



# Investigating the role of transport as part of Green Bond investment considerations

## Synthesis Briefing - Module 3

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## EXECUTIVE SUMMARY

It is now clear that there are serious concerns about the environmental, social and economic viability of fossil fuels with growing pressure to transition to cleaner and cheaper energy sources. For instance, in November 2019, Sweden's central bank, Riksbank, announced its decision to sell bonds from Western Australia, among other regions, based on performance on reducing greenhouse gas emissions, stating, *"We are now rejecting issuers who have a large climate footprint."*<sup>1</sup> The Deputy Governor of Riksbank said, *"Australia is not a country known for good climate work"* and therefore Riksbank are more interested in investing in assets which are provided by issuers who are aligned with their goal of sustainability.<sup>2</sup> Along with other pressures, this tangible shift in investment policy by a foreign investor has called for careful consideration of the greenhouse gas intensity of Governments offering international bonds, with a key focus being on transport given the potential for electrification coupled with renewable energy to reduce emissions cost effectively in the short term.

The serious trend away from investment in fossil fuel related investments has been growing for a decade with Peabody Energy - once the world's largest publicly traded coal company - filing for bankruptcy protection to restructure under debts of US\$10 billion after its share price plummeted from US\$1,200 in April 2011 to less than \$3 by April 2016.<sup>3</sup> The same year the United Nations led a global mandate in the form of the 'Paris Agreement' which called for each nation to nominate 'Nationally Determined Contributions' to meeting the global goal of *'keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels'*. By late 2016, 144 countries; representing over 80 percent of global greenhouse gas (GHG) emissions; had ratified the agreement. Some of the world's largest GHG emitters have made ambitious targets, with India seeking to move away from fossil transport fuels with India's Minister of State, stating *"The idea is that by 2030, not a single petrol or diesel car should be sold in the country"*.<sup>4</sup>

Such moves to significantly reduce fossil fuel consumption are causing a shift in investment priorities, especially amongst those who seek medium to long term returns. This is particularly important for pension and superannuation funds, or those with social good outcomes in mind, such as philanthropic groups, faith-based organisations, local governments, and universities. For instance JPMorgan Chase now lists new coal mines or coal fired power plant developments in a high income OECD country under their 'prohibited transactions' alongside child labour and illegal logging.<sup>5</sup> In Australia many organisations have now committed to fully divest from fossil fuel related investments. For instance the City of Melbourne has committed to not invest any of its \$38 million portfolio into companies with fossil fuel related activities, and requested its staff superannuation fund to offer a fossil-fuel free option.

By committing to fossil-fuel divestment, the assets and investments will be sold and the revenue shifted to other investments with better long term prospects. These include the renewable energy sector, which has seen the cost of energy generation plummet in the past three decades. Hence, those who sell soon will benefit, but those that wait are very likely to see the appetite for fossil fuel investments significantly drop in the coming years. The real buzz in the investment community is in the area of 'Green Bonds' with the French Government receiving offers of €23 billion for green bonds with a term of 22 years and a fixed interest return of 1.75 percent.<sup>6</sup> In Australia a number of organisations have taken advantage of this also. For instance the Treasury Corporation of Victoria raised \$300 million in 48 hours with a 5 year timeframe and an agreed interest rate of 1.75 percent, Monash University raised \$218 million with a 20 year timeframe and an agreed interest rate of 'well below 5 percent', and the Queensland Government raised \$750 million using AA+ rated green bonds with a 7 year timeframe and an agreed interest rate of 3 percent. There is significant potential to improve the attractiveness of bonds by improving the environmental performance of the transport sector that warrants further investigation.

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<sup>1</sup> Flodén, M. (2019) 'Flodén: Riksbank Selling Bonds for Climate Reasons' [Speech] at: Örebro University and Kommuninvest, Örebro

<sup>2</sup> Reuters (2021) 'Sweden's central bank dumps Australian bonds over high emissions', The Guardian.

<sup>3</sup> Lannin, S. (2016) 'Coal miner Peabody Energy files for bankruptcy protection', ABC News.

<sup>4</sup> Greenpeace (2017) 'Aircapocalypse: Assessment of Air Pollution in Indian Cities', Greenpeace.

<sup>5</sup> JPMorgan Chase and Co (2017) 'Environmental and Social Policy Framework', JPMorgan Chase and Co.

<sup>6</sup> Luxembourg Times (2017) 'France issues first 'green bonds' with record 7 billion euro sale', Luxembourg Times.

