater for industrial, agricultural, and irrigation usage is a possible option. Furthermore, groundwater around the area has the potential to provide the required security in case of a severe drought with little investment.

Sewerage

Another aspect of environmental resilience is the provision of sewerage for the proposed development growth. It is required to identify which treatment plants will require augmentation. For example, it is expected that the water treatment plant at Big Hill will require augmentation. An alternative second treatment plant along Bullock Creek north of Marong could supply treated water to service new intense agricultural activity along the floodplains to the north. Otherwise, package sewerage plants for the new development could be provided until connection to the treatment plant in Epsom is justified.

Flooding

It is paramount to accurately define Bendigo flood prone areas due to Bendigo Creek. Such areas should not be developed and can be used for agriculture, recreation and as part of the stormwater retention system. Furthermore, flood mitigation solutions such as on-site detention facilities which capture stormwater runoff from residential lots and hold it temporarily to reduce the impact of downstream flooding, should be considered for new developments.

Fire risk

Fire risk in Bendigo is very high due to the forest that surrounds the town. The last big fire was very close to the CBD. For this reason, it is proposed to create a fire break corridor around Bendigo. This corridor should comply with the new Bushfire Management Overlay Planning Requirements. The buffer needs to be provided for new and old developments to ensure the safety of Bendigo's residents.

Food security

Increased population will place higher demand on food supply. Providing food from farms in the Bendigo region would minimise carting all produce to Melbourne and back again resulting in a more sustainable food supply. Advanced technology options should be investigated to facilitate development of such markets. Also, educational programs for farmers may have significant value in improving farm productivity through farm Internet of Things (IoT) and by efficiently activating soil microbiology.

Waste management

Currently, in Bendigo's landfill, there are no facilities to recycle plastic. This means large amounts of plastic end up in the landfill cell that could instead be used to produce revenue from recycled plastic. This is putting additional pressure on the capacity of the landfills. The creation of a new landfill is not considered a transformational project; it is rather a necessity resulting from urban development.

Decentralisation

Changing the planning thinking from the one city centre toward having a polycentric city will result in more sustainable development. Bendigo must actively seek Melbourne-based businesses to encourage relocation in the region. These imported jobs will help seed the development of the decentralised city. The concept aligns with a wider state-based decentralisation focus.

Decentralising the jobs 'cluster' can allow for more people to live closer to their work, with easy access to transport and services. This provides an opportunity to choose active transport such as walking and cycling with direct implications on traffic reduction and a healthier population.

Energy Efficient

It is imperative that the City of Greater Bendigo initiates policies and guidelines for new developments, with a minimum of 5-star energy ratings required for new buildings. This should be encouraged by incentives such as reduction of rates or development contributions if the construction practices increase quality and minimise the waste of energy. The City of Greater Bendigo should promote widespread adoption of both behind-the-meter generation and storage, and community-level renewable energy generation schemes. Bendigo, with sufficient focus, can readily take a national lead on regional renewable energy generation projects.

The local government can lead the efforts to reduce greenhouse gas emissions and earn carbon credits by adopting smarter practices. These include upgrading public and commercial lighting, reducing the energy use of buildings and improving the efficiency of commercial vehicle fleets. Driving innovation in the building stock, including new materials, green roofs and walls, modular construction and solar energy with battery storage is also important.

Power sources

New ideas regarding the provision of alternative power sources have emerged in recent times. For example, the use of geothermal energy using the existing mining shafts under Bendigo is a possibility worth thorough investigation. The Bendigo goldfields had the largest concentration of deep shafts in the world, some shafts reaching over 1400 metres at their deepest point.

Bendigo underground is a unique environment where seven separate working mines remain to this day, which steadily accumulate groundwater. These conditions may be ideal to provide Bendigo's own pumped hydro scheme.

