

MULTI USE BYRON SHIRE RAIL CORRIDOR

Case Studies Report

06 JUNE 2019

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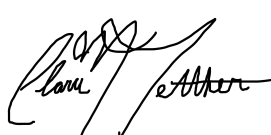
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BYRON SHIRE COUNCIL MULTI USE BYRON SHIRE RAIL CORRIDOR

Economic Report 1 Case Studies

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Report No	Final Report	
Date	6/06/2019	
Revision Text	3	

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REVISIONS

Revision	Date	Description	Prepared by	Approved by
0	18/03/19	Draft report	DPP/RO	AK
1	20/03/19	Draft report update	DPP/RO	AK
2	09/05/19	Final report	RO	AK
3	06/06/19	Final Report	RO	CT

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EXECUTIVE SUMMARY

This is a compilation of select case studies which has been prepared to shed light on various experiences elsewhere in the world with the reactivation of disused rail corridors. Each case study provides a brief description of the rail corridor reactivation, features of the corridor and the reactivation project, drivers of change, economic/social benefits and seeks to distil key success points and/or applicable learnings for Byron Shire Council.

1.1 Lessons From case Studies

Lesson 1 - Infrastructure Matters: The specific design of any rail trail infrastructure matters.

- For example, cyclists tend to value complete separation from road and train traffic because it is safer
- Similarly, with the onset of e-bikes and high efficiency road cycles, segregation between pedestrians and cyclists can also be an issue
- Disused rail corridors offer great potential for complete separation from vehicle traffic, so any if shared with bus or rail vehicles it is important that the segregation is maintained
- Rail infrastructure offers a “natural” segregation in that the rail infrastructure formation is sat on a shoulder of ballast higher than the adjacent cess or access road
- The speed of the rail trail also matters. If it is able to cut through certain areas to provide a faster option than car-travel, it will be more appealing (especially for commuter traffic), as in the Midtown Greenway example.

Lesson 2 - Targeted Amenities: The amenities provided along the trail are also important and can help shape the type of pedestrian and cycling traffic that is attracted to the trail.

- If Byron Shire’s primary goal is to provide efficient transit and dispersion of tourists away from congested roads, without necessarily stimulating more tourism, they can focus on providing trail amenities that target existing tourist traffic. E.g. implementing service circuits to current popular events and festivals, activities and markets, and also provide incentives along the route for tourist use (e.g. benches, picnic tables, bike racks)
- Opportunities at stations, festival and event sites and accommodation areas for bike sharing and hiring will also act to incentivise tourists to use bikes. Similarly, incentives offered by the festival and event organisers – such as free usage of the rail corridor service will also increase patronage.

Lesson 3 - Governance Models: Strong community integration and effective planning of the route from the outset will help set up the Byron Shire Rail Corridor for success.

- Learning from the Otago Central Rail Trail in New Zealand, Byron Shire Council could consider establishing a Trust to raise funds for the final corridor solution and to undertake marketing and promotion activities.

Lesson 4 - Promoting Active Transport:

- The Midtown Greenway has been very successful in promoting active transport in Minneapolis.
- This has been due to a combination of factors, such as the complete separation from vehicle traffic, the comparative speed of the trail vis-a-vis commuting by car, the effective use of planning, zoning and land-use strategies. These factors should all be considered by Byron Shire Council if strong active transport utilisation is a principal goal
- Byron Shire Council may also want to consider some sort of active transport campaign similar to the Wealden District Council’s approach (on the Cuckoo Trail) of sending a certificate to residents, and maybe some sort of prize to visitors, who register online when they complete 100 miles.

Lesson 5 - Zoning Laws:

- As demonstrated by the Burke-Gilman Trail in Seattle, USA, property values near a rail trail can be affected by their proximity to the trail (studies have also shown that properties near public transport also benefit¹)
- Byron Shire Council may wish to consider these potential impacts – plus and minus – when making zoning and land-use decisions in proximity to any future corridor solution.

Lesson 6 - Guided Busways:

- Byron Shire Council should be wary of any suggestions to convert the railway into a guided busway, given the experience of Cambridgeshire. Costs for the busway ended up being significantly higher than originally agreed and the project was delivered two years late. Moreover, there have been significant engineering problems found with the guided busway, including shallow foundations and inadequate drainage.

Lesson 7 - Autonomous Vehicles: There are numerous examples of Autonomous Vehicle pilots underway in Australia and across the world.

- Should Byron Shire Council wish to investigate this option further, they could contact the NSW Smart Innovation Centre to discuss how they could conduct such a trial as part of the rail corridor reactivation. Byron Shire Council could discuss the experiences so far of Armidale and Coffs Harbour in conducting such trials
- An AV trial would allow Byron Shire Council to begin collecting information to inform future policy and regulation surrounding AEV shuttles, which will one day help Byron Shire Council address some of their existing traffic congestion problems.

Lesson 8 – Rail with Trail: There are a growing number of examples of combining cycle paths with heritage or regional commuter railways. Rail with Trail could be a simple but vital way of providing Byron Shire Community with both active and public transport choice.

¹ <https://www.yourmoney.com.au/real-estate/public-transport-impacts-the-value-of-your-property/>

2 MURRAY TO THE MOUNTAINS RAIL TRAIL

2.1 Background

The Murray to the Mountains Rail Trail is located in North East Victoria, 250 km from Melbourne. It is one of Australia's most developed rail trail with three separate trails incorporating 116 km of sealed surface trail. The three different trails were developed at different times:

- Bright - construction of the present rail trail began in Bright in 1993 and finished in 2002 to Wangaratta and Beechworth
- Rutherglen - The rail trail between the winery town of Rutherglen and Wahgunyah, on the Murray River was completed in 2009
- Wangaratta - The Wangaratta to Oxley section of the trail was opened in May 2011. (Rail Trails Australia: Murray to the Mountains Rail Trail)

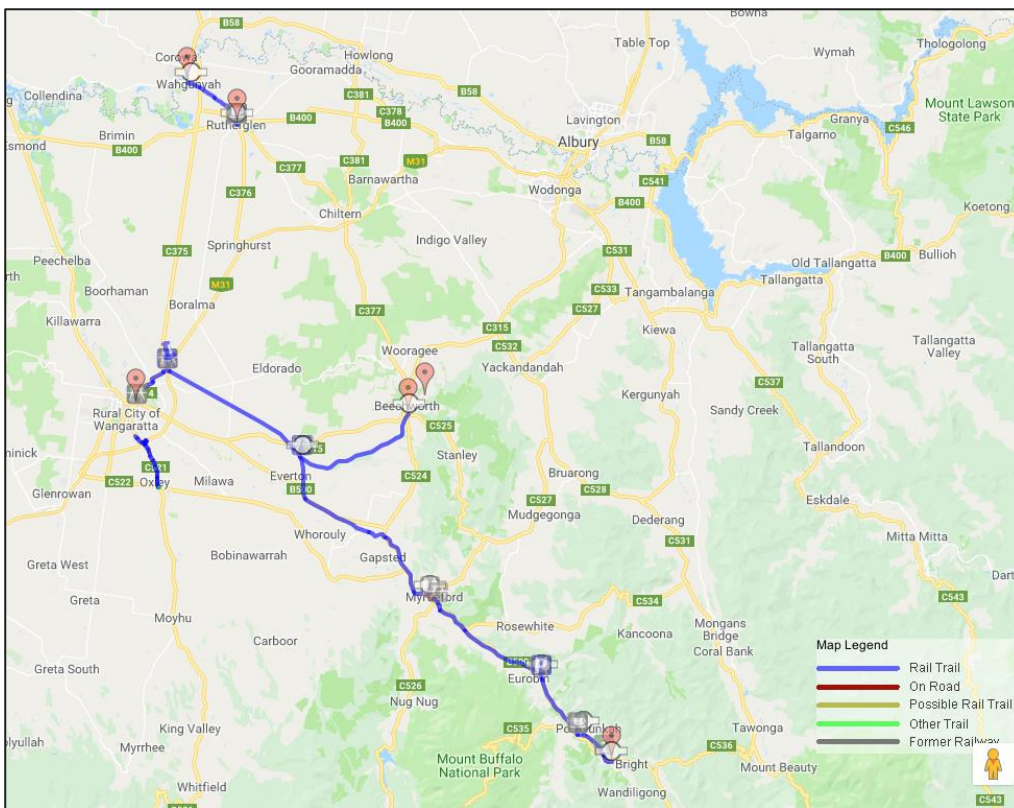


Figure 2-1 Murray to the Mountains Rail Trail extent of sections

2.2 Particular Features of the Corridor Reactivation

The predominant user group for rail trails is cyclists, ranging from elderly people, to baby boomers, young couples, family groups with children, teenagers and young children. Professor Sue Beeton of La Trobe University undertook a study of the impact of rail trails on the communities through which they pass. The study involved interviews and a survey of users of the Murray to the Mountains Rail Trail in north east Victoria over the 2009 Easter weekend. The study found:

- Of the 128, only 22 identified themselves as living close to the Rail Trail but were all travelling with visitors. Travel companions were evenly spread between travelling with a partner, family or friends, while only a small number of respondents (five per cent) travelled alone
- The respondents were predominantly employed in professional and administrative positions (47 per cent and 25 per cent respectively) with 14 per cent retired; however, no respondents identified themselves as unemployed.