# INTRODUCTION

## Overview of Green Bonds

In simple terms a 'Bond' is a formal IOU issued by a government, company or bank, to an investor for a particular price over a set term, based on the promise of repayment of the price paid plus a fixed amount of interest, referred to as the 'coupon'. Since 2011 interest in this mechanism to direct capital towards 'green' projects has grown with some US\$150 billion of green bonds issued internationally by 2017, however this is less than 1 percent of the global value of listed bonds, and reached US\$267 billion by 2019. A study by The Climate Bonds Initiative in 2016 suggested that along with the amount of labelled green bonds at the time, nearly US\$118 billion, there was as much as US\$576 billion in 'climate-aligned bonds' that were not designated as 'green'. The majority of both green bonds and climate-aligned bonds are invested in transport (66.8%) and energy (18.8%), with some 36 percent of the overall bonds held by China.<sup>7</sup> A study has shown that between 2014 and 2018 green bonds out-performed the closest equivalent S&P Index with a 5 basis point premium in the secondary bond market.<sup>8</sup>

In 2016 the government of Victoria became the first Australian government to use green bonds when it raised AU\$300 million in 48 hours,<sup>9</sup> and shortly after, Monash University raised AU\$218 million. Approved investments as part of the Monash University green bonds included a 5 star green star certified building, restoration of an existing library, as well as \$6 million solar panel installation and external LED lighting project.<sup>10</sup> The President and Vice-Chancellor of Monash University, Professor Margaret Gardner said, '*Monash has a responsibility to provide strong and visionary leadership on sustainable development*'. In 2017 the Queensland Government raised AU\$750 million using AA+ rated green bonds with a 7 year timeframe and an agreed interest rate of 3 percent. The investment was earmarked to be used for a number of sustainable transport (including cycleways and additional railway infrastructure) and renewable energy related projects (including a solar farm in the Sunshine Coast).<sup>11</sup>

The Big Banks in Australia have also explored the potential of green bonds - offerings have been oversubscribed - with Australia's first green bond issued by the National Australian Bank (NAB) in 2014. It was issued with the intention to raise \$150 million for renewable energy investments, and was raised to \$300 million due to significant demand. The energy projects financed by NAB's green bonds, are expected to have a capacity of 1.5 gigawatts of renewable energy, which is enough energy to power 730,000 homes for 1 year, and avoiding nearly 4 million tonnes of greenhouse gas emissions a year. ANZ followed suit and raised \$600 million using green bonds to finance green buildings in Australia, New Zealand and parts of Asia and renewable energy projects in solar and wind generation.<sup>12</sup> Westpac issued its first green bonds in 2016 and raised \$500 million towards renewable energy and low carbon commercial property projects within Australia.<sup>13</sup> The Commonwealth Bank issued its first green bonds in 2017 for the amount of \$650 million in order to finance 12 projects in renewable energy, green buildings and low carbon-transport.<sup>14</sup>

In January 2017 the Government of France launched the largest and longest ever green bond program. The French Sovereign Green Bond issuance cultivated offers of €23 billion and allocated €7 billion (around AUD\$32 and AUD\$10 billion respectively in January 2017) with a term of 22 years and a fixed interest return of 1.75 percent. Reporting on the program will be done by a 'Green Bond Evaluation Council' made up of independent experts.<sup>15</sup> In an attempt to provide some structure around this new form of bond the International Capital Market Association created the "Green Bond Principles" and as part of this process has created a set of typical investment times suitable for green bonds, namely:<sup>16</sup>

<sup>7</sup> Climate Bonds Initiative (2016) 'Bonds and climate change: The state of the market in 2016', Climate Bonds Initiative.

<sup>8</sup> Partridge, C. and Medda, F. (2020) 'The evolution of pricing performance of green municipal bonds', Journal of Sustainable Finance & Investment, 10:1, 44-64.

<sup>9</sup> Andrews, D. (2016) 'Victorian Green Bonds An Australian and World First', Victorian Government.

<sup>10</sup> Dembek, K. Madhavan, D. Michaux, F. Potter, B. (2016) 'Impact Investing Australia: Investor's Report', Impact Investing Australia.

<sup>11</sup> Climate Bonds Initiative (2021) Queensland Treasury Corporation, Climate Bonds Initiative.

<sup>12</sup> Conroy, J. (2015) 'Australian Investors Lap Up ANZ Green Bonds', Australian Business Review.