4. Working Towards a Smarter City

Engineers Australia recommends:

A smart city will embrace new technologies, and focus on smart-enablement, resilience and collaborative innovation, to create a city that is competitive, open, interconnected and intelligent. It will feature excellent connectivity using the latest communication technology and transport links, with significant capacity for growth due to the high quality, flexible buildings and infrastructure, with a distinctive character derived from the diverse mix of buildings, uses, streets, spaces, and outstanding heritage and culture.

Technology

In common with all areas of the nation, Bendigo and its surroundings are in need of reliable high-speed internet access. The concept of extending the growth of the city, increasing commerce and promoting less commuting and more flexible 'working from home' conditions, requires access to superior network connectivity solutions. Better connections are not only focused on transport but also build on the investment in the National Broadband Network by further supporting regional communities to connect with new markets. Bendigo offers an ideal lifestyle environment for many progressive digital economy endeavours, but these must be supported with capable network infrastructure.

Transport flexibility

The use of shared vehicles can be promoted and special parking spaces for them could be provided. Also, the use of light rail on the existing tracks can make Bendigo more accessible and dynamic, providing connectivity and reducing congestion. In addition, light rail provides a sustainable, clean way of transport. While no city around the world has eliminated traffic congestion, most world-class cities have invested in fast, efficient public transport systems to provide viable alternatives to passenger vehicles.

Regional transport links, such as fast rail, increase both access to jobs and access to the labour force. Fast rail between centres provides people with a greater range of options for where they live and work. It allows people and businesses to take advantage of the amenity and affordability of regions and smaller cities while reducing the pressure on larger metropolitan centres. Also, it creates incentives to establish businesses and create jobs in smaller centres by offering fast, convenient access to markets and services of larger cities when required. Furthermore, it has the potential to ease the pressure on the largest cities, while providing important links to jobs and services for regional centres.

Building high-speed rail would require significant investment. Funding of this scale simply cannot be met by local or state government budgets, and it may be unrealistic to build the entire network at once. The Australian Government should instead consider whether innovative funding and financing approaches could strengthen the case to deliver high-speed rail.

The Commonwealth is also interested in parallel proposals that seek to link major regional centres better to their neighbouring capital cities through improving travel times on existing transport connections—for example in South East Queensland, Newcastle, Wollongong, and Geelong. Engineers Australia has identified this as an opportunity to add Bendigo as a neighbouring city that could bring large benefits for all Victoria.

Land management

A smart city can also be defined by adequate use of its land and the provision of housing. The Greater Bendigo City Council should identify areas where heritage and character must be preserved and also delineate areas where developments can accommodate multi-story buildings. Strategically placed high-density solutions have potential to encourage economic development in the selected areas, reduce the congestion on the roads by encouraging people to use alternative transport (bicycle riding or walking), resulting in healthier communities. Furthermore, this solution would align well with the “10-minute neighbourhood” concept. Though this will require significant upgrade of the existing infrastructure to cater for the greater density in the selected areas.

Education

Experience shows that people educated in regional centres are more likely to remain in regional areas, contributing to the socio-economic development of those communities. Transforming Bendigo into a smart city relies on the cooperation of its residents. Educating the citizens on the benefits of various elements of a smart city and how they could be implemented with the help of residents, is critical for implementation of varied smart city projects. It is important to improve the education facilities existing in the region and encourage other organisations to be involved in the mass education of Bendigo citizens on sustainability issues.

5. Growing Jobs, Tourism and Investment

Engineers Australia recommends:

Connecting people and businesses results in creating more jobs for more people, contributing to an increased standard of living in the Bendigo region. This promotes economic growth, increased productivity and employment expansion, assisting with broader investment opportunities in the region through areas such as housing, services, and tourism.