- Ages were varied, ranging from one year old to 79, with a slight majority of men (53 per cent). The largest group was aged between 41 and 60 years old, however the high representation of riders in the 0-10 age groups illustrates the significance of mixed family groups and the suitability of the Rail Trail for all ages
- Half of the respondents had past experience in using rail trails and identified the Murray to the Mountains Rail Trail as one they had visited previously. Over half (53 per cent) considered themselves to be frequent riders, cycling more than once a week, but not daily. The next largest group (23 per cent) were regular weekly riders, suggesting that while the trail is being used by people who cycle often, they are primarily recreational cyclists with a quarter who do not cycle regularly (Beeton 2009).

2.3 Ownership/Management Structure

The trail is managed by the Rural City of Wangaratta, Alpine Shire Council and Indigo Shire Council. Management of the trail is in accordance with the Victorian Government guidelines. There is a General Committee of Management that has two representatives of each of the Local Governments through which it passes, one representative from the Technical Group (a sub-committee) and three representatives from the Advisory Group (a sub-committee). In discussions with officers at the Rural City of Wangaratta, one of the key elements that came out was that the trail is seen, marketed and managed as one trail that just happens to pass through three Local Governments. This has been critical to the trail's success (Goulburn Crookwell Rail Trail Feasibility Study).

2.4 Drivers of Change

With many of the rail lines in the area being gradually closed the rail trail was recognised as a way to boost visitor numbers and raise the profile of the area by connecting some of the best nature-based trails with the region's iconic food and wine destinations. In 2016 the Victorian Government announced further funding to extend the existing rail trail and create new links between the Murray to Mountains and High Country Rail Trails. In announcing the funding, the Minister stated that "Worldwide, cycling trail tourism is growing at a phenomenal rate and Victoria's North East is well poised to take on an increasing number of domestic and international visitors." (Rail Trails Australia: Funding for High Country and Murray to Mountains Rail Trail)

2.5 Social Impacts

Many tourist related business, largely tours, accommodation and bike hires, are supported by the rail trail. This increase in tourism dollars has had a beneficial social impact as it increases employment rates within the region. The Murray to the Mountains Rail Trail in North East Victoria is one of the better known rail trails in Australia. Research work undertaken over Easter 2006 (Beeton 2006) found that average daily expenditure was \$258/user/ day. The bulk of this expenditure was on food and beverage (57 per cent of daily expenditure which equates to \$147/ user/day). Beeton applied accepted economic multipliers to these figures and calculated that the direct contribution to the local economy per user per day was in excess of \$480.

Positive social impacts from the trail also includes the promotion of group and community activities including sporting clubs, work groups, service clubs, social clubs, Over 50's groups and organised tour groups. Some use the rail trail for team-building, some use it for fitness training, others for a social club outing.

Cycling on the trail provides a unique opportunity for locals and visitors to experience the natural environment and gain health, social and economic benefits through physical activity, community connections, business development and jobs (Goulburn Crookwell rail Trail Feasibility Study)

2.6 Key Success Points

Activation of the Murray to Mountains Rail Trail has four key components:

- A marketing campaign to drive awareness and increase visitation
- Extension of the Murray to Mountains trail between Beechworth and Yackandandah to link the two heritage towns

- Private sector activation for facilities that support business investment in a range of cycle tourism experiences, enhancements and attractions along the trails, including artistic, interpretive and architectural installations.

Private activation has been initialised with the appointment of an experienced consultant, specifically charged with sourcing and analysing private sector investment opportunities, as well as sourcing and securing new commercial opportunities associated with both cycle experiences and the broader tourism products to effectively meet growing market demand. (Goulburn Crookwell Rail Trail Feasibility Study)

Integrated management with the council and stakeholders can increase the visitation rates and overall success of the trail from a community aspect.

3 BASS COAST RAIL TRAIL

3.1 Background

The Bass Coast Rail Trail is located 130 km south-east of Melbourne, near Phillip Island Victoria. It is a single stretch of gravel trail that covers 23 km between Wonthaggi and Anderson in Victoria. This trail is part of a former branch line from Nyora to Wonthaggi. The line was opened in 1910 to service the coal mines, passengers and farm produce in the Wonthaggi area. The line was closed in 1978 due to the decline in passengers and mining. The line has some similar characteristics as the Byron Shire rail line as it moves through farmland, coastal bushland, historic coal mining reserves and along the Gippsland coastline. (<https://www.railtrails.org.au/trail?view=trail&id=203>).

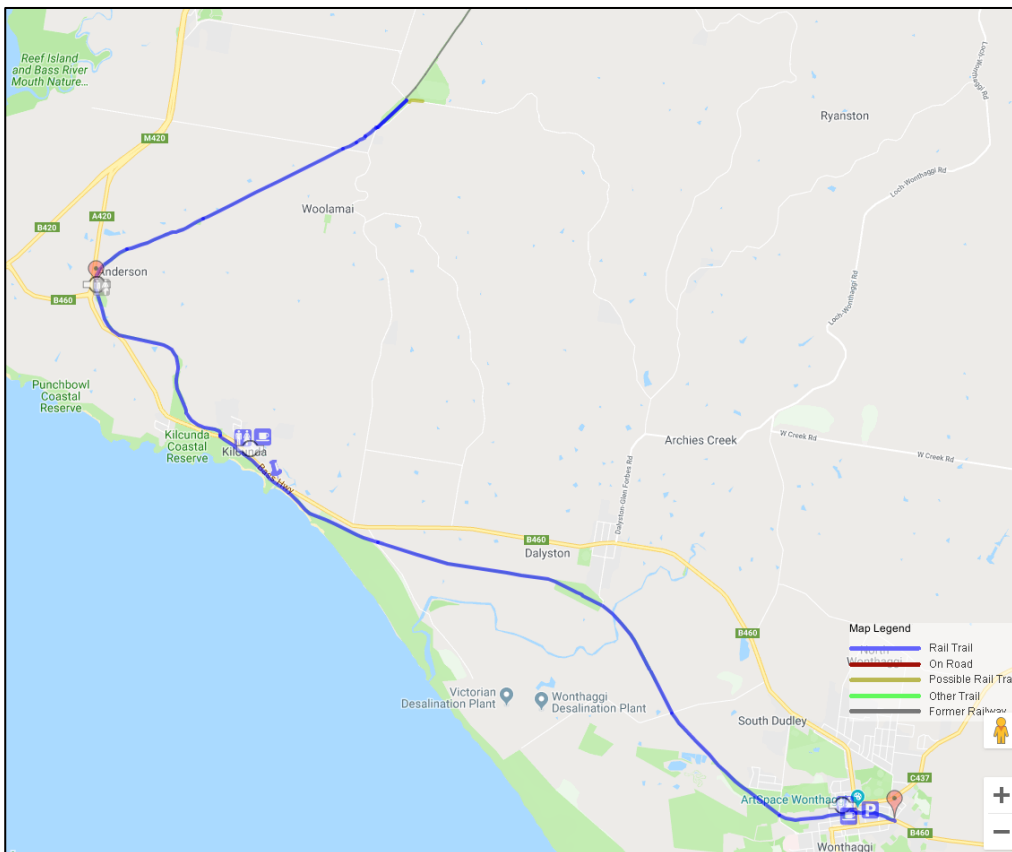


Figure 3-1 bass Coast Rail Trail extent

3.2 Particular Features of the Corridor Reactivation

The trail includes areas of cultural and industrial heritage significance, along with dramatic landscapes and environments of natural and ecological significance. The trail is used for walking, horse riding, cycling and other recreational activities. An important part of the region's tourist infrastructure, it is also used frequently by local residents, many of whom use it daily. (<https://heritagecouncil.vic.gov.au/research-projects/industrial-heritage-case-studies/bass-coast-rail-trail/>)

3.3 Ownership/Management Structure

The trail is managed and developed by the Bass Coast Shire Council. A series of reports and plans were prepared between 1991 and 1994 looking at the conservation values and proposed development. The Concept Design and Management Plan for the Anderson to Wonthaggi section was completed in 1994, at which time the Bass Coast Council appointed a Committee of Management. (<https://heritagecouncil.vic.gov.au/research-projects/industrial-heritage-case-studies/bass-coast-rail-trail/>)

3.4 Drivers of Change

The coal mine closed in 1968 and, following declining rail usage, the railway itself was closed in 1978. At this time much material and infrastructure was stripped from the site. In subsequent years the neglected site was vandalised. The rail line passes through a range of landscapes and includes striking built infrastructure: bridges (including the Bourne Creek timber trestle bridge), a timber rail viaduct, railway stations, remnants of mines and mining activity (including a largely intact mullock heap at Mitchell's Mine and four miner's cottages at Wonthaggi).

The trail site is adjacent to the old State Coal Mine at Wonthaggi, Mitchell's Mine Historic Reserve and the historic cemetery at Kilcunda, coastal reserves and the Wonthaggi Wetlands.

The trail includes areas of cultural and industrial heritage significance, along with dramatic landscapes and environments of natural and ecological significance. (<https://heritagecouncil.vic.gov.au/research-projects/industrial-heritage-case-studies/bass-coast-rail-trail/>)

3.5 Social Impacts

The Bass Coast Rail Trail now forms an important recreational linear reserve, connecting a range of environments and accessing different areas of industrial heritage significance along with many other areas. Interpretation is provided along the length of the trail.