<sup>13</sup> Westpac (2016) 'Westpac Prices its First Climate Bond', Westpac Media Releases, Westpac Bank.

<sup>14</sup> Commonwealth Bank (2017) Commonwealth Banks Launches Inaugural CBA Climate Bond, Commonwealth Bank.

<sup>15</sup> Agence France Tresor (2018) 'January 24 2017: Launch of the green OAT 1.75% 25 June 2039', Government of France, [www.aft.gouv.fr](http://www.aft.gouv.fr)

<sup>16</sup> ICMA (2016) 'The Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds', International Capital Market Association.

- Renewable energy (including production, transmission, appliances and products);
- Energy efficiency (such as in new and refurbished buildings, energy storage, district heating, smart grids, appliances and products);
- Pollution prevention and control (including wastewater treatment, greenhouse gas emissions control, soil remediation, recycling and waste to energy, value added products from waste and remanufacturing, and associated environmental monitoring analysis);
- Sustainable management of living natural resources (including sustainable agriculture, fishery, aquaculture, forestry and climate smart farm inputs such as biological crop protection or drip-irrigation);
- Terrestrial and aquatic biodiversity conservation, (including the protection of coastal, marine and watershed environments),
- Clean transportation (such as electric, hybrid, public, rail, non-motorized, multi-modal transportation, infrastructure for clean energy vehicles and reduction of harmful emissions);
- Sustainable water management (including sustainable infrastructure for clean and/or drinking water, sustainable urban drainage systems and river training and other forms of flooding mitigation);
- Climate change adaptation (including information support systems, such as climate observation and early warning systems); and
- Eco-efficient products, production technologies and processes (such as development and introduction of environmentally friendlier, eco labelled or certified products, resource efficient packaging and distribution).

In 2010 the Climate Bonds Initiative launched the 'Climate Bond Standard and Certification Scheme' as a voluntary standard that allows bond issuers to receive certification for their projects and that is aligned to the green definitions for transport in the EU taxonomy on sustainable finance. The scheme lists several automatically eligible transport related assets that can be certified including:<sup>17</sup>

- Most fully electric, hydrogen, or other zero-direct emissions transport - including private vehicles, passenger trains, urban subway/metro, trams, and their directly supporting infrastructure;
- Electric charging and hydrogen fuelling infrastructure;
- Public walking and bicycle infrastructure; and
- Some types of manufacturing facilities for components of the above.

The scheme also lists a set of assets that are eligible with considerations for CO<sub>2</sub> emissions, for improving GHG emission efficiency during an interim of improvement. The thresholds in these considerations for vehicles is maximum of 50 grams of CO<sub>2</sub> per passenger kilometre for direct emissions from eligible passenger vehicles issued after 2020, and zero emissions after 2025. Direct emissions from eligible freight vehicles are restricted to 25 grams of CO<sub>2</sub> per tonne kilometre up to 2030, 21 grams up to 2050 and 18 grams thereafter.<sup>18</sup> These limited assets are:

- Zero direct-emissions (such as electric or hydrogen) freight rail for which <25 percent of its freight is fossil fuels;
- Hybrid private vehicles (not including trucks);
- Fossil fuelled public transport;
- Technology and infrastructure that allows for car sharing schemes, road charging systems, better utilisation of public transport, and other such systems.

The EU created a voluntary Green Bond Standard with the intention to "*enhance the effectiveness, transparency, comparability and credibility of the green bond market and to encourage the market participants to issue and*

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<sup>17</sup> Climate Bonds Initiative (2020) 'Low Carbon Transport, Transport Criteria: Climate Bonds Standard', Climate Bonds Initiative.