Attracting growth

The greatest opportunity for Australia’s future lies in people’s ideas, skills, experience and enterprise, which drive productivity growth. To attract and secure talent from other regions, Bendigo must offer access to career opportunities, education, and training. Moreover, Bendigo must offer lifestyle, culture, and amenity. For an increasingly mobile labour force, the liveability of a city can be the determining factor between choosing to live in one city over another. Additionally, to grow jobs, it is recommended to increase manufacturing, attract Melbourne-based businesses and jobs into the region, and investigate the possibility of bringing more flights to the new Airport.

Housing price pressures and increasing congestion in Melbourne make Bendigo an attractive destination, especially if improved rail service utility is delivered in the near future. The prospects for increased numbers of retirees in the region must be fully considered in terms of planning for suitable services and facilities to support the projected growth in this area. Selected overseas examples display the benefits of solid planning and development to suit target demographic evolution of this type.

6. A Fairer, Inclusive, Safer and Healthier Community

Engineers Australia recommends:

Cities are first and foremost for people. Their function is to serve humanity, so they must have a human-friendly environment. Becoming a smart city must lead to the improvement of the quality of life of citizens. Our natural and built environments must be sustainable and liveable, with high-quality public spaces that bring people together to exchange ideas and build a sense of community. They must also be accessible, therefore, public transport projects that improve accessibility to job centres and promote urban renewal are fundamental.

Most of the necessary infrastructure to satisfy these requirements will follow once the decision on the location of the development of new satellite cities is made. Each satellite city will require some commercial activity, schools, parks, etc. The satellite cities can be analysed in an overview plan and identify the potential for stormwater basins, recreation paths, connectivity, etc. Besides contributing to the transport flexibility, the addition of bicycle paths and walking trails also encourages a healthier community, promoting exercise and outdoor activities.

7. Engineers Australia Transformational Suggestions

The City of Greater Bendigo formed in 1994 from the amalgamation of 5 municipalities, the former City of Bendigo with the Borough of Eaglehawk, Shire of Strathfieldsaye, Shire of Huntly, Rural City of Marong and parts of the Shire of Mclvor. It seems that there has never been a study to show how the merger of the old municipalities could be integrated into a new entity. Perhaps the Council should consider this as a priority to enable formulating a framework for decision making and planning. There is a need for an Outline Development Plan (ODP), which would shape the next 30 years of growth around Bendigo. Aligning the transport and metropolitan level planning strategies would aid a holistic and long-term approach to infrastructure planning and investment, including the protection of important corridors and precincts for future uses. Long-term accessibility to the new developments, job 'cluster' and services, need to be considered to minimise additional travel and encourage active transport.

Engineers Australia challenges the City of Greater Bendigo Council to broaden its vision in planning for 2050 Bendigo. It is recommended that the Council and strategic planners exploit Engineers Australia's knowledge and connections to facilitate successful outcomes.

The implementation of a Bendigo Metro System using the existing railway tracks and upgrading the closed ones can transform the city. It can interconnect the CBD and bring it back to life, whilst allowing for further development and de-centralisation of employment and housing. It will minimise congestion and make the city more sustainable and environmentally responsible.

Repopulate the CBD providing accommodation in buildings of not more than five stories, where the heritage of the city is not interfered with. These buildings could have retail on the ground floor, commercial activities on the first floor, and the other floors for residential use. More people in the area will drive economic activity in the CBD.

Bendigo ought to strive to lead the nation in key areas such as renewable energy, water use, and transport connectivity. Bendigo is ideally positioned to do so, and can create sustained (and controlled) growth by being seen to be an intelligent city in all aspects.

The City of Greater Bendigo has the potential to become one of the great regional centres of Australia. It is ideally located in Victoria, close to Melbourne and other Regional centres, though far enough away to be self-sufficient and to develop its own identity. Given both federal and state Government support, and with the resources available locally, this regional area can lead the way in Australia.

Smarter Systems for Smarter Agriculture

A population growth doubling will require double the amount of food to feed the new population. However, the world is rapidly reaching the boundaries of agricultural land usage. If the current production efficiency of food remains the same, there will not be enough food produced to maintain the population increase. This is a broad global issue and any production efficiency or resource management improvements generated within the Bendigo region, could drive export opportunities.

