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# **ELECTRIC LOCOMOTIVES GLOBAL MARKET TRENDS**

Fleet, Suppliers, Procurement Projects, Forecast

**2022**



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## **ELECTRIC LOCOMOTIVES – GLOBAL MARKET TRENDS**

Fleet, Suppliers, Procurement Projects, Forecast

Cologne, March 2022

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## Executive summary

(...) SCI Verkehr has analysed the world market for electric mainline locomotives. The various railway companies worldwide operate a **fleet of about xx electric mainline locomotives** as of the end of 2021 with a high average age of around **xx years**.

Around **xx%** of the worldwide installed base is accounted for by **Asia, xxx and xxx**. The largest country markets are **China, xx and xx**, accounting for around xx% of the overall fleet. In the large railway markets of America, but also in the world region Australia/Pacific, the installed base of electric locomotives is xx.

Most of the fleet consists of **freight mainline locomotives**, accounting for around **xx% of the fleet**. The remaining fleet share is operated in passenger rail services.

Dividing the fleet in mainline (four-axle) and **heavy mainline (six or more axles) locomotives**, most of the fleet consists of xx, accounting for **more than xx% of the fleet**. xx locomotives are barely widespread outside of Europe. In regions such as CIS and Asia, trains are often (...)

Trends and drivers impacting the electric locomotive market:

3

Increasing environmental awareness and political support for railways - emission free traction (...)



### Increasing environmental awareness and political support for railways – (...)

In most world regions, the current conditions for railways are very promising as the willingness for **political support has increased significantly** in the past years considering **climate targets**. With its low carbon footprint, railway transport provides a large potential for bringing about emission reductions in the transport sector.

In each world region, **electric emission free mainline locomotives have been operating for decades and are contributing to environmentally friendly transport**, but (...)

Overall, the **worldwide installed base** of electric locomotives **will** (...). This is mainly driven by the Asian region with its focus countries **China and India**, where SCI Verkehr expects (...).

But **SCI Verkehr expects partly also** (...) in some regions despite high political support (...)



Already xx% of  
the worldwide  
locomotive  
mainline fleet is  
of electric traction  
in 2021




1

**The market for electric locomotives  
in Australia/Pacific**

## The market for electric locomotives in Australia/Pacific

### 1 Overview region – Extract from the MC Study

#### 1.1 Executive summary

Australia/Pacific		Electric locomotives	Trend	
	Installed base	Units 2021	xx	
		Average development 2021-2026 (p.a.)	xx	xx
		Average age 2021 (in years)	xx	
	OEM - market	Volume 2021 (EURm)	xx	
		Average development 2021-2026 (p.a.)	xx	↗
		Volume 2026 (EURm)	xx	
	AS -market	Volume 2021 (EURm)	xx	
		Average development 2021-2026 (p.a.)	xx	xx
		Volume 2026 (EURm)	xx	

strongly increasing ↑, increasing ↗, constant →, decreasing ↘, strongly decreasing ↓

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In the Australia/Pacific region, a small electric locomotive **fleet of around xx units** was in operation at the end of 2021. The installed base in Australia/Pacific makes up only **less than xx% of the worldwide electric locomotive fleet**.

In the electric locomotive segment, the following dynamics occur:

- (...)
- In the years to come, SCI Verkehr expects an again **slightly increasing OEM market** as most recent modernisations in the old part of the Australian fleet were carried out over xx years ago and the age structure reveals that a **large part of the fleet is due to replacement with new assets** in the years to come. However, overall, the OEM market is small, as the **low degree of electrification** leads to a dominance of diesel traction among the locomotives operated.
- (...)
- For after-sales services, the current market volume is around EUR xx million with (...) tendency in the considered forecast period due to (...).
- (...)

## 1.2 Overview installed base/transport market

The Australia/Pacific region has an installed base of around xx electric locomotives. The low degree of electrification has led to a dominance of diesel traction among the locomotives operated. Electric locomotives only represent about xx% of the total locomotive fleet in the region.

- The entire electric locomotive fleet is operated in (...) services and consists exclusively of heavy mainline locomotives.
- The average age of the fleet is xx years.