The rail trail is surfaced with fine gravel. *Most of the rail tracks were removed when the railway was decommissioned, but the remnant steel lines from the Bourne Creek trestle bridge have been reused as a 'relic' at Kilcunda Station.* This bridge, one of five repaired, has been adapted to accommodate horse riders as well as walkers and cyclists.

At some points the trail deviates from the path of the rail line – in some cases to ensure the safety of users near busy highways, in others to protect regenerated vegetation.

The development of the rail trail has also been a catalyst for the adaptive reuse of associated historic structures – for example, Wonthaggi station is now a museum, arts and crafts shop – and the trail also brings visitors to adjacent mining heritage sites, such as the State Coal Mine Heritage Area at Wonthaggi.

Solar panel counters at Kilcunda and Wonthaggi track the use of the trail. These indicate an average of 10,000 users per month in the summer peak period and 5000 to 7000 at other times.

Maintenance, including weed and vegetation control is a continual expense, as is managing vandalism. The community plays an active role in looking after the trail and providing informal 'surveillance'. A Friends Group, formed in 2006, helps with marketing and promotion, advice and minimal maintenance. (<https://heritagecouncil.vic.gov.au/research-projects/industrial-heritage-case-studies/bass-coast-rail-trail/>)

3.6 Key Success Points

- The rail trail provides public access to the region's mining and agricultural heritage, while also providing economic and ecological benefits to the community
- The project demonstrates that industrial heritage includes long, linear sites that connect widely differing environments and heritage contexts
- The project shows the value of a long-term approach with staged development over decades, including room for growth and change
- Solar panel counters are used on the trail to track usage.

4 FERNLEIGH TRACK (ADAMSTOWN TO BELMONT RAIL TRAIL)

4.1 Background

The Fernleigh Track – Adamstown to Belmont Rail Trail is located near Newcastle NSW. It is a 16 km sealed track that runs from Adamstown to Belmont. The railway opened in the late 1880's. The last passenger train ran in 1971 and during the 1980's as coal mines along the corridor began to close down the line ceased to be used in 1991. The Newcastle City and Lake Macquarie councils bought the land of this former private coal railway to Belmont and opened the first section of the rail trail, Adamstown - Kahibah (Burwood Rd), in 2003. Stage 3 of the Fernleigh Track from Whitebridge to Redhead opened in 2009. Stage 4 from Redhead to Jewells Station was completed in mid-2010 and the completed rail trail to Belmont was opened in March 2011. (<https://www.railtrails.org.au/trail?view=trail&id=80>)

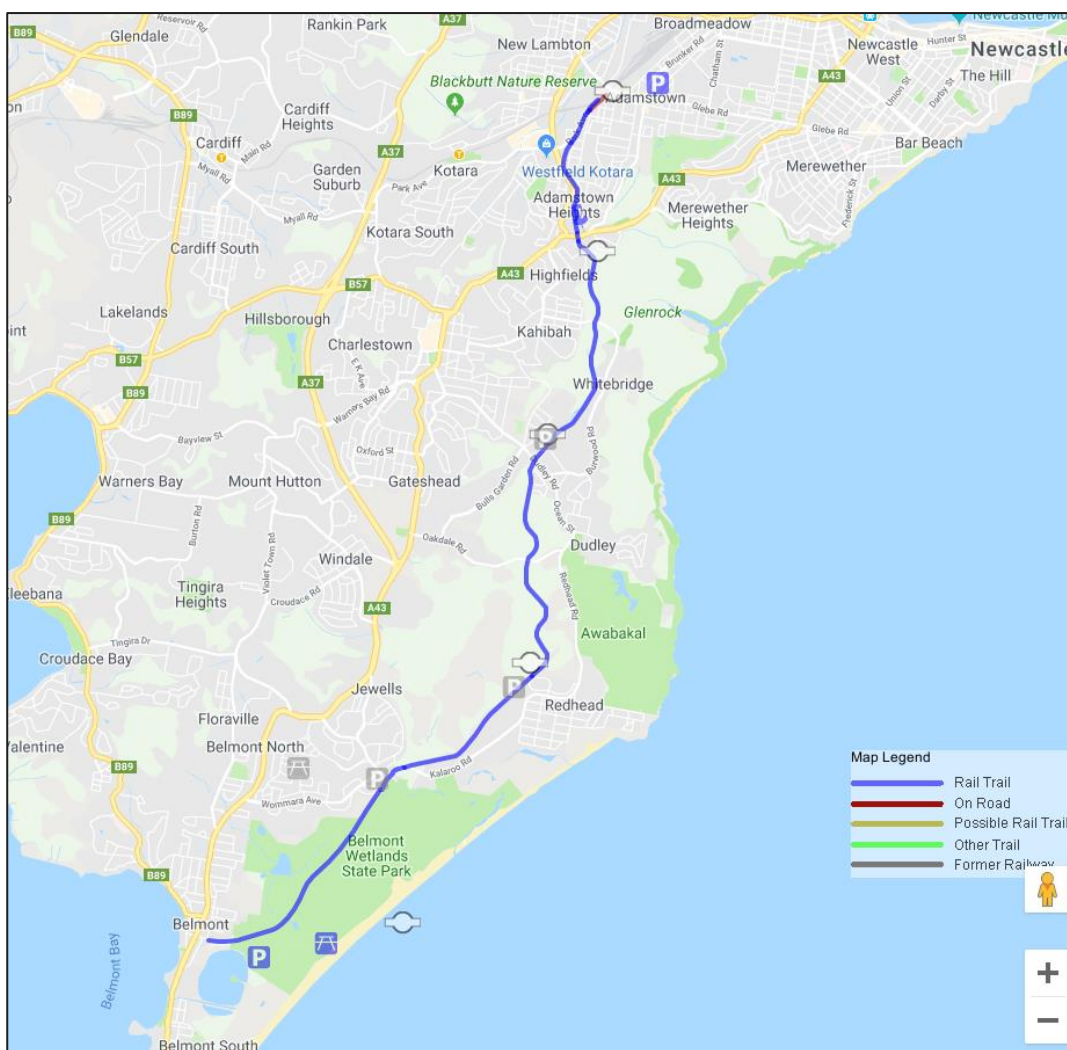


Figure 4-1 Fernleigh Track extent

4.2 Particular Features of the Corridor Reactivation

There are no formal studies on the demographic of the users. The trail is sealed with no major inclines and is located within an urban/suburban area. There are several access points and all busy road crossing have facilities to cross safely. The track is a popular facility, used for both localised commuting and recreational purposes. The track is suited to walking and cycling. The track has a tunnel, the Fernleigh Tunnel, a restored 181 metre long, curved rail tunnel that marks the connecting point between the cities of Lake Macquarie and

Newcastle. (<http://www.newcastle.nsw.gov.au/Explore/Things-to-do/Walking-cycling/Fernleigh-track>)
(https://www.visitlakemac.com.au/images/documents/fernleigh_track2012.pdf)

4.3 Ownership/Management Structure

The Fernleigh Track shared pathway is a joint project of Lake Macquarie City Council and the City of Newcastle. Funding for this project was provided by both Councils and State and Federal Government grants. (<http://www.newcastle.nsw.gov.au/Explore/Things-to-do/Walking-cycling/Fernleigh-track>)

4.4 Drivers of Change

Guided by the Fernleigh Track Committee the transformation from former rail corridor to community asset began in 1994 after the joint purchase of the land by the Lake Macquarie and Newcastle City Councils. In 1999, the development of a shared pathway was proposed. Funding from both Councils and the NSW State and Federal governments allowed construction to commence with a significant focus set on restoration and preservation. Different sections were completed in stages, spanning 2003 – 2011.
(https://www.visitlakemac.com.au/images/documents/fernleigh_track2012.pdf)

4.5 Social Impacts

The trail is part of the Cyclesafe Network. The Cyclesafe Network (CSN) is a system of family safe, easily navigated and usefully connected cycling, walking and shared paths across the Newcastle and Lake Macquarie local government areas. The aim of the network is to make walking and cycling for short trips – less than 2 kms for walking and less than 10 kms for cycling – a viable alternative to car travel. In addition to its transport infrastructure benefits, the CSN will also deliver health benefits to the population of the Hunter region by increasing physical activity as part of everyday life.
(https://www.heartfoundation.org.au/images/uploads/publications/Fact_Sheet_CSN_160615.pdf)

The track provides:

- easy grades for people of all fitness levels
- safe off-road link between residential and employment areas
- former stations and heritage railway relics are visible from the track
- the Fernleigh Tunnel as the connection point between Lake Macquarie and Newcastle.

4.6 Key Success Points

Considerable effort has gone into preserving the history of the corridor with *rail track being left in place where practical, and removed rail and sleepers used for features along the trail.*

5 MARY TO THE BAY RAIL TRAIL

5.1 Background

The Mary to the Bay rail trail is an 18 kilometre long cycle track which originates from the Urangan Pier, a tourist destination in the heart of the Hervey Bay township and terminates at Vernon national park, on-route to Maryborough. This cycle path is contained in a corridor previously utilized by a branch of the North Coast main line railway, for which rail services closed in 1993.