Around the world this issue of agricultural productivity has been keenly noted, and successful pilot programs addressing the matter are well underway. An example is where Israel's harsh climates are able to produce super cattle with each cow delivering twice as much value to the table as an Australian cow. Another recent project in Japan, where land area is tightly constrained, achieves efficient use of land area with the world's largest vertical farm producing 10,000 heads of lettuce a day, with only about half the land footprint of a football field. These successes are driven by locally identified problems and measurable outcomes that research has addressed. Bendigo has the potential for world-leading success along related lines, with wise decision making and appropriate research endeavour.

The Bendigo region, and Australia in general, has large amounts of open space. We have the opportunity to be a visible leader in significant aspects of intelligent agriculture, rather than following others.

An example of domestic success is the national rice industry. Australian rice production involves the most efficient use of space and water in the world, from a small producing area we feed 20 million people around the world. Superior results have been achieved with collaboration between farming enterprises and CSIRO. Research from CSIRO assisted in defining many challenges, where technology was identified as a useful solution. The process has delivered research outputs to guide relevant policy changes, enabling businesses to leverage technology and creating new business opportunity. Challenges encountered along the way require collaboration and interdisciplinary problem solving. In general research is expensive, and cannot be funded at the individual farm level. Collaboration is required to identify common issues to address. Research results are often technical and produced via experiments and trials. Engineers assist in obtaining long term sustainable outcomes on behalf of the community.

Research results are driven by information, where Information, Telecommunications and Electronic Engineers (ITEE) see opportunities using sensors and electronics to gather data, which is then transmitted over telecommunications infrastructure, providing information to relevant expert systems or expert decision makers. The expert input delivered to farmers allows better sustainable and economic decisions on the ground.

This above rice-production success story involves common elements that can be applied to many other endeavours. Shared or common problems between competing businesses can be identified and matched to technology solutions. ITEE and engineers more broadly can help facilitate similar journeys for other areas involved with smart cities, including traffic, transport, electricity usage and generation and healthcare. We challenge the greater Bendigo region to broaden their thinking when planning Bendigo 2050 and recommend that the

council and strategic planners exploit Engineers Australia's knowledge and connections to facilitate other success stories with the use of smarter systems.

Bendigo should have visionary and ambitious long-term goals if it is to achieve its potential.

To refine the vision for the Bendigo region, and to drive toward opportunities, Bendigo must exploit expertise networks such as those facilitated by Engineers Australia. Forming collaborative interdisciplinary working relationships with relevant technical groups will ensure wise counsel is available to navigate the complexity of decision making that is presented by new technology opportunities.

Professional engineers with relevant expertise can be tapped through the Engineers Australia networks, including through kindred organisations of local IEEE and IET groups.

Smart Cities

Bendigo should aim to be a leading smart city. The Bendigo Smart City Initiative has, pleasingly, taken form over the last 12 months plus. However, the path to being a truly smart city is likely to be a long one, filled with many decisions that are highly complex from a technical perspective. Fortunately, Bendigo can take a lead from global best practice. The IEEE in particular has a large body of work and information pertaining to smart cities.

Bendigo has a perhaps unique position to lead in a Smart City sense. Bendigo is in the "Goldilocks Zone" in terms of size and proximity to the larger capital city – not too large or distant, but likewise not too small or close. Fully tapping this potential will involve a considerable amount of serious technical engineering consideration. Bendigo needs to be wary of making the mistake that Smart Cities are largely about marketing oneself as "smart" with little substance. Bendigo also needs to avoid the push by some corporate entities that suggest that enabling a smart city simply involves one product or a single system implementation. Relevant professional engineering expertise will ensure that Bendigo is able to maximally exploit the opportunities ahead. Professional engineers with appropriate experience to help guide council decision making can be tapped via leadership networks within Engineers Australia.