Installed base 2021 (units)	Freight	Passenger	Total
Total	xx	xx	xx
Ø-age	xx	xx	xx
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The most important characteristics of the region are the following:

- The railway network in the Australia/Pacific region is characterised by long overland lines, the railway network density is low and is primarily used for freight transport. The network consists of three gauge-sizes: narrow (1,067 mm), standard (1,435 mm) und broad gauge (1,600 mm).
- (...)
- The market development for electrification in the region is determined by new developments of commuter railway and light-rail transit.
- (...)

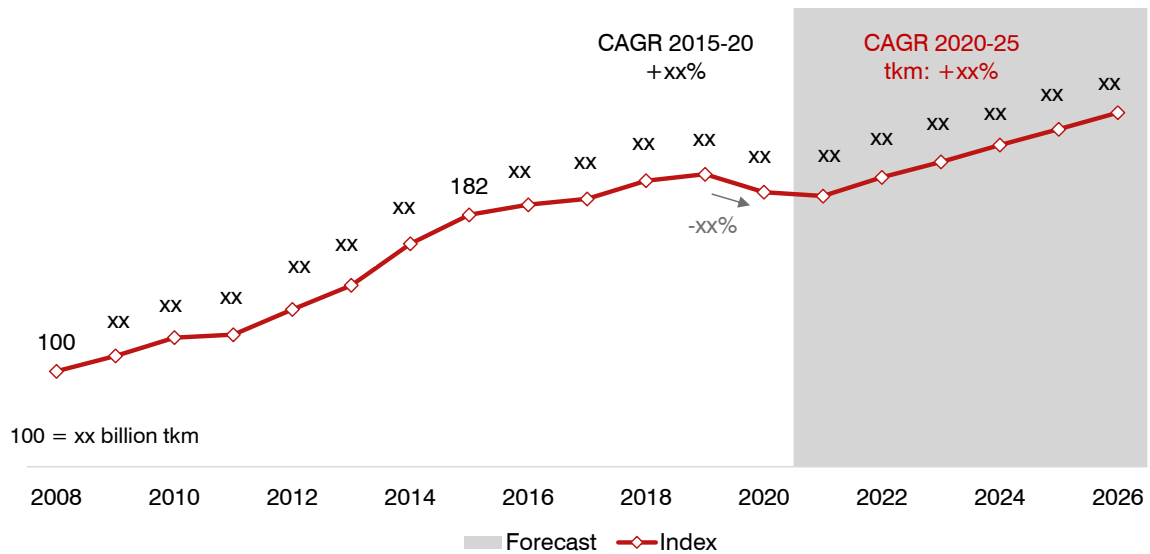
Australia/Pacific – Infrastructure data 2021			
Main gauge (mm)	Main voltage system	Network length (km)	Electrification degree (% of network length)
1,067   1,435	25 kV AC	xx	xx
© SCI Verkehr GmbH			

Rail transport in this world market region is almost entirely concentrated on **Australia** with a share of around xx% in the total **rail freight** transport performance. The region's transport performance grew strongly over the last decade and freight transport services by rail nearly doubled. Especially between xx and xx, rail freight transport performance experienced a strong growth reflecting the increasing production of iron ore. Rail freight in Australia is **specialised on the transport of heavy bulk goods** such as coal and ores. The country runs the world's the heaviest and longest heavy haul trains, with **axle loads of 40 t** and train lengths of 2.5 km or more. Intermodal transport is also increasing but in the other segments of non-bulk freight, road freight is more common. Due to the high proportion of ore and coal, rail freight transport enjoys a high modal split of around xx%.

Australia's rail transport industry consists of xx private operators, primarily located in southern states and resource rich areas.

(...)

