MEND THE GAP

Disability Action Research Kollective

This zine features work by
Richard Amm

Summary

Why do step-free boarding:

Generate 72.4 billion for the UK economy, but only cost 6 billion.

Train floors and platform positions are not required to match even on new infrastructure.

There is no plan to ever achieve step-free boarding across the majority of the network.

The gap causes 21% of all injuries and 48% of all deaths on the railway network.

There are 14 million disabled people in the UK, and the most common barrier to work is transport.

Ramped boarding fails at a rate of 15%.

Reduced dwell times, more capacity, faster and more reliable transport.

How to do step-free boarding:

Enforce precise placement when building or fixing platforms. (915mm height, 730mm offset)

Mandate a procurement standard for matching low floor heights when buying new trains.

Update policy documents, making standards mandatory instead of optional.

Introduction

“Accessible”, “Fully Accessible” and “Access for all” often only involve access from street to platform and do not include level boarding from platform to train. Level boarding is being able to get from the platform to the train independently, without the need for organising staff to provide a portable ramp. While accessibility is included in information gathering and considered in station remediation, level boarding is often not.

There are a variety of reasons why the gap exists. The UK built some of the earliest rail systems, but they were never intended to be joined together, and so there were no coherent Standards. To this day, different rail companies have monopolies in different areas, and each has its own approach. There is still no enforcement for platform placement standards or for train floor heights. New trains and platforms are still being built and bought that are not compatible (e.g. Thameslink, Crossrail, Elisabeth Line, HS2, etc.) Inaccessible trains procured now will likely still be in service till 2065.

This zine is a distillation of an Engineering MSc project by Richard Amm, and the solutions are heavily drawn from those proposed by railway Engineer Gareth Dennis and the Campaign for Level Boarding. Particularly #RailNatter Episode 31: Is level boarding on trains really that hard to achieve? and #Railnatter Episode 275: This campaign made railways better for everyone.

Experiences of disabled passengers

“I always pick up a free paper to wave out of the door in case there is no arranged ramp at my destination.” - Andrea

David McQuirk, 49 years old, was forced to crawl onto the train after no staff turned up. He notifies train companies of his journeys 24 hours in advance, as wheelchair users are required to do for most stations so staff will be able to help them and provide ramps for them to get on, but estimates help fails to turn up on around 40% of his trips. He has said, “I’ve missed trains so many times, not being able to find staff.”

“I once was boarding a train via a ramp in a motorised wheelchair. At the bottom of the ramp, the rail assistant pushed the base of my wheelchair tray without my consent. The tray was pushed onto the controller on my wheelchair, which then drove me up the ramp at full speed. I took out two passengers before I hit the door on the other side of the train, breaking my foot.” - Michael Grimmett

“Got left on a train at Newcastle that was cancelled while en route to London, everyone got off and I was stuck. Ended up pissing myself on the train ‘cause the bathroom door was locked.” - Cassandra

Anne Wafula Strike, a Paralympian, while on a multiple-hour train journey, was forced to wet herself as there was no accessible toilet. She was unable to disembark because there were no staff at the stations to let her off. “I was completely

robbed of my dignity by the train company," she said. "I would like to ask the train company when will they give me my dignity back? As a disabled person, I have worked so hard over the years to build up my confidence and self-belief. Having access to a toilet, especially in a developed nation like the UK, is one of the most basic rights. I tried to conceal the smell of urine by spraying perfume over myself. When I finally got home after my nightmare journey, I scrubbed myself clean in the shower, then flung myself on my bed and sobbed for hours."

Risks with the current system

There are 14.1 million disabled people in the UK, and mobility impairments are the most common type. There are 1.2 million wheelchair users, and 5.1 million pensioners, with the number of pensioners to double in the coming years. One of the most common barriers to work for disabled people is difficulty with transport; for example, wheelchair users can't get on most of the London Underground. A 10% rise in the employment rate amongst disabled adults could contribute an extra £12 billion to the Exchequer by 2030.