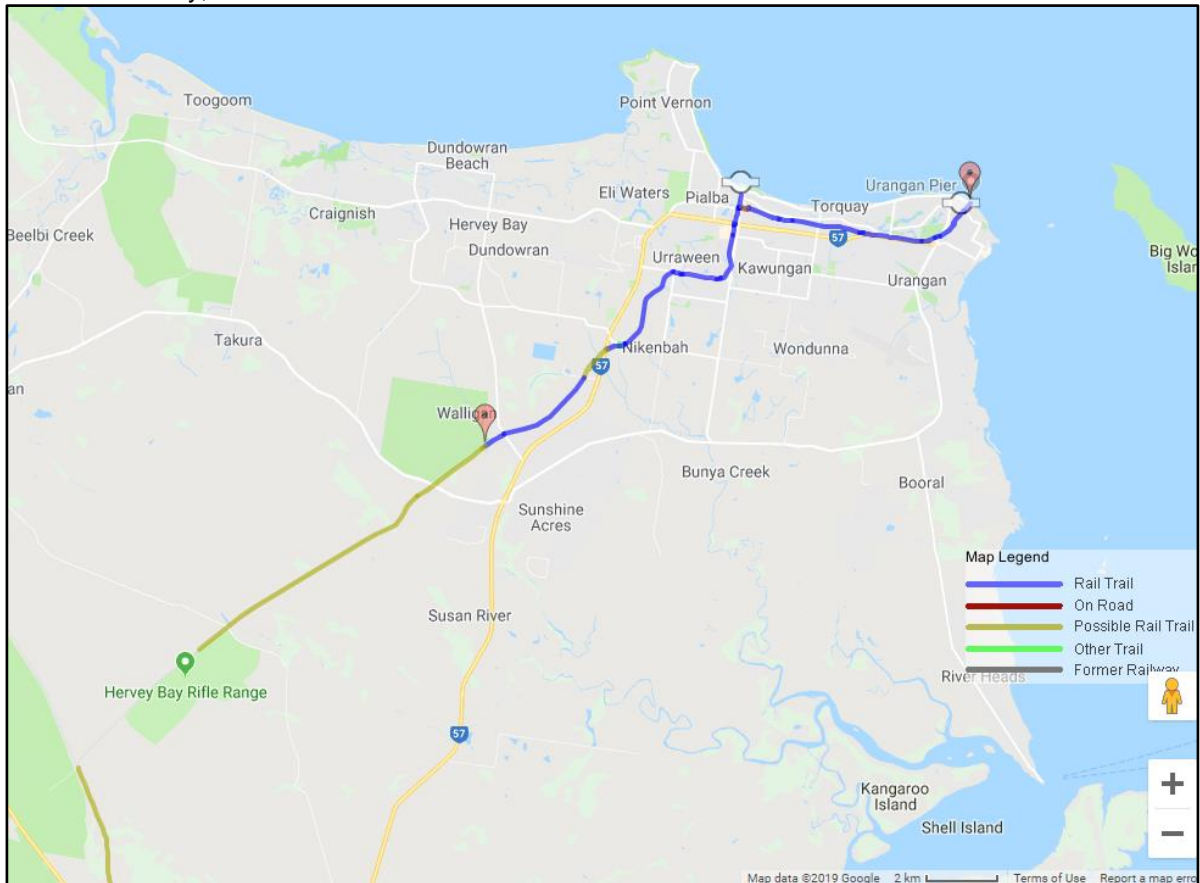


Figure 5-1 Mary to the Bay Rail Trail extent

5.2 Particular Features of the Corridor Reactivation

This rail trail runs through Hervey Bay and connects several tourist destinations including the Uraween pier and esplanade. This rail trail is unique in that facilitates many forms of transport such as mobility scooters, walking and equestrian use.

5.3 Ownership/Management Structure

The trail is managed by the Fraser Coast Regional Council, who extended the trail to the Urangan Pier, which links it up with the foreshore shared path along the Bay waterfront. The Council, supported by local cycling groups such as the Fraser Coast BUG, have developed a plan for the whole of the former line to be converted to a rail trail and a connection made from Colton to Maryborough to provide a safe link between the two cities. (<https://www.railtrails.org.au/trail?view=trail&id=69>)

5.4 Drivers of Change

There was a strong local interest in using the old rail corridor and developing a rail trail to connect Maryborough to Hervey Bay as both a tourist facility and local commuter and recreational route, returning the corridor to its former glory.

At the end of 2018 Council has received a \$66,000 grant from the Department of Transport and Main Roads to conduct a feasibility study of the Mary to the Bay Rail Trail. This study is due to be presented by May 2019. This study will look at extending the trail from the existing end point at Stockyard Creek to the township of Maryborough. (<https://www.frasercoast.qld.gov.au/-/mary-to-bay-rail-trail-feasibility-study>)

5.5 Social Impacts

The development of the rail trail provided a number of local tourism opportunities. Bicycle hire, accommodation and cafes are an integral part of rail trails developed all over Australia. The feasibility study will cover:

- The tourism, recreational and economic opportunities of the trail;
- how to safely cross the Maryborough Hervey Bay Road, Dundowran Road, Torbanlea Pialba Road and Churchill Mines Road
- Estimate the costs of building the trail
- Development and Implementation Plan
- Construction staging
- Maintenance requirements
- Potential for community involvement in maintenance of the trail
- Consultation with key stakeholders
- Key success points for trail viability.

Post feasibility study it has been estimated that if extended to Maryborough, the rail trail could attract 15,000 yearly visitors and provide an additional \$3.2 million a year to the local economy. The completion of the corridor may also provide benefit in reducing traffic between Maryborough and Hervey Bay.

5.6 Key Success Points

Although incomplete, the Mary to the Bay Rail trail provides an example of how local communities positively perceive rail trails in their region and how they can improve the quality of life for locals and visitors.

6 SELF DRIVING URBAN MOBILITY SYSTEM PORTUGAL

6.1 Background

“Urban Mobility System Upgrade how shared self-driving cars could change city traffic” a report released by Organisation for Economic Co-operation and Development (OECD) for the International Transport Forum (ITF). ITF works for transport policies that improve peoples’ lives. Their mission is to foster a deeper understanding of the role of transport in economic growth, environmental sustainability and social inclusion and to raise the public profile of transport policy.

The report “examines the changes that might result from the large-scale uptake of a shared and self-driving fleet of vehicles in a mid-sized European city. The study explores two different self-driving vehicle concepts, “TaxiBot” and “AutoVot”. TaxiBots are self-driving cars that can be shared simultaneously by several passengers. AutoVots pick-up and drop-off single passengers sequentially. Two premises for this study: First, the urban mobility system upgrade with a fleet of TaxiBots and AutoVots should deliver the same trips as today in terms of origin, destination and timing. Second, it should also replace all car and bus trips. The report looks at impacts on car fleet size, volume of travel and parking requirements over two different time scales: a 24-hour average and for peak hours only. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

6.2 Particular Features of the study

The study found that:

- Nearly the same mobility can be delivered with 10 per cent of the cars
- The overall volume of car travel will likely increase
- Impacts on congestion depend on system configuration
- Reduced parking needs will free up significant public and private space
- Ride sharing with TaxiBots replaces more vehicles than car sharing with AutoVots
- The size of the self-driving fleet needed is influenced by the availability of public transport
- Managing the transition will be challenging. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

6.3 Ownership/Management Structure

New vehicle types and business models will be required. A drastic reduction in the number of cars needed would significantly impact car manufacturer business models. New services will develop under these conditions, but it is unclear who will manage them and how they will be monetised. The role of authorities, both regulatory and fiscal, will be important in guiding developments or potentially maintaining market barriers. Innovative maintenance programmes could be part of the monetisation package developed for these services. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

6.4 Drivers of Change

Improvements in road safety are almost certain. Environmental benefits will depend on vehicle technology. The deployment of large-scale self-driving vehicle fleets will likely reduce both the number of crashes and crash severity, despite increases in overall levels of car travel. Environmental impacts remain tied to per kilometre emissions and thus will be dependent on the adoption of more fuel-efficient and less polluting technologies. TaxiBots and AutoVots are in use 12 hours and travel nearly 200 kilometres per day, compared to 50 minutes and 30 kilometres for privately-owned cars today. More intense use means shorter vehicle lifecycles and thus quicker adoption of new, cleaner technologies across the car fleet. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

6.5 Social Impacts

In all cases examined, self-driving fleets completely remove the need for on-street parking. This is a significant amount of space, equivalent to 210 football fields or nearly 20 per cent of the kerb-to-kerb street space in our model city. Additionally, up to 80 per cent of off-street parking could be removed, generating new opportunities for alternative uses of this valuable space.

Self-driving vehicles could change public transport as we currently know it. For small and medium-sized cities it is conceivable that a shared fleet of self-driving vehicles could completely obviate the need for traditional public transport.