Development of rail freight performance in the Australia/Pacific region [index 2008 = 100]



Source: ABS, OECD, SCI Verkehr Forecast

© SCI Verkehr

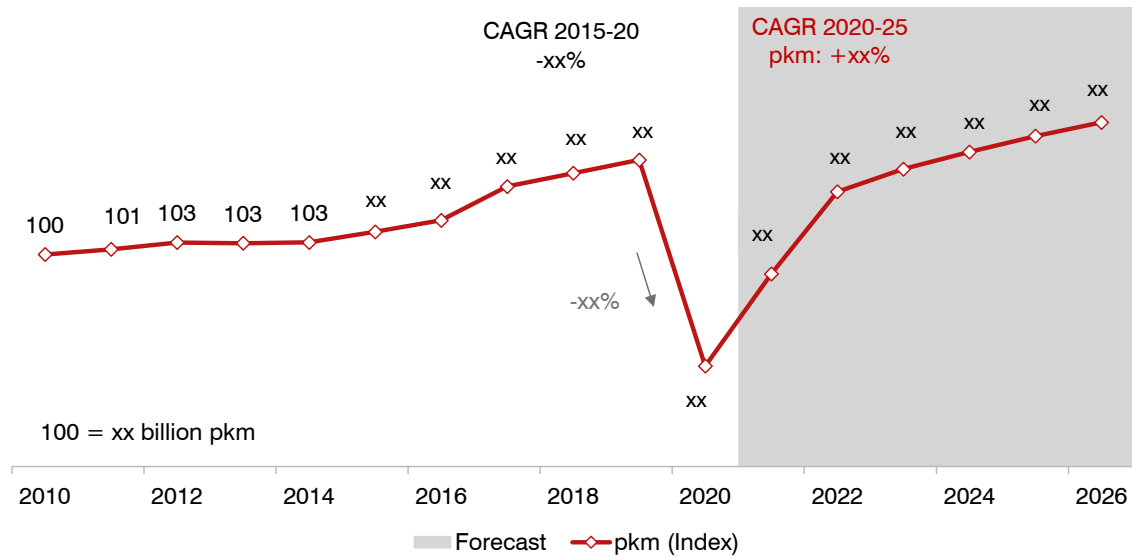
Figure 1: Development of rail freight performance in the Australia/Pacific region

Growth in the region is driven by an expected further increase of (..) production and transport. Further reasons are **planned infrastructure projects** such as the development of the Carmichael coal mine north of the Galilee Basin along with the construction of a 200 km rail link or the construction of the 1,700 km Inland Rail line from Brisbane to Melbourne.

Australia was (...) **affected by the Covid-19 crisis than other world regions**. However, the country has to cope with the effects of falling demand for coal and sinking trade with China. In the September quarter 2020, Australian total coal export volumes decreased by 11% compared to the same quarter in 2019. In the March quarter 2021, the decline amounted to 8% with exports to China declining to zero. In the June quarter 2021, (...)

The managing director of Australia's largest operator Aurizon expects the rail freight volumes (...).

Development of rail passenger performance in the Australia/Pacific region [index 2010 = 100]



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Figure 2: Development of rail passenger performance in the Australia/Pacific region

Australia is by far the largest **passenger rail transport market** in the Australia and Pacific region, accounting for xx% of the region's total transport performance in 2019. Road and air transport over long distances dominate passenger mobility in the region. The modal split of passenger rail transport thus amounts only to xx%. In 2019, the Australia/Pacific region accounted for less than xx% of the worldwide pkm volume. Given the geography of the region (major cities which are far apart from one another), a substantial change in this arrangement is extremely unlikely. Significant growth is mainly being seen in (...). Following a decline of xx% in 2020 due to the Covid-19 pandemic, SCI Verkehr expects an annual growth of xx% p.a. from 2020 to 2025.

(...)

### 1.3 Locomotive market and development

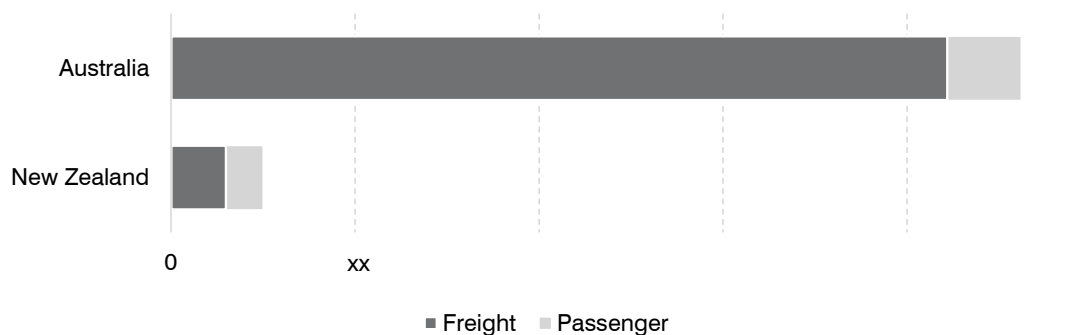
In the Australia/Pacific region, the electric locomotive fleet comprises a total of around **xx locomotives** with an average age of xx years and can be characterised as follows:

- **Fleet development:** the fleet in operation remained constant in recent years.
- **Age profile:** around xx% of the installed base has exceeded the life of xx years. While the fleet in Australia is around xx years old on average, the fleet in New Zealand is xx years old on average.
- **Application:** the fleet is operated in (...) services.
- **Ownership/Operators:** in Australia, private companies like Pacific National Pty Ltd and Aurizon Network Pty Ltd are operating the locomotive fleet. (...)
- **High-level trend:** The market is highly dependent on (...)
- (...)

#### Installed base of electric locomotive fleet in Australia/Pacific

More than xx% of the total fleet is operated in Australia, the remaining part of the fleet is based in New Zealand. No electric mainline locomotive is operated in Fiji.

#### Installed base of electric locomotives in Australia/Pacific (xx units)

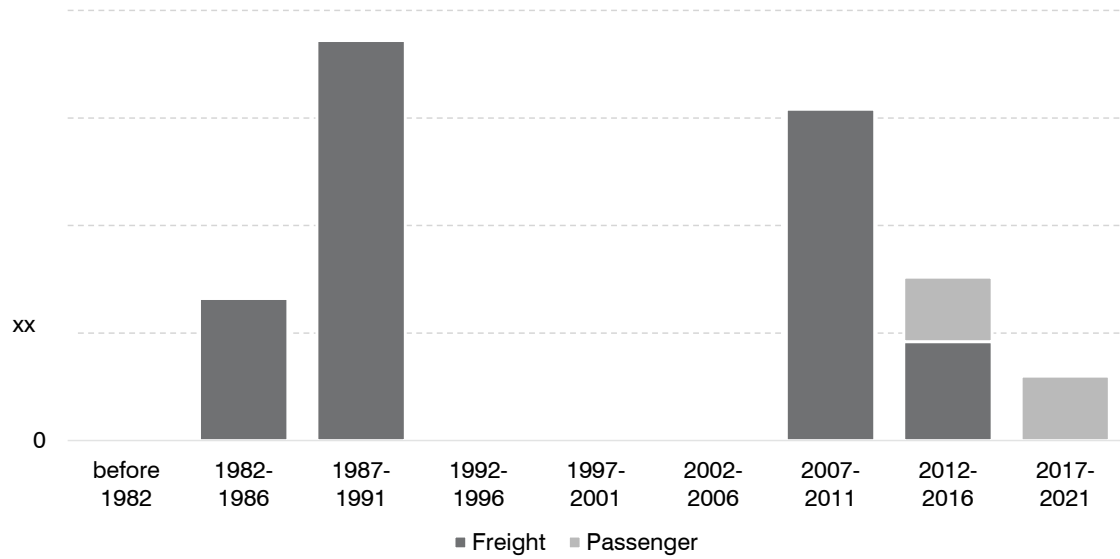


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Figure 3: Installed base of electric locomotives in the Australia/Pacific region

Procurements of electric mainline locomotives in the Australia/Pacific region took volatile trends and were undertaken in cycles. After a period with no deliveries at the end of the old century/beginning of the new century, from 2008 on, many new locomotives entered the region until 2014. In the recent five-year period 2017-2021, (...).

**Age structure of electric locomotives in Australia/Pacific (xx units)**



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Figure 4: Age structure of electric locomotives in the Australia/Pacific region

**Ownership/operatorship**

(...) xx operators have an electric locomotive fleet. The installed base of electric locomotives in Australia is operated by Aurizon, (...), the locomotives in New Zealand by state-owned operator KiwiRail. With xx% of the fleet, Aurizon operates the by far largest part.