Intelligent Transport Systems

Significant activity is now starting to occur in Intelligent Transport Systems (ITS) within Australia and globally. Bendigo is well-positioned to be a test bed for ITS technologies. Professional engineering networks can be exploited to make such a vision a reality. The benefits to the Bendigo region are high visibility nationally, and encouragement of local high-tech investment. Bendigo can create significant wider economic momentum through targeted efforts on selected ITS endeavours. Expert professional engineers can be readily located to advise council on the technical and strategic merits and opportunities which present themselves in this area.

We include reference to some efforts from Intelligent Transport Systems Australia (ITSA) at 23rd Intelligent Transport Systems (ITS) World Congress on 14 October 2016 <https://www.its-australia.com.au/wp-content/uploads/HLPRT-Report-Final.pdf>. There were 29 speakers around the world to discuss:

- Top three ITS challenges facing their country or city over the next three to five years to enhance the liveability of cities and communities?
- The top three initiatives being undertaken by their government or city over the next three to five years to enhance the liveability of cities and communities?

In summary the overall key challengers were related to:

- Congestion;
- Sustainability;
- Climate change; and
- Safety.

The overall initiatives ranged broadly:

- A national policy framework for ITS;
- the importance of a legal and regulatory framework and reform for automated vehicles;
- platforms for big data analytics, data sharing, and the internet of things;
- mobility as a service – seamless, multimodal transport regardless of mode;
- increased priority for public transport and public transport services;
- digital infrastructure – electric cars as part of the sustainability framework;
- engaging the community; and
- The interface or integration of data, technology and people.

Professional engineering networks can be tapped to provide high-level expertise and substantial breadth and depth of experience in this promising area. Bendigo can be a visible leader on ITS trials nationally.

Smart Grid

The entire population of the nation is aware that energy generation is a significant issue for the nation and the planet. Regional renewable energy generation projects are an intelligent way to provide energy security for the Bendigo region as demand grows with population increase. However, Smart Grids are far more than renewable energy generation. They encompass sophisticated demand management approaches, and ultimately help maintain and maximise the potential of existing transmission and distribution infrastructure, helping to avoid significant capital outlays. There are again many examples globally where Bendigo can look for inspiration.

Smart homes

Smart homes might initially appear to be an area where Bendigo could conclude that there is reduced scope for being a national leader. However, there are strong connections to the overall smart city approach. Certainly the communications infrastructure to support smart homes is likely to overlap with wider Smart City communications infrastructure initiatives. Additionally, smart homes are a significant consideration for remote healthcare aimed at looking after the elderly. Bendigo already has a leading health care sector in several ways. Bendigo can possibly leverage their existing strengths to take a lead in this aspect of Smart Homes. The prospects are especially exciting when considered in conjunction with the possibility of Bendigo seeing a massive growth in retirement living (given the lifestyle benefits of the region and the proximity to Melbourne via VLine).

Conclusion

ITEE is at the heart of many of the technologies that surround us today, and most of the emerging technologies that will be a major part of our lives over the coming decades.

Wide professional networks of engineers, with large breadth and depth of expertise, are available through Engineers Australia.

Professional engineers with relevant experience are often needed to identify technology implementation 'traps' that must be avoided. Less experienced decision makers, without sufficient qualified advice, can easily fall prey to many 'unknown unknowns' in ITEE high-technology areas.

The opportunities presented by ITEE technologies are substantial and exciting. Bendigo is well-positioned to exploit many of these opportunities, and to be a visible national, and perhaps global, leader in several areas of strategic merit.

Professional Engineers are ready to provide input on complex decisions and can be sourced through Engineers Australia to help deliver implementations.

From the ITEE perspective, the future is limited more by our collective and shared vision than anything else. Bold thinking, coupled with measured analysis and informed decision-making can provide substantial benefits to the future of the Bendigo region.

Contact details

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