It's been over 20 years since disabled people's right to access transport was passed into law, but many of us still can't even use our local train stations. Just 1 in 5 stations across the UK are step-free to the platform, and cuts to station improvement funds have meant that progress has now all but ground to a halt. Once you are on the train, you can only get off at your pre-booked destination, no matter how

long your journey is. Some trains do not have accessible bathrooms, or sometimes the bathroom is non-functional. Without step-free boarding, you cannot disembark in unsafe situations. If staff do not turn up, you are trapped on the train and might miss your destination. 15% of all booked assistance is not delivered or is delivered unsatisfactorily.

The gap makes up 21% of total injury risk and 48% of the total fatality risk of the entire rail network, and it is the source of the most serious accidents. In an average year, there are 57 accidents and 11 deaths at the gap.

Manual boarding ramps cause 7% of the total accidents on the rail network and increase dwell time. Currently, ramp boarding is associated with £1.5m annually in financial penalties and a total delay of 47,000 minutes to trains. It is also associated with a loss of £400k annually for injuries related to this task. Delays of 5 minutes happen once every 227 ramps.

Mythbusting

Myth 1: "You have to raise platforms extra high to get level boarding."
This myth thinks about the platforms in isolation, which would have to be raised high to meet existing trains which have extra-high floors. Step-free boarding would generally need platforms to be lowered, not raised. The trick is getting low-floor trains to replace the existing high-floor trains.

Myth 2: “Step-free access is incompatible with freight trains.”

This relies on the assumption of needing to raise platforms extra high, and is not true. Where platforms are raised to the level of the boarding standard, that is still compatible. Step-free access levels, with low platforms and low train floors, are entirely compatible with freight wagon clearance, on curved or straight platforms. A step-free platform will be compatible with all train types currently on UK networks. If platforms were raised extra high to meet existing train floor heights, then that would be incompatible with freight, but that isn’t what the level boarding standards propose. This is, however, the mistake HS2 and Crossrail made, which has prevented universal level boarding from ever being achieved without major reconstruction due to the extra-high platforms. Their attempt at having some stations with extra high-level boarding does prevent freight, but that was due to their not planning for low-floor trains.

Myth 3: “You have to fix all the platforms before introducing the trains.”

Level boarding trains can work with any existing platforms except for the high-type platforms, which are rare. Like the Stadler Fleet for Greater Anglia, they had low-floor trains but didn’t fix the platforms. So there was an improvement even without having done all the platforms. The life of a train is 30-40 years, but platforms can be done in a year, so trains need to be done first.

Myth 4: “It will not work on curved platforms.”
It will work on 98% of the network as level boarding is possible on all stations above a radius of 360 meters. There is a currently functioning example with the Stadler trains in the UK, which use mechanical gap fillers to handle curved platforms. Gauging is also less of an issue with step-free trains because they don’t have a permanent footstep. High and tight platforms, while rare, would generally need working on anyway, regardless of the trains used, but step-free trains would be more compatible with them than existing trains.

Myth 5: “It can’t be done on high-speed trains or diesel trains.”
This has also already been done by Stadler trains.

Myth 6: “It is less safe than having a step because people don’t notice the small gap.”
This is not at all supported by existing evidence, Merseyrail specifically improved safety which resulted in step free boarding and has data from before and after which shows it is significantly safer.

“The railway industry and the Department for Transport have waited too long to take action to resolve the risks at the platform train interface. Not only does this mean that disabled passengers – or indeed those with buggies or luggage – have a dreadful experience when getting on or off trains, but we are risking people’s lives for the sake of not setting that interface to a set of rules agreed long ago. I don’t think it is unreasonable to aspire to solve that problem.”

– Gareth Dennis,Engineer and Campaign for Level Boarding co-founder.

Modern Examples

Spain passed legislation in 2007 requiring all future train stock to have step-free access. Their railway operator, RENFE, has a rolling program of adapting existing trains, where a single carriage is replaced with one with a low floor and an accessible toilet. In 2025, the UK has no equivalent nationwide requirements for procuring train stock with low floors, only optional recommendations which are generally ignored.

The Netherlands has plans to make its entire rail network fully accessible by 2030. They are achieving this by standardising platforms and ensuring that new train stock matches those platforms. The London tube network plans on making all its stations accessible to the platform by 2096, with no plans on achieving universal level boarding from platforms to trains.

Thameslink (2018)
Their new trains had high floors as they were based on their existing trains, so level boarding was done by raising platforms to be much higher to achieve level boarding but only in central stations which could then not take freight. This led to people getting on independently at inner stations and then not being able to get off at outer ones, as they didn't book assistance.