Public transport, taxi operations and urban transport governance will have to adapt. Shared self-driving car fleets will directly compete with urban taxi and public transport services, as currently organised. Such fleets might effectively become a new form of low capacity, high quality public transport. This is likely to cause significant labour issues. Yet there is no reason why current public transport operators or taxi companies could not take an active role in delivering these services. Governance of transport services, including concession rules and arrangements, will have to adapt. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

6.6 Key Success Points

Mixing fleets of shared self-driving vehicles and privately-owned cars will not deliver the same benefits as a full TaxiBot/AutoVot fleet - but it still remains attractive in all fleet-mixing scenarios, overall vehicle travel will be higher. Also, vehicle numbers will increase in three out of four peak hour scenarios. Improved traffic flow of automated cars could mitigate congestion up to a point. However, the public policy case for self-driving fleets alone (without high-capacity public transport) may be difficult to make based solely on space and congestion benefits, due to the increase in overall travel volumes. Nonetheless, even in mixed scenarios, shared self-driving fleets could be a cost effective alternative to traditional forms of public transport, if the impacts of additional travel are mitigated. “All in” deployment of shared self-driving fleets may be easier in circumscribed areas such as business parks, campuses, islands, as well as in cities with low motorisation rates. (https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)

7 DRIVE SWEDEN

7.1 Background

The first self-driving bus is now rolling in Gothenburg, at the Chalmers University of Technology campus in Johannesburg. The project which is led by RISE is a part of the Government's innovation partnership program, "The next generation's travel and transport," and is funded in part by Vinnova through Drive Sweden. (<https://www.drivesweden.net/en/news/premiere-self-driving-buses-gothenburg>)



Figure 7-1 Self driving bus

7.2 Particular Features of the initiative

The beginning phase of this initiative has now begun. An autonomous shuttle bus is now available to the public, moving people between the main entrance of Chalmers University of Technology, Johannesburg Science Park, and the Chalmers Library. "We intend to demonstrate that self-driving vehicles are both safe and comfortable," says Anne-Rosa Simonsen, the communications manager at Autonomous Mobility, the company responsible for the shuttle operation. (<https://www.drivesweden.net/en/news/premiere-self-driving-buses-gothenburg>)

7.3 Ownership/Management Structure

Behind this venture is a partnership between fifteen organizations and companies related to mobility, urban planning and transport. The bus-project in Gothenburg is a part of the Government's innovation partnership program, "The next generation's travel and transport," and is funded in part by Vinnova through Drive Sweden. (<https://www.drivesweden.net/en/news/premiere-self-driving-buses-gothenburg>)

7.4 Drivers of Change

This is an important, collaborative project where business, academia and public actors join forces. During the test period, research will be conducted on technology and user acceptance that will be used to assess the potential of self-driving vehicle technology. (<https://www.drivesweden.net/en/news/premiere-self-driving-buses-gothenburg>)

7.5 Social Impacts

The buses are electric, create less noise than conventional diesel or gas buses, and are local emission free. The small, self-driving buses are a completely new type of vehicle - which creates opportunities not thought to previously existed. They can authorities understand how cities of the future can develop, with reducing private car ownership and creating more efficient transportation, especially where people are sharing rides. This opens up possibilities for new types of city development, and when used in this manner, reduces the need for parking in dense areas. (<https://www.drivesweden.net/en/news/premiere-self-driving-buses-gothenburg>)

Gothenburg City Planning Authority is the first in the world to examine the interaction between autonomous vehicles and sustainable, long-term urban planning. The city is exploring the effects and benefits of technology, including, but not limited to, the future need for parking facilities, enhanced road safety, accessibility, and implications to the use of public space. (<https://www.drivesweden.net/en/news/gothenburg-first-city-incorporate-autonomous-vehicles-urban-planning>)

7.6 Key Success Points

Acceptance of relatively new technology in this case has been rapid mainly due to its flexibility and ease of use.

8 BURKE GILMAN TRAIL WASHINGTON, USA

8.1 Background

The Burke/Gilman Trail is a notably successful rail to trail conversion, occupying an abandoned Seattle, Lakeshore and Eastern Railway corridor in Washington, USA. After the line was abandoned in 1971, the first 12.1 miles (19.5 km) was opened as a public trail in 1978.



Figure 8-1 Burke Gilman Trail extent

8.2 Particular Features of the Corridor Reactivation

Even on weekdays more than 2000 people per day use the Burke-Gilman Trail for commuting and recreation. Because of unusually strong public attachment to the trail, managers have long recognised the need for community integration and involvement.

8.3 Ownership/Management Structure

The City of Seattle, the University of Washington and King County cooperated on developing the route. Seattle Children's Hospital is situated on the route and has made associated investments in the trail to encourage its use on their campus, particularly for commuting.

8.4 Drivers of Change

The City of Seattle bought the property from Northern Pacific in the 1970s. Residents were quick to recognise the potential of the railroad line and launched a movement to obtain right-of-way for a public biking and walking trail. The City of Seattle cooperated with the University of Washington and King County to develop the route. Seattle City has also been leading the (long-running and controversial) project to complete the trail's "Missing Link" (maritime and industrial businesses have challenged the proposed route for the missing trail link).

8.5 Identified Gains from Reactivation

A 1987 study by the Seattle Engineering Department found that properties near (but not immediately adjacent to) the trail sell for approximately six per cent more than properties away from the trail, and that they sell more quickly (based on a survey of experienced real estate agents).

8.6 Social Impacts

Cycling in Seattle has increased due to the city's implementation of the 2006 Bicycle Master Plan, a ten-year strategy to improve cycling conditions. As a result, bicycle lanes, sharrows (street arrows indicating a shared road), separated bike trails like the Burke-Gilman and educational programs have popped up citywide.

The path is popular due to the fact that it caters to a wide variety of skill levels; it is easily accessible, undemanding physically and completely separated from car traffic. The trail is as much a thoroughfare for commuting to work and the University of Washington as it is a staple for social recreation and fitness.

8.7 Key Success Points

Strong community integration and effective planning of the route from the outset—including across partners, ideas and (importantly) infrastructure—will help set up the Byron Shire Rail Corridor for success, including to avoid long-running community disputes like the “Missing Link”.

9 OTAGO CENTRAL RAIL TRAIL, SOUTH ISLAND, NEW ZEALAND

9.1 Background

The Otago Central Rail Trail is a 152 km trail that follows the route of the Otago Central Railway, from Clyde to Middlesmarch, New Zealand. It is all completely off-road, with no traffic. Most of the corridor has had the rail removed and has been resurfaced with gravel.



Figure 9-1 Otago Rail Trail extent

9.2 Particular Features of the Corridor Reactivation

The success of the Otago Central Rail Trail inspired government to set up the New Zealand Cycle Trail (NZCT), a national initiative to develop 18 world class cycling trails throughout New Zealand.

9.3 Ownership/Management Structure

The Otago Central Rail Trail was bought by the Department of Conservation (DOC) in 1993 to be used as a recreational reserve. The trail is maintained and developed by the DOC and the Otago Central Rail Trust (Trust), with the DOC undertaking maintenance and the Trust upgrading trail facilities (toilets, information boards, shelters) and funding trail resurfacing.

9.4 Drivers of Change

The Department of Conservation (DOC) established the Otago Central Rail Trail Trust to help it raise funds. The Trust has evolved from its original fund-raising purpose to now play a key role in marketing and promotion.

9.5 Identified Gains from Reactivation

A 2014-2015 survey estimated the economic impact of the rail trail to the regional economy as shown in the table below:

Impact Summary	Direct	Total
Output	\$6,906,855	\$10,398,110
GDP	\$3,553,253	\$5,270,786
Employment (FTEs)	81.0	102.4

Comparing expenditure across the 2014-15 survey against similar surveys done in 2008 and 2011, the 2014-15 data represents a 15-16 per cent decrease in expenditure, GDP and FTEs compared to 2011, but a 44 per cent increase in output, 49 per cent increase in GDP, and a 37 per-cent increase in FTEs compared to the 2008 survey.

9.6 Social Impacts

The trail caters to a wide variety of skill levels. Demographics of the users include retirees, families, school, fitness and social groups. The trail accommodates walking, cycling and horse riding.

The towns in the area have developed facilities for trail users, and companies have been developed to aid travellers on the trail, such as transporting luggage between destinations and accommodation. Due to the increasing numbers of pubs now available on the track route, the trail has also been nicknamed the 'Ale Trail' instead of 'Rail Trail'.

9.7 Key Success Points

A successful first trail can be both a test-case and a catalyst for a broader state-wide (or national) rail trail network. Moreover, a partnership between a government department (in this case the Department of Conservation) and a Trust that is established specifically for the trail project is one example of an effective management structure for a rail trail. Byron Shire may wish to consider the suitability of this management partnership model for their rail corridor.

10 CUCKOO TRAIL, EAST SUSSEX, UK

10.1 Background

The 11-mile-long Cuckoo Trail follows the old route of the railway linking Heathfield, Hailsham and Polegate. Opened in 1880, the railway was named the Cuckoo Line after the tradition that the first cuckoo of spring was always heard at the Heathfield Fair. The rail line was shut in the 1960s as part of the "Beeching Plan".



Figure 10-1 Cuckoo Trail extent

10.2 Particular Features of the Corridor Reactivation

Between April and June, the distinctive call of the cuckoo can be heard along the trail. Other birds, butterflies and wildlife can be seen on the trail any time of year. Benches have been erected along the trail, and picnic tables and bike racks are located at intervals along the trail. The trail is mainly off-road, so is family-friendly and suitable for people of all ages.

10.3 Ownership/Management Structure

The Cuckoo Trail is owned by Wealden District Council and East Sussex County Council.

10.4 Drivers of Change

Visitors to the trail can fill in a log and send it off once they have completed 100 miles. Wealden District Council will then send them a Cuckoo Challenge certificate.

Wealden District Council are in talks with the app-based cycle rental company Country Bike about bringing new opportunities for visitors to the Cuckoo Trail.

Identified Gains from Reactivation (economic gains): Approximately 250,000 visitors visit the Cuckoo Trail annually.