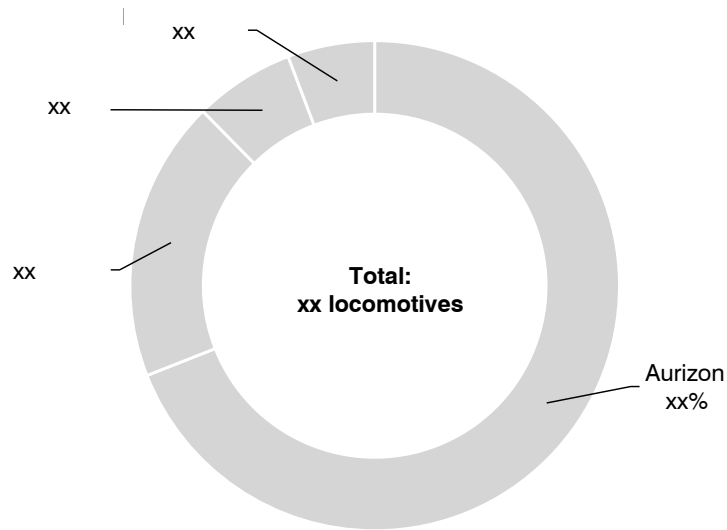
Owner type of installed base 2021	Incumbent	Competitor	Total
<b>Total (%)</b>	xx	xx	<b>xx</b>
<b>Total (units)</b>			<b>xx</b>

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(...)



**Owner of electric locomotives in Australia/Pacific (xx units)**



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Figure 5: Owner of electric locomotives in the Australia/Pacific region

Following deliveries by consortia involving the two locomotive manufacturers Alstom and Bombardier to Australia in the 1990s and the beginning of the 2000s, Siemens Mobility has been (...)

The most important products in the Australia/Pacific region are the following:

- **3500/3600 class:** is a class of six-axle locomotives built by Walkers Limited between xx and xx. xx units were ordered in xx to operate coal trains on the Blackwater and Goonyella railway lines. Later, another xx units were ordered and delivered as **3900 class**.
- **3900 class:** is a class of six-axle electric locomotives built by (...)
- (...)
- **E40AC (3800/7100 class):** was designed by Siemens for heavy duty freight services. The mechanical manufacturing of carbody and bogies is newly designed. Its electrical system is based on standard components and the proven design of (...)
- (...)

**Market volume and market development**

The current market volume for new electric locomotives in the Australia/Pacific region is xx; for after-sales services, it is around EUR xx million p.a.

This market development is influenced by the following drivers:

Drivers of procurement	Brief description	Relevance	Trend
<b>Political environment/ Investment funds</b>	<ul style="list-style-type: none"> <li>(...)</li> <li>(...)</li> <li>In 2020, Aurizon announced a \$50 million Future Fleet Fund as part of a climate strategy. SCI Verkehr expects that the investment will be mainly spent to (...).</li> </ul>	☺	xx
<b>Fleet structure</b>	<ul style="list-style-type: none"> <li>The current electric locomotive fleet consists partly of locomotives ordered in the late 1980s and of new locomotives delivered since the mid-2000s.</li> <li>The great majority of the locomotives delivered in the 80s and 90s have underwent modernisations. Modernised locomotives such as the Class 3100/3200 or Class 3900 are expected to (...).</li> </ul>	xx	→
<b>Transport demand</b>	<ul style="list-style-type: none"> <li>Transport demand is largely dependent (...).</li> <li>However, the demand depends greatly on the business (...)</li> </ul>	xx	xx
<b>Technology trends</b>	<ul style="list-style-type: none"> <li>(...)</li> </ul>	☹	↗
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>The line network in this market region comprises more than xx km with an electrification degree at around xx%. SCI Verkehr (...).</li> </ul>	xx	xx

Relevance for procurement: ● = very high, ● = high, ● = medium, ☺ = low, ○ = none  
 5-year trend: strongly increasing ↑, increasing ↗, constant →, decreasing ↘, strongly decreasing ↓

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(...)

**Important current and planned procurement and modernisation projects**

Country	Vehicle type	Units	Operation	Period	Remarks
New Zealand	xx	15	xx	2020-xx	In October 2018, KiwiRail and the authorities decided to (...). Works on the first locomotive had begun end of 2020 – the first locomotive is scheduled to (...).
Australia	xx	xx	xx	xx	xx

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