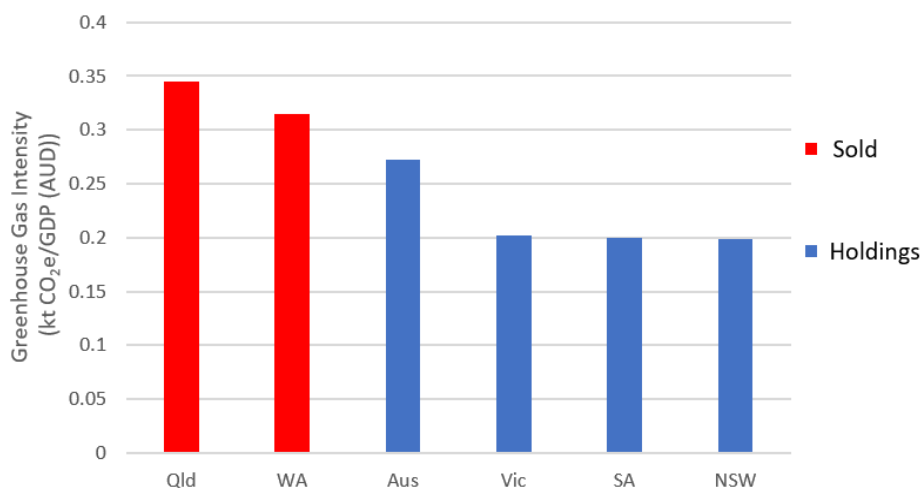
<sup>18</sup> Climate Bonds Initiative (2020) 'Low Carbon Transport, Transport Criteria: Climate Bonds Standard', Climate Bonds Initiative.

invest in EU green bonds."<sup>19</sup> The standard lists appropriate transport related uses for Green Bond proceeds including:

- Acquisition and operation of hybrid passenger and commercial vehicles emitting less than 50g of CO<sub>2</sub> per kilometre until 2025 and then zero emissions thereafter.
- Acquisition and operation of hybrid freight transport vehicles emitting less than 1g of CO<sub>2</sub> per kWh, or CO<sub>2</sub> emissions less than 50 percent of reference emissions of all vehicles in same subgroup.

## Divestment and Green Bonds

According to a report by the Asian Development Bank some 18 central banks across Asia and the Pacific have divested from standard bonds in favour of green bonds, stating that such banks ‘believe they should be playing a key role in promoting green finance’.<sup>20</sup> In November 2019, Sweden's central bank, Riksbank, announced its decision to sell bonds from Western Australia, among other regions, based on poor performance on reducing greenhouse gas emissions, stating, “We are now [contributing to climate change mitigation] by rejecting issuers who have a large climate footprint.”<sup>21</sup> These bonds equate to \$1.26 billion dollars across the three regions affected by this new policy (WA, Queensland and Alberta, Canada), out of a total investment of \$5.36 billion by Riksbank in Australia and Canada.<sup>22</sup> The Deputy Governor of Riksbank, Martin Flodén, said that, “Australia is not a country known for good climate work” and therefore Riksbank are more interested in investing in assets which are provided by issuers who are aligned with their goal of sustainability.<sup>23</sup> The Riksbank has outlined that they will only invest in Australian states with lower greenhouse gas intensity than the national average, which is presented in Figure 1.<sup>24,25</sup>



**Figure 1:** Riksbank investment based on Greenhouse Gas Intensity of States with reference to National Average

Source: Adapted from Riksbank<sup>26</sup> and based on data from the Federal Australian Government<sup>27,28,29</sup>

<sup>19</sup> European Commission (n.d.) 'European Green Bond Standard', European Commission.

<sup>20</sup> Durrani, A., Volz, U. and Rosmin, M. (2020) 'The Role of Central Banks in Scaling Up Sustainable Finance: What Do Monetary Authorities in Asia & the Pacific Think?', Asian Development Bank Institute.

<sup>21</sup> Flodén, M. (2019) 'Flodén: Riksbank Selling Bonds for Climate Reasons', [speech], Sverige Riksbank.

<sup>22</sup> Flodén, M. (2019) 'Monetary Policy in a Changing World', [speech], Sverige Riksbank.

<sup>23</sup> Reuters (2021) 'Sweden's central bank dumps Australian bonds over high emissions', The Guardian.

<sup>24</sup> Breman, A. (2020) 'How the Riksbank can Contribute to Climate Policy' [speech], Sverige Riksbank.

<sup>25</sup> Flodén, M. (2019) 'Monetary Policy in a Changing World', [speech], Sverige Riksbank.

<sup>26</sup> Breman, A. (2020) 'How the Riksbank can Contribute to Climate Policy' [speech], Sverige Riksbank.

<sup>27</sup> Australian Government (2020) 'National Greenhouse Gas Inventory: December 2019', Department of Industry, Science, Energy and Resources, Australian Government.

<sup>28</sup> Australian Government (2020) 'Australian National Accounts: State Accounts', Australian Bureau of Statistics, Australian Government.

<sup>29</sup> Australian Government (n.d.) 'National Greenhouse Accounts 2019', Department of Industry, Science, Energy and Resources, Australian Government.