In a recent Business Case for the Hailsham, Polegate and Eastbourne Movement and Access Corridor (which included a segment of the Cuckoo Trail, although it was a broader sustainable transport project), it was stated that recent sustainable transport demonstration projects in the East Sussex region had resulted

in increases in cycling, walking and bus use and a decrease in car use and the amount of traffic on the roads.

The number of cycling trips per head of population grew substantially, by 26-30 per cent, while walking trips increased by 10-13 per cent per head.

10.5 Social Impacts

The trail accommodates walkers, cyclists and horse riders. It is part of the National Cycle Network and serves as a traffic-free route between several local schools.

10.6 Key Success Points

Family-friendly rail trails - with interesting wildlife and plant draw-cards and family-friendly amenities, such as benches, picnic tables and bike racks - can form the centrepiece of a broader campaign to promote healthier and more active lifestyles in regional areas. Byron Shire has ample natural and wildlife assets it may wish to consider using as rail trail drawcards.

11 MIDTOWN GREENWAY, MINNEAPOLIS, USA

11.1 Background

The Midtown Greenway is a 5.5-mile long former railway corridor in south Minneapolis, with biking and walking trails. The Greenway was originally part of the Milwaukee Railroad's main line to the West Coast, which began running in 1882. The first phase of the Greenway was opened in 2000.



Figure 11-1 Midtown Greenway extent

11.2 Particular Features of the Corridor Reactivation

The Midtown Greenway is grade-separated from the street grid for most of its distance across the city. This means cyclists get barrier-free bicycling that can make cross-town trips faster than going by car. It's also open 24 hours a day, year-round, is well-lit and safe, and has security cameras and a volunteer group that polices the Greenway daily.

Midtown Greenway is so integral to the city's transport network that in the snowy months it is often ploughed before the streets. There are many hardy cyclists that regularly brave the harsh winter weather.

The Greenway is also considered to be at the forefront of the Trail-Oriented Development movement, which leverages investments in cycling and pedestrian infrastructure to offer a car-free lifestyle for people seeking more physically active and environmentally sustainable modes of getting around.

11.3 Ownership/Management Structure

The Midtown Greenway is owned by Hennepin County Regional Railroad Authority. The corridor is operated by the city, but the Midtown Greenway Coalition has several volunteer committees that manage different aspects of the trail.

11.4 Drivers of Change

The Midtown Greenway Coalition is the grassroots organisation that successfully advocated for installation of the Midtown Greenway by public agencies.

11.5 Identified Gains from Reactivation

In 2015, the then Hennepin County Commissioner Peter McLaughlin noted that the amount of real estate investment that's sprung up [around the Midtown Greenway] has been "unbelievable" and that property values along the corridor have gone up at least 90 per cent. Bike traffic in Minneapolis grew by 47 per cent between 2007 and 2011, with many of these cyclists switching from car-use to bike use.

11.6 Social Impacts

The Greenway trails are plowed in the winter, lit at night, and open 24/7. Several thousand people use the Greenway each spring, summer, or fall day, and hundreds of hearty cyclists and runners use it each winter day no matter how cold or snowy as it offers barrier-free bicycling that can make cross-town trips faster than going by car.

11.7 Key Success Points

The Midtown Greenway has been very successful in promoting active transport in Minneapolis, and the city has also seen economic development benefits from adjusting their zoning laws and trail amenities to encourage people to live adjacent to the trail. Byron Shire may wish to consider ways they could adjust their zoning laws around the Byron Shire Rail Trail to encourage economic development adjacent to the trail.

12 FLORIDA EAST CENTRAL REGIONAL RAIL TRAIL

12.1 Background

The East Central Regional Rail trial covers a distance of just over 50 miles or 80 km and is located along Florida's east coast, connecting towns between Edgewater and Titusville to the city of Deltona.

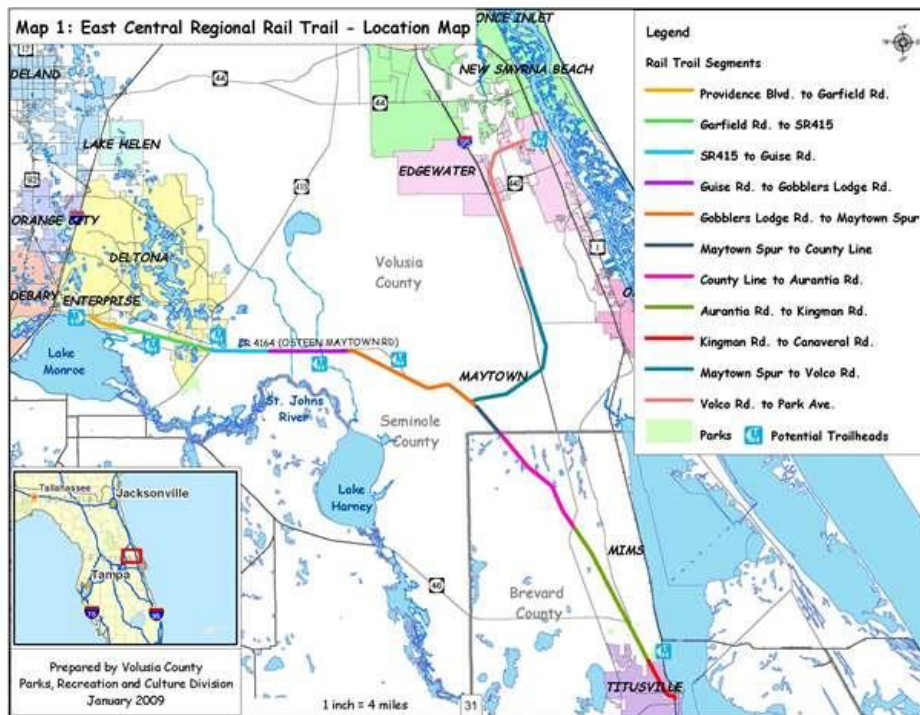


Figure 12-1 Florida East Central Regional Rail Trail extent

12.2 Particular features of the Corridor reactivation

There are medium-long term plans to connect the ECRRT with the East Coast Greenway and a number of other Rail Trials, creating a network across the majority of the state and all the way north to Maine. The ECRRT is also a multi use rail trial, allowing pedestrians, cyclists, wheel-chairs and mobility scooters.

12.3 Ownership/management structure

The Department of Environmental protection is the owner of the rail trial and has leased the corridor to the Brevard and Volusia counties immediately after the rail trail had been constructed. These two counties are now responsible for development and management of the asset.

12.4 Drivers of change

As mentioned previously the ERRT is part of a greater system of rail trails, these have been funded and developed by several organisations and groups, with the aim of providing non-motorised transport options, and encouraging active transport and healthy lifestyles. Importantly this rail trail would become part of the east coast greenway, running 3000 miles up and down the entirety of the united states east coast between Florida and Main. In keeping with the American great Outdoors initiative (AGO), the corridor will be compatible with both active and passive use, the only restriction being motorized vehicles (not including disability mobility scooters).

12.5 Key Success Points

From the ECRRT and the greater system of rail trails which it will become part of, Byron Shire Council can gain insight into how a multi use corridor can be used to encourage an active and healthy lifestyle within the shire, while providing alternative transport services.

Also, the two counties the rail trail pass through are jointly responsible for development and management of the asset.

13 RAILTRACK RIDERS: AUSTRALIA'S FIRST PEDAL RAILWAY (TASMANIA)

13.1 Background

Australia's First Pedal Railway: the Railtrack Riders allows visitors to travel at their own pace and fully experience the sights, sounds and smells of the rainforest. It is the only tourism product of its type currently operating in Australia. Railtrack Riders are four-wheeled, lightweight vehicles that are powered by foot pedals. (<http://www.railtrackriders.com.au/>)



Figure 133-1 Railway pedal vehicles

13.2 Particular Features of the Corridor Reactivation

Being pedal-powered, the Railtrack Riders allows visitors to travel at their own pace and fully experience the sights, sounds and smells of the rainforest. The riders have a seating capacity that accommodates a family or a couple travelling independently along the railway in convoy formation. (<http://www.railtrackriders.com.au/community-vision/>)

In 2011, approximately 2000 visitors enjoyed travelling on the Railtrack Riders on this 2.5 kilometre section of non-operational rail corridor. (<http://www.greatrailexperiencetasmania.com.au/operators/railtrack-riders/>)

13.3 Ownership/Management Structure

Until 1991, Maydena was a 'company town' established by Australian Newsprint Mills (ANM) and relied on ANM to support direct and indirect employment.

Local residents established the Maydena Community Association in 1991 after ANM closed its operations. The Association has since been pro-active in setting goals and strategies to achieve social and economic independence for the town.

Railtrack Riders was born from an initiative of the Maydena Community Association Inc. with a desire to develop a tourist enterprise that gives visitors an insight into Tasmanian forestry / rail heritage and values associated with the adjoining areas like the World Heritage 'Southwest Wilderness' and Mt Field National Park (the World's third oldest National Park).

The Company opened for business in December 2009 by volunteers, and now it has become more viable able to offer employment opportunities to the local community.

The first prototype Railtrack Rider was designed and constructed through the resourcefulness of community members and local business. (<http://www.railtrackriders.com.au/community-vision/>)

13.4 Drivers of Change

Inspired by successful US, Canadian, Swedish and German pedal powered vehicles that make the most out of unused rail infrastructure, Railtrack Riders was established by the Maydena Community Association Inc in 2009. The community has turned the Railtrack Riders concept into a self-supporting business venture. (<http://www.greatrailexperience Tasmania.com.au/operators/railtrack-riders/>)

13.5 Social Impacts

Railtrack Riders Pty Ltd is part of Maydena's community's aim to create a sustainable future through economic growth, employment opportunities and the development of tourism product that capitalises on the region's natural and cultural values.