Elisabeth Line & Crossrail (2022)
When plans for Crossrail were drawn up, seven stations along the line were planned to have no lifts or step-free access

to platforms, and it was only after years of campaigning by disabled people that this was addressed. Sadly, it did not plan universal level boarding, other than for a small handful of central London stations.. Crossrail was going to use the Heathrow platforms, which were extremely high, and set that as the standard for all of it. Instead, they should have fixed Heathrow to have low platforms. Views of those specifying the project at the time believed you had to raise the platform to achieve level boarding, but this was not the case. The raised platforms meant that freight trains would be blocked on those platforms, so they could only be done in central London stations. Which meant that getting on unassisted could mean nobody would know you were on there to get you off once it went to the outer stations, which were no longer step-free. This is particularly unhelpful for disabled people because most bungalows and accessible homes are generally not built in central London. Choosing an extra high platform design caused enough complaints that it may have made future projects with extra high platforms unlikely in future.

Merseyrail 777 upgrade (2023)
Because of a fatality, Merseyrail made new trains with level boarding a key part of the specification. Merseyrail also thought through the platform adaptations to match the low floors on the 777 trains. They made safety and accessibility a primary approach, and level boarding was an outcome. The trains also had “Toblerone” wedges to deflect falling people away from the edge and had electronic edge fillers to make the train-platform interface seamless. Some of the motorised gap fillers have been having issues. They have

seen a 90% drop in people needing assistance to travel, with the remaining people mostly being visually impaired people who need assistance getting on and off.

HS2 (Probably never)
They planned to have a high platform for HS2 and had to deal with low platforms everywhere else. They were going to have some kind of train-mounted ramp, but that was unlikely to ever work because of the narrow platforms like Penrith. It would hit the back wall of the platform. What they should have done instead is specify a standard level boarding solution.

Scotrail Suburban Fleet (Future) (EMU and BEMU), has announced that they "hope" and "anticipate" that future procurement will involve low-floor trains to achieve level boarding. While the get-out-of-jail phrases are included, this is promising because train procurement rarely considers level boarding. This indicates that awareness of level boarding is becoming increasingly mainstream. Most of the stations have already been corrected to be compatible.

Manchester Metrolink Trams - high-floor trams, but still matched the high platforms they reused.

Tyrne and Weir Metro - Original metro cars had low floors and used existing low platforms.

Greeter Anglia Fleet - Uses Stadler 745 and 755 trains, which have low floors and provide level boarding at mostly compliant platforms, but there is a mixture of platform

heights. It busts a lot of myths, it has loads of freight, and it all works, and lots of different platform heights and everything works.

Stadler trains have a range of trains that allow for level boarding. They have been successfully implemented in the UK in Merseyrail and Greater Anglia and may be the future of level boarding in the UK, as they are ahead of other manufacturers, as nobody else currently offers it in the UK at the time of writing (2025).

Alston and Siemens, the train manufacturers, have a new fleet for GB with low floors in the next wave of new trains, which will be level-boarding capable. These may only show up after 2030.

Alstom / Bombardier Transportation have a level boarding solution but did not launch it at the recent greatest gathering (2025). But they will be taking a fleet design from Europe, which has a low floor and introducing it to the UK in future.

CAF trains appear to have no interest in delivering a level boarding solution.

Hitachi trains appear to have no interest in level boarding.

“It’s absurd that we continue to buy and run trains that embed dependency and risk in their design. Disabled people want to travel independently where possible. Level boarding not only brings that ideal closer, but it makes everyone’s journey easier and safer. This is a win for everyone.”

– Alan Benson of Transport For All

Why is there no level boarding on new stations?

Only 20% of stations are accessible from street to platform, and this is usually what is meant when it is said to be accessible. But once disabled people get to the platform, they are dependent on staff to get on and off the train. But only 11% of stations are staffed at all times. Less than 2% of stations currently have level boarding, which means that disabled people can get from the platform onto the train without needing help from staff.

The Department of Transport (DoT) incorrectly thinks level boarding is impossible. Level boarding is missing from UK railway accessibility design standards, and there is no long-term strategy to achieve it, yet. Not even from the disability committee that specifically exists to recommend accessibility upgrades to public transport.