The decision by Riksbank is representative of a broader investment trend away from high-polluting investments, such as fossil fuel intensive investments, and towards 'greener' investments in the form of 'Green Bonds'.<sup>30</sup> In fact, between 2007 and 2020, a total of US\$1 trillion in green bonds was issued, increasing exponentially and having doubled between 2018 and 2020, with rapid growth expected to continue.<sup>31</sup> One of the major bodies certifying green bonds is the 'Climate Bonds Initiative', a non-profit organisation that has created a Climate Bonds Standard. While not all green bonds follow the Climate Bonds Standard, it is a useful reference that builds upon the requirements of the EU's European Green Bonds Standard.<sup>32</sup>

## Rationale for Greener Investments

There is an increasing financial risk linked to climate change which central banks are becoming more cautious of. This includes transition risk, where a company either cannot or does not adapt to lower emissions operations.<sup>33</sup> These risks often demonstrate higher costs and lower income which ultimately deter central banks from investing in projects or investments which are not aligned with their sustainability purpose or goals. The approach that the Riksbank and other large organisations are now taking is to only purchase bonds issued by entities which are assessed to deliver on sustainability principles formulated in international standards and norms.<sup>34</sup>

In fact, banks are now using the process of norm-based negative screening to identify bonds issued by companies which uphold these international standards and, therefore, have a reduced financial risk linked to sustainability. The European Investment Bank has similarly decided to end its investment in fossil fuels by the end of 2021, instead financing renewable energy and storage, as well as e-mobility, both inside and outside of the European Union.<sup>35</sup> Hence climate change can no longer be ignored by those seeking to offer investment opportunities such as bonds,<sup>36</sup> as the governments of Western Australia, Queensland and Alberta recently found. It is likely that other central banks will follow suit if such governments do not take strategic action to reduce greenhouse gas emissions.

There are long-term benefits involved in investing in sustainable projects, which align with the usual long-term nature of investing in bonds. Hence, there is now a greater consideration of sustainability for central banks when they consider purchasing investments.<sup>37</sup> Such efforts to improve environmental and sustainability related performance will be of strong interest for 'Environmental, Social and Governance' (ESG) investors who want to fulfil ethical and social responsibilities by supporting projects with a positive and sustainable impact on the environment and society. However such investment opportunities will also be of interest to standard investors who will see investment in green bonds as a wise opportunity for long-term investment.<sup>38</sup> In the long run these bonds will become stronger credits and will rise in value, while promoting a more sustainable business model.<sup>39</sup> The shift towards green bonds and other associated investments will also increase the demand for greener assets and infrastructure which align with these ESG principles, such as EVs and sustainable transport options.<sup>40</sup>

Central banks and foreign investors around the world continue to become more educated and aware of how the economy is negatively affected by climate change, and how they can, through their investments in selected bonds, encourage sustainability and decrease dependence on fossil-fuels in their economies.<sup>41</sup> Although central banks

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<sup>30</sup> Arabella Advisors (2018) 'The Global Fossil-Fuel Divestment and Clean Energy Investment Movement', Arabella Advisors.

<sup>31</sup> Jones, L. (2020) '1 Trillion Mark Reached Global Cumulative Greens Issuance Climate Bonds Data Intelligence Reports' Climate Bonds Initiative.

<sup>32</sup> Climate Bonds Initiative (2020) 'Certification under the Climate Bonds Standard', Climate Bonds Initiative, [www.climatebonds.net](http://www.climatebonds.net)

<sup>33</sup> Anderson, M. and Stenström, M. (2021) 'Sustainability Considerations when Purchasing Corporate Bonds' Sveriges Riksbank: Economic Commentary.

<sup>34</sup> Anderson, M. and Stenström, M. (2021) 'Sustainability Considerations when Purchasing Corporate Bonds' Sveriges Riksbank: Economic Commentary.

<sup>35</sup> Willis, R. (2019) 'EU Bank Launches Ambitious New Climate Strategy and Energy Lending Policy' European Investment Bank.

<sup>36</sup> Anderson, M. and Stenström, M. (2021) 'Sustainability Considerations when Purchasing Corporate Bonds' Sveriges Riksbank: Economic Commentary.

<sup>37</sup> Anderson, M. and Stenström, M. (2021) 'Sustainability Considerations when Purchasing Corporate Bonds' Sveriges Riksbank: Economic Commentary.

<sup>38</sup> Eggerstedt, S. (2020) 'Green and ESG Bonds: What's Behind their Rise', Schroders.