13.6 Key Success Points

- Community developed tourist operation that offers a unique experience
- Utilises existing infrastructure (rail tracks) so lower development cost vs developing new infrastructure

14 CAMBRIDGESHIRE GUIDED BUSWAY, UNITED KINGDOM

14.1 Background

The Cambridgeshire Guided Busway opened in 2011 and connects Cambridge, Huntingdon and St Ives in the English Country of Cambridgeshire. It is the longest guided busway in the world, at over 25 km (or 15.5 miles). The northern section uses the course of the Cambridge and Huntingdon railway.



Figure 144-1 Guided busway extent

14.2 Particular Features of the Corridor Reactivation

The Cambridgeshire Guided Busway is segregated infrastructure. Buses can travel up to 50 miles per hour on the guided sections. There are also four park-and-ride facilities along busway.

While cyclists and pedestrians travel on the traffic-free maintenance path, there are safety concerns for cyclists, especially following a fatal cyclist accident in September 2018.

Ownership/Management Structure: The Guided Busway was commissioned by the Cambridgeshire County Council. Stage-coach and Whippet bus companies service the routes.

14.3 Drivers of Change

Cambridgeshire County Council commissioned the guided bus-way, despite strong opposition from certain groups. Identified Gains from Reactivation (economic gains): Ex-ante Benefit-Cost Ratio (BCR) for Cambridgeshire Guided Busway was 2.26. Peter White of the University of Westminster states that: "given the rapid growth in ridership and large diversion from car it is likely that out-turn benefits would at least equal the forecast."

Strong growth in usage of the busway was reported from the outset, with the Year 2 monthly ridership forecasts achieved within the first three months. Approximate percentage growth in ridership of about 10 per cent occurred between 2012-13 and 2014-15, according to data from Stage-coach. A large component of that growth has been from car users, especially through the park-and-ride sites.

14.4 Social Impacts

The aim of the Cambridgeshire Guided Busway was to provide high quality, reliable and frequent local public transport along the A14 corridor and reduce congestion on the road. The Guided Busway route in Cambridgeshire links Cambridge city centre to several local town centres, hospitals, colleges, tourist destinations, rail interchanges and existing and new park and ride sites. The permanent infrastructure of a

dedicated busway improves public perception of bus travel. Dedicated busways have consistently shown increased patronage figures, when compared to on-road services.

14.5 Key Success Points

Costs were significantly higher than originally agreed and the project was delivered two years late. Cambridgeshire County Council ended up settling out of court with the contractor BAM Nuttall to claw back some of the project overruns. Council has since also identified significant repairs required for the busway, due to shallow foundations and inadequate drainage. Therefore, before embarking on any similarly ambitious project (particularly a guided busway), Byron Shire Council may want to investigate these engineering concerns further.

Moreover, planning the busway with an adjacent cyclist and pedestrian path as an integral feature with more emphasis on safety and usability, may allow Byron Shire Council to achieve greater active transport gains, as well as increased bus ridership.

15 SMART CIRCUIT, COLUMBUS, USA

15.1 Background

Smart Circuit is Ohio's first self-driving shuttle, taking riders on a 2.25 km, (1.4 mile) loop to explore the Scioto Mile in downtown Columbus. Passengers can travel between the shuttle's four stops - COSI (the Centre of Science and Industry), The National Veterans Memorial and Museum, the Smart Columbus Experience and Bicentennial Park.

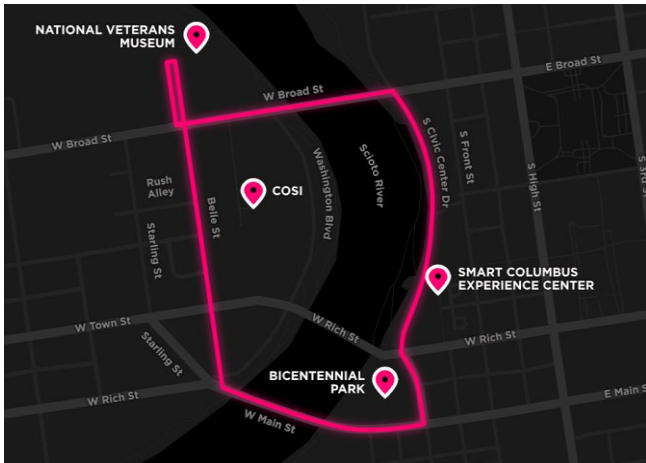


Figure 155-1 Smart Circle extent

15.2 Particular Features

The Smart Circuit uses a fleet of six-seater May Mobility shuttles. The vehicles have a 40.23 km (25 mile) per hour maximum speed. Three vehicles service the route and fully-charged vehicles from the May Mobility fleet are swapped in every few hours. They feature a large digital display and a single operator oversees the trip and takes control of the vehicle in case of emergency. The vehicles use LIDAR (Light Detection and Ranging), radars and cameras to obtain a 360 degree view.

The Smart Circuit connects to the Scioto Mile and the Scioto Trail at Bicentennial Park. Tourists and recreational cyclists can hire a bike through the CoGO bike share program.

15.3 Ownership/Management Structure

Smart Circuit is made possible through the leadership and support of Smart Columbus, DriveOhio, May Mobility and The Ohio State University.

15.4 Drivers of Change

Columbus was the winner of the U.S. Department of Transportation's (USDOT's) Smart City Challenge. Columbus was awarded \$50 million in grant funding and was designated America's Smart City. The Smart Circuit forms part of Columbus' winning Smart City strategy.

15.5 Identified Gains

While it is too early to identify gains from the project, it will provide important feedback and information to policy makers who are hoping to gain an understanding of the policy issues and regulation requirements surrounding Autonomous Vehicle (AV) use.

15.6 Social Impacts

The shuttles offer Columbus residents and visitors a hands-on experience designed to educate local innovators on the capabilities and potential of autonomous vehicle technology and inspire the community to envision how self-driving vehicles can transform our community's future.

15.7 Key Success Points

Smart Circuit will give the City of Columbus an opportunity to collect data on autonomous shuttles, how they are used, what sorts of technological challenges they currently face, and how they can fit in to government policy, regulations and procurement models. Smart Circuit also serves as a recreational attraction for tourists and residents of Columbus and its successful operation will help users become comfortable and familiar with riding in Autonomous Electric Vehicles (AEVs). Byron Shire Council could use a similar small-scale AEV project to begin with, which will provide information to be collected to inform future policy and regulation surrounding AEV shuttles, and also as an attraction and marketing tool for use in the region.

16 VERY LIGHT RAIL NATIONAL INNOVATION CENTRE (VLRNIC), DUDLEY, UK

16.1 Background

A new type of rail vehicle is needed, especially for short routes where operating traditional heavy rail or tram solutions is uneconomic. The emerging very light rail (VLR) sector aims to remedy this, by harnessing technology from the automotive sector to create hybrid or all-electric self-propelled vehicles which are lightweight (less than 1 tonne per linear metre), energy efficient, cheap to manufacture & operate and geared to the needs of communities.

The proposed VLR National Innovation Centre (VLRNIC) will be located in Castle Hill in Dudley. The site is that of the former Dudley rail station, which ceased passenger services in the 1960s, and is adjacent to a disused freight line running between Stourbridge and Walsall. The alignment will initially be re-laid with a single test track from Castle Hill to Cinder Bank. This will be used for prototype trials, allowing for testing and evaluation of demonstrator vehicles and systems. (<http://www.verylightrail.com/the-centre/>)

16.2 Particular Features of the VLR

A vehicle with a weight of less than 1 tonne per linear metre is considered very light weight by current standards. The very light rail (VLR) sector offers a significant opportunity for UK companies to develop new solutions embracing technology transferred from the automotive sector, leading to the growth of a new industry supplying UK and international rail schemes.

VLR offers many advantages over traditional rail systems. These include the following:

- vehicles with low axle weights (around 4 tonnes)
- self-powered vehicles with energy recovery and storage systems as standard
- reduced capital cost and installation time for track infrastructure
- reduced infrastructure operational and maintenance costs
- There is great potential for VLR vehicles to be used on disused branch lines across the UK, many of which have been closed since the early 1960s. (<http://www.verylightrail.com/sample-page/>)

16.3 Ownership/Management Structure

The VLRNIC is run by a UK consortium of local councils and transport companies.



16.4 Drivers of Change

A key focus of the Innovation Centre's research and development activity will be a holistic approach to public transport solutions. The driving vision behind the Centre is for lower-cost VLR technologies to become part of future integrated, multi-modal 'hub-to-home' transport systems. Far from introducing VLR as a competitor to traditional heavy rail or high speed services for intercity connections, work at the Innovation Centre will approach the emerging vehicle technology as an alternative to existing technologies, where it is appropriate to do so – e.g. at the beginning or end of longer journeys, linking halts in local communities to larger regional transport hubs. (<http://www.verylightrail.com/the-centre/>)

16.5 Social Impacts

Research into VLR will explore ways to reduce the weight and cost of carriages and track to provide a cheaper alternative to heavy rail and metro systems for connections between suburban and rural areas. VLR offers a cheaper public transport option for users as well as a more environmentally friendly system.