In 2022, the Department of Transport (DoT) incorrectly says level boarding is impossible in their Inclusive Mobility Document. Even though it has already been achieved in Spain, Switzerland, Germany and the Netherlands, as well as within devolved UK areas like Merseyrail.

In 2020, the Office of Rail and Road (ORR) only had guidance for access to the platform but not for access to the train, with level boarding completely missing from their accessibility categorisations.

In 2015, level boarding standards were missing from accessibility designs for new stations, while things like tactile paving were included.

In 2022, the Disabled Persons Transport Advisory Committee (DPTAC) recognised the need for level boarding but provided no long-term strategy beyond recommending further research.

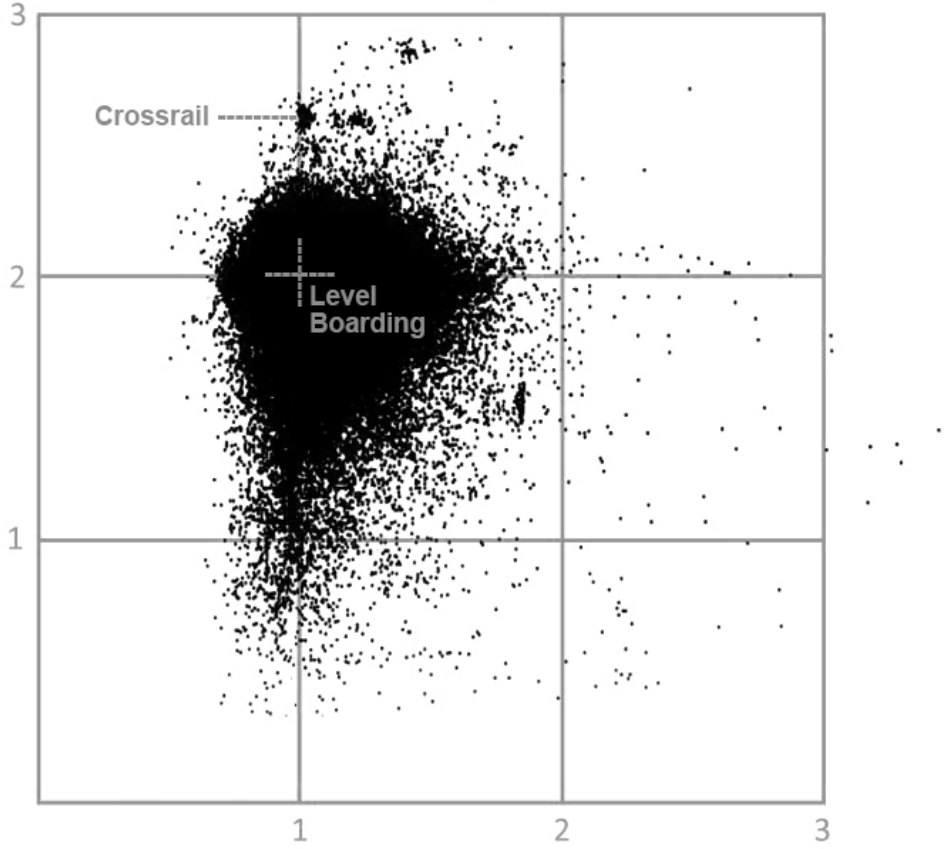
In 2021, the London Underground realised they were using a faulty risk model which underestimates the harm done at the gap.

The Rail Safety and Standards Board (RSSB) allows too much variance in platform placement (Source: Platform Train Interface Strategy Technical Report - Appendix E T866.) (Currently up to three feet in two dimensions)

Platform placement varies by three feet (In two dimensions)

Each black dot represents the placement of a platform edge of a station in England, in reference to the closest rail edge. As you can see, there is an enormous amount of allowed variance. Some of the new networks form their own smaller clusters far above the central cluster. Crossrail didn't want to lower the platform at Heathrow, so it made all of the central London stations much higher to provide step-free access. This made it so freight trains couldn't use those platforms, so all the outer stations needed manual boarding with a ramp instead. It has locked in dependence and inaccessibility for disabled people for decades.

Variation in platform edge placement in England in Feet



How to achieve level-boarding