<sup>39</sup> Alonso-Conde, A. and Rojo-Suárez, J. (2020) 'On the Effect of Green Bonds on the Profitability and Credit Quality of Project Financing', Sustainability 2020, 12, 6695

<sup>40</sup> McCoach, L. (2021) 'Green Bond Market in Australia and Overseas' G+T Lawyers.

<sup>41</sup> Andersson, M. and Stenström, M. (2021) 'Sustainability considerations when purchasing corporate bonds', Sveriges Riksbank.

and foreign investors are only recently starting to consider sustainability and climate risk when purchasing bonds, they have always considered financial risks in decision making.<sup>42</sup> Hence, as there is now a clear nexus between financial sustainability and environmental sustainability, it is becoming more important to consider the emissions and climate impact of a potential issuer before purchasing a bond. In 2021 the Western Australian Treasury Corporation announced its intention to "*develop a Sustainability Bond Framework to facilitate the issuance of Green, Social or Sustainability bonds to finance direct government expenditure on eligible assets to support the WA Government's ongoing commitment to continuous improvement of the State's ESG outcomes*".<sup>43</sup>

## GREEN BONDS AND TRANSPORT

### Potential for Transport to improve investment attractiveness

According to the Climate Bonds Initiative transport operators are some of the early leaders in the green bond space with Société du Grand Paris becoming the largest certified issuer in 2020 with US\$12.2 billion as part of a decade-long expansion of the Paris commuter and metro rail network. Also the New York MTA has issued 4 billion, Los Angeles County MTA has issued US\$1.4 billion, and the Japan Railway Construction, Transport and Technology Agency (JRRT) has issued 1.3 billion in green bonds.<sup>44</sup> Volkswagen also have a focus on the green bonds and have brought to the market some US\$2.2 billion in bonds to finance their electric vehicle program. In WA, the transport industry accounts for 16 percent of all greenhouse gas emissions, equivalent to 14.9Mt CO<sub>2</sub>e per year. This is slightly less than the national average of 19 percent, however approximately half of these emissions in both jurisdictions are from light passenger vehicles.<sup>45</sup> Electrification of transport is, therefore, a major opportunity to reduce emissions. Electric Vehicles (EVs) generate a third of the greenhouse gas emissions that ICVs generate per kilometre, with most of these emissions created from electricity that was generated by fossil fuels.<sup>46</sup>

Introducing additional cycling infrastructure to discourage short-range private vehicle usage has been shown to reduce greenhouse gas emissions from light vehicle transport by up to 5 percent,<sup>47</sup> with some high adoption scenarios projecting up to 11 percent emissions reduction by 2050.<sup>48</sup> However, on its own, it is unlikely that increased cycling infrastructure would reduce emissions to the point that would alleviate overseas investor concerns. Some cities, such as Oslo, Norway, have successfully reduced the amount of greenhouse gases produced from transport by up to 15 percent, though this has mostly been through the adoption of alternative fuels, such as electricity and biofuels.<sup>49</sup> Other green bond issuers would be likely to invest in regions with commitments to pedestrianisation and cycling infrastructure, as they are considered automatically eligible under the Climate Bonds Standard.<sup>50</sup>

When considering shared transit infrastructure such as public buses there is some short-term potential to attract investment as fossil fuel public transport can be certified under the Climate Bonds Standard if it emits less than 50 grams of CO<sub>2</sub> per passenger per kilometre travelled. However this will no longer be the case after 2025 when the requirement will be for zero operational emissions. Electrification of road-based public transport infrastructure is automatically considered eligible under this standard, as is the use of hydrogen fuel cells.<sup>51</sup> Trackless Trams as a corridor based mid-tier transport option is gaining interest across Australia, led in part by efforts by the Sustainable Built Environment national Research Centre (SBEnc) and the Curtin University

<sup>42</sup> Andersson, M. and Stenström, M. (2021) 'Sustainability considerations when purchasing corporate bonds.' Sveriges Riksbank.

<sup>43</sup> WA Government (2021) Supporting continuous improvement in ESG outcomes for Western Australia, Government of Western Australia, August 2021.

<sup>44</sup> Jones, L. (2021) 'Record \$269.5bn green issuance for 2020: Late surge sees pandemic year pip 2019 total by \$3bn', Climate Bonds Initiative.