16.6 Key Success Points

The VLR aligns well with Byron Shire Council's desired outcome. It is relatively inexpensive to operate and maintain and requires only minimal necessary restorative track works. The VLR also provides an economically viable service for rural areas.

17 DMV (DUAL-MODE VEHICLE JAPAN)

17.1 Background

In the late and early 2000's a Kawasaki subsidiary Nichijo manufacturing Co. Ltd and the Hokkaido Railway Company formed a partnership on a project, designing and developing Dual-mode vehicles (DMV) capable of running on both rails and roads as an ordinary bus. Through these buses Hokkaido could provide a more efficient service to rural areas with decreasing patronage. The design of these vehicles won a good design award in 2008 after field testing had started in 2007.



Figure 177-1 Dual Mode Vehicle

17.2 Particular features/specifications

The DMV vehicles which were developed closely resembled standard shuttle buses commonly used on roads. However, these vehicles have hydraulically lowered and raised steel guide-wheels, which facilitate movement along rails. The DMV vehicles have been designed to optimize time efficiency and only require between 10-15 seconds (depending on starting configuration) to change between rail and road modes.

These vehicles can be joined to one another, as to be used in series, increasing passenger capacity and increasing effectiveness of drive power with two engines. Vehicles can be connected either facing the same direction or away from each other, the latter to simply traveling in the reverse direction.

The maximum on-rail speed of these vehicles is 70 km per hour. Depending on the model of DMV and the seat configuration inside, these vehicles have a capacity of between 16 and 29 passengers.

17.3 Testing

The Hokkaido railway Company ran Trails operation services of the DMVs on the Islands Senmo line, incorporating 11 km of track and 25 km of road.

17.4 Key Success Points

These DMV's provide an example of potentially how effective a solution the Hi-Rail option could be for the Byron Shire. Hi-Rail only requires basic rail and road infrastructure, increasing flexibility of the provided service and capable of operating outside of the corridor (to tourist destinations such as festival sites). The purchase and maintenance costs of DMV's are respectively only 1/6 and 1/4 of the cost of VLR rolling stock.

18 2GETTHERE (AV BUSES)

18.1 Background

2getthere is a global supplier and industry leader in the field of Autonomous buses. As a company they boast over 25 year-experience with autonomous vehicles and have two models of driverless shuttles.

Additional to their AV shuttles, 2getthere also develops sensory systems and software to assist av vehicles on exclusive or semi-exclusive guided busways and also in mixed traffic conditions.



Figure 188-1 Autonomous bus

18.2 Particular features and specifications of shuttles

2getthere has two types of shuttles the GRT and PRT. The GRT is an automated minibus and can facilitate a maximum of 24 passengers (16 standing). This shuttle/pod is just over 6 m in length and is 2 m wide.

The GRT has an electric and battery run, which take 11 minutes to charge from 30 to 80 per cent. The range of the shuttle is 50 km, with a maximum speed of 60 km/hr.

18.3 Current examples of the systems in use (global)

2getthere has had its shuttles and systems implemented at a number of locations across the globe one of the most significant of these being the Rivium (Rotterdam) project, which has been in operation since 1999. Currently these shuttles travel along a segregated path and encountering pedestrian and vehicle intersections. In 2020, these shuttles will be integrated into mixed traffic systems, to provide an important new service to Rotterdam. Are also being used at 2getthere shuttles are also being tested and will be implemented at the Brussels and Amsterdam Airports in the near future.

18.4 Key Success Points

2getthere's autonomous shuttles in combination with their AV and sensory systems and software provide Byron Shire Council with a viable option for corridor reactivation if a bus solution is selected. These shuttles have a range, speed, passenger capacity and charge time acceptable to the requirements of Byron Shire Council. 2getthere also provides Byron Shire Council with examples of how driverless shuttles have been successfully implemented in combination with or alongside existing transport systems.

19 PARRY PEOPLE MOVERS

19.1 Background

Parry People Movers (PPM) were developed as lightweight rail vehicles for use on regional railways in the United Kingdom. Currently their railcars are powered by gas, diesel or hydrogen dependent on requirements and age of the vehicles, with the modern vehicles taking advantage of high energy efficient low emissions technologies.

While PPM pride themselves on being well ahead in the market of providing energy efficient vehicles which are practical, built for purpose and sensible, and very good value for money.

The Parry People Mover has been demonstrated on a number of independent tourist railways and is now in revenue earning service between Stourbridge Junction and Stourbridge Town.



Figure 199-1 Parry People Movers Source
<http://www.parrypeplemovers.com/>

19.2 Particular features and specifications of vehicles

19.2.1 Existing vehicles

Vehicles are gas, flywheel (rotating flywheel is a store of kinetic energy which is used to power the vehicle), hydrostatic transmission with a capacity for 60 passengers.

One of the prime considerations of PPM for Byron Shire Council is that the vehicles operation independent of each other without the need for signals.

19.2.2 Under Development: Bogie Mounted Vehicles

PPM is currently developing a 120 passenger unit, low carbon, clean hybrid designed vehicle specifically designed to run on local branch lines and also over embedded tracks in public roads like a tram (future proofing potentially for connection with light rail) It operates at 60 km/h and will be able to carry 120 passengers.

19.3 Current examples of the systems in use (global)

A small 12 passenger railcar was designed and built in 1992 to and first ran on a test track at Cradley Heath, then on a specially constructed loop of line at Himley near Wolverhampton. In the mid-1990s the same vehicle provided demonstration passenger services in Central Birmingham, Barking, Brighton and Swansea. Returning to Himley Car 6 ran for 3 further years carrying an estimated 50,000 passengers, then was returned to the test track at Cradley Heath and has been maintained in operational conditions ever since².

PPM's have been used since 2012 on the South Staffordshire Line between Stourbridge Junction and Brierley Hill providing passenger services on the line for the first time since the Beeching Axe of railway lines in the UK in the 1970/80's.

19.4 Key Success Points



Figure 19-2 Artists impression of Light railcar Halt

Source: <http://www.parrypeoplemovers.com/>

PPM's journey and uptake of vehicles demonstrates that running smaller vehicles on regional lines is not only viable but a service that is used extensively by tourists and locals alike.

² www.parrypeoplemovers.com

20 RAIL WITH TRAIL

20.1 Background

“Rail with Trail” is the name given to a small subset of rail trails where the railway right of way remains and is used by railway vehicles whilst running in parallel to a trail for pedestrians/cyclists and recreational use. The number of rails with trails is growing globally, however currently the majority exist in Canada, Europe, the United States³.

The principal benefit of constructing a trail along an active railroad is that it multiplies the value a community can derive from the corridor providing residents and visitors alike with multiple transport options.



Figure 7 Rail with Trail Chehalis Wester Trail in Washington State <https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/>

20.2 Particular features and specifications of Rail with Trail

Unlike traditional rail trails, existing Rail with Trails. Rail with trails are considered valuable assets in providing both safe transportation networks for pedestrians and bicyclists whilst still maintaining freight, passenger and tourist rail lines.

The majority of Rail with Trails currently existing globally have trails located within 10 metres of the active railroad tracks. Although it is noted that currently there is not a functional Rail with Trail in Australia, the principles of operation are similar, and it is reasonable to assume that such an operation would be as successful in Australia as long as risk management techniques were put in place such as:

- The trail was designed for safety
- Prominent signage is used to warn users of any potential any dangerous areas
- Rail and cycle/pedestrian trail are regularly maintained and inspected
- Safe system of working is approved and implemented for rail vehicles

20.3 Current examples of the Rail with Trail in use (global)

In the United States over 88 Rail with Trails exist over 33 states, with an official report produced and published by the United States Department of Transportation (USDOT) in 2002 “Rails-with-Trails: Lessons Learned”. The key findings from this report and research studies undertaken in the US found that rails with trails were safe, common and increasing in number⁴.

Some examples are provided below in Figures 18 – 22.

³ https://en.wikipedia.org/wiki/Rails_with_trails

⁴ America's Rail with Trails: A resource for Planners, Agencies and Advocates on Trails along active railroad corridors. September 2013, Rail to Trails Conservancy



Figure 8 Portland Pedal Power Source: <https://www.portlandpedalpower.com/blog/2014/02/changing-old-rails-into-new-trails/>



Figure 9 Rail with Trail White Rock, south of Vancouver. Source: <https://www.adventurecycling.org/resources/blog/report-shows-that-rails-with-trails-are-safe-and-increasing/>



Figure 10 York County Heritage Rail with Trail <https://elcr.org/saving-our-endangered-trails/>



Figure 11 The Rail with Trail was built alongside the York County-owned former PRR line, currently in use by heritage railway Steam into History. Source: https://en.wikipedia.org/wiki/York_County_Heritage_Rail_Trail

20.4 Key Success Points

From the above examples it is evident that Rail with Trails appear to be a growing and feasible solution to revitalising heritage or old railway corridors whilst preserving the railway for vehicles in current or future timelines. As more communities across Australia commence to actively seek ways of encouraging active transportation, and as Regional, State and Federal Agencies seek to find solutions to transportation congestion and isolation, Rail with Trails could be a simple but vital way of providing a community with both active and public transport choices.



Figure 12 Rail with Trail South Korea Source: <https://www.thestar.com.my/lifestyle/features/2013/12/21/biking-through-korea/>

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