<sup>45</sup> BITRE (2009) 'Greenhouse gas emissions from Australian transport: projections to 2020, Working paper 73', Bureau of Infrastructure, Transport and Regional Economics, Canberra ACT

<sup>46</sup> US Department of Energy (2016) 'Emissions from Hybrid and Plug-In Electric Vehicles', US Department of Energy.

<sup>47</sup> Neves, A. and Brand, C. (2019) 'Assessing the potential for carbon emissions savings from replacing short car trips with walking and cycling using a mixed GPS-travel diary approach' Transportation Research Part A: Policy and Practice, Volume 123, Pages 130-146,

<sup>48</sup> Mason, J., Fulton, L. and McDonald, Z. (2015) 'A Global High Shift Cycling Scenario', The Institute for Transportation & Development Policy and the University of California, Davis.

<sup>49</sup> City of Oslo (2019) 'Climate Statistics', The City of Oslo.

<sup>50</sup> Climate Bonds Initiative (2020) 'Low Carbon Transport', Climate Bonds Initiative.

<sup>51</sup> Climate Bonds Initiative (2020) 'Low Carbon Transport', Climate Bonds Initiative.

Sustainability Policy Institute (CUSP).<sup>52</sup> The research team has undertaken an in-depth investigation of the use of Trackless Trams in Perth.<sup>53</sup> The research has led to the proposal of a fully electrified Trackless Tram System which would be eligible under the Climate Bonds Standard. The report proposes a 30km corridor system with an estimated cost of \$750 million,<sup>54</sup> compared to the Metro Area Express Tramway proposal that is expected to cost \$1.88 billion and cover 22km.<sup>55</sup> Such a significant reduction in cost, along with associated greenhouse gas emission reductions make such a mid-tier transport investment very attractive. SBEnrc and CUSP will be working with partners to undertake a trial of the Trackless Tram in Perth in 2021.

## Considerations for Construction

As of 2018 Non-Road Diesel Engines (NRDE) made up almost 6 percent of Australian GHG emissions (as well as twice the particulate emissions of the nation's vehicle fleet) and was forecast to rise by 25 percent by 2028. These engines are in non-transport vehicles and mechanical equipment. Australia has no standards to limits on emissions from NRDEs as in other countries including the USA, EU nations, China, India and Turkey, though Australian Environmental Ministers have initiated and are approaching publication of a discussion document for NRDE emission regulation.<sup>56,57</sup> While the Climate Bonds Initiative certifications does not list or consider NRDE investment in its bond certification, criteria for cement is being developed and the mitigation of emissions by NRDEs can reduce the state's total emissions.<sup>58</sup> The high potential for improvement in Australia means that Western Australia can lead the national field and improve its emissions per GSP relative to that of the country, and increase appeal to green investors, including recently withdrawn Riksbank.

Zero emission building sites have been demonstrated in Norway, where at an Oslo building site spanning a 100 metre thoroughfare there was mitigation of 99 percent of GHGs - equivalent to removing 20 cars from the road for the year – by substituting NRDE machinery for electrical machinery powered by batteries or the electricity grid.<sup>59,60</sup> Additionally Norway has committed to making municipalities' construction fossil-fuel free by 2021 and emission free by 2025<sup>61</sup> and Oslo, Budapest, Los Angeles and Mexico City have agreed to targets of reducing embodied GHG emissions in major work for infrastructure by 30 percent by 2025.<sup>62</sup> A report by C40 Cities, Arup and the University of Leeds suggests several initiatives for reducing emissions from construction in cities by up to 44 percent by 2050, including: Low emission construction machinery, efficient material design, improving existing building use, substituting high-emission materials, lower-carbon cement, and reuse of components and materials.<sup>63</sup>

The substitution of fossil fuel in construction fleets and equipment with hydrogen fuel cells offers potential for reducing emissions, although is highly dependent on hydrogen fuel processing carbon efficiency. It is likely to be counter-productive compared to electric alternatives given most of the limited amount of hydrogen produced is through the process of methane reforming (a process which produces both carbon monoxide and carbon

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<sup>52</sup> Newman, P., Mouritz, M., Davies-Slate, S., Jones, E., Hargroves, K., Sharma, R., and Adams, D. (2018) Delivering Integrated Transit, Land Development and Finance – a Guide and Manual: with Application to Trackless Trams. Sustainable Built Environment National Research Centre (SBEnrc), Australia.

<sup>53</sup> Mouritz, M., Newman, P., and Verschuer, M. (2020) Trackless Trams and Transit Activated Corridors in Perth: Mid-Tier Transit and Urban Regeneration Core Report. Sustainable Built Environment National Research Centre (SBEnrc), Australia.

<sup>54</sup> Mouritz, M., Newman, P., Verschuer, M. (2020) Trackless Trams and Transit Activated Corridors in Perth: Mid-Tier Transit and Urban Regeneration Core Report. SBEnrc 1.62 – Sustainable Centres of Tomorrow: People and Place.

<sup>55</sup> Government of Western Australia (214) MAX - Metro Area Express: 'About the Project – Anticipated timeline', The Government of Western Australia: Department of Transport.

<sup>56</sup> Australian Government (2020) 'Non-road diesel engines – evaluating a national approach to managing emissions, Discussion paper', Department of Agriculture, Water and the Environment, Department of Agriculture, Water and the Environment, Department of Agriculture, Water and the Environment.

<sup>57</sup> Australian Government (2020) 'Evaluation of Non-Road Diesel Engine emissions', Department of Agriculture, Water and the Environment, Department of Agriculture, Water and the Environment, Australian Government.

<sup>58</sup> Climate Bonds Initiative (n.d.) 'Steel', Climate Bonds Initiative.

<sup>59</sup> Ellingson, H. (2021) 'New pedestrian street brings new life to Oslo city centre', Klima Oslo.

<sup>60</sup> Keegan, M. (2021) 'The Scandinavian way to zero-carbon construction', Future Planet, British Broadcasting Corporation [www.bbc.com](http://www.bbc.com)

<sup>61</sup> Europa, B. (2021) 'Norwegian cities lead the way in reaching zero-emissions in construction sites', Bellona.

<sup>62</sup> C40 Cities (2021) 'How to reduce embodied emissions in municipal construction and lead by example', C40 Cities Climate Leadership Group, C40 Knowledge Hub.

<sup>63</sup> C40 Cities (n.d.) 'Mayors of Copenhagen, Oslo and Stockholm Commit to Clean Construction', C40 Cities Climate Leadership Group.

dioxide).<sup>64</sup> However, hydrogen fuel cells may be able to provide a viable solution when produced using renewable energy that may result in reductions in greenhouse gas emissions, however the fuel still needs to be transported.<sup>65</sup>

The retrofitting of hydrogen supplements to diesel engines offers significant GHG emission reductions from reduced diesel consumption – the savings stem from cheaply generating hydrogen with water and mains electricity, which is increasingly decarbonising in generation sources with the uptake of renewable energy. Alternatively, there are on-demand systems retrofitted to diesel machines which utilise engine power and water to produce hydrogen, as in the scalable HYDI system. Currently, the technological capability to electrify construction fleets and equipment is in its early stages. Some companies, such as Caterpillar, are currently working toward electric/diesel and electric/biofuel hybrid construction vehicles, with such technology likely to become commercially available in Australia.<sup>66</sup> Currently, the amount of greenhouse gas emissions produced from construction fleets and equipment in WA is not publicly available as construction is grouped with all non-energy mining and manufacturing.<sup>67</sup>

## **FURTHER INVESTIGATION**

The following specific areas are recommended for further investigation:

- a) Research into the relative contribution of different types of 'green' transport programs and assets related to electric vehicles toward the green credentials of bonds, including research into how investment in electric vehicle related programs and assets to bolster green bond performance can generate additional revenue opportunities.
- b) Research into the potential for electrification of vehicles, plant and equipment in the construction sector can reduce greenhouse gas emissions and enhance the attractiveness of government bonds.
- c) Research into the process of achieving 'climate bond certification' and how electric vehicle related programs and assets would be assessed.
- d) Research into the potential to access finance to invest in such programs and assets as part of green financing, including consideration of job creation potential

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<sup>64</sup> Gonclaves, A. (2019) 'Hydrogen Cars vs. Electric Cars: Which is More Sustainable?'. Youmatter.

<sup>65</sup> Blank, K., Kirk, T. and Muralidharan, R. (2019) 'Pulling the Weight of Heavy Truck Decarbonization: Exploring Pathways to Decarbonize Bulk Material Hauling in Mining', Rocky Mountain Institute.

<sup>66</sup> Meagar, D. (2020) 'Sustainability in the Construction Industry', The West Australian.

<sup>67</sup> Australian Government (2019) Quarterly Update of Australia's National Greenhouse Gas Inventory, Department of the Environment and Energy, Australian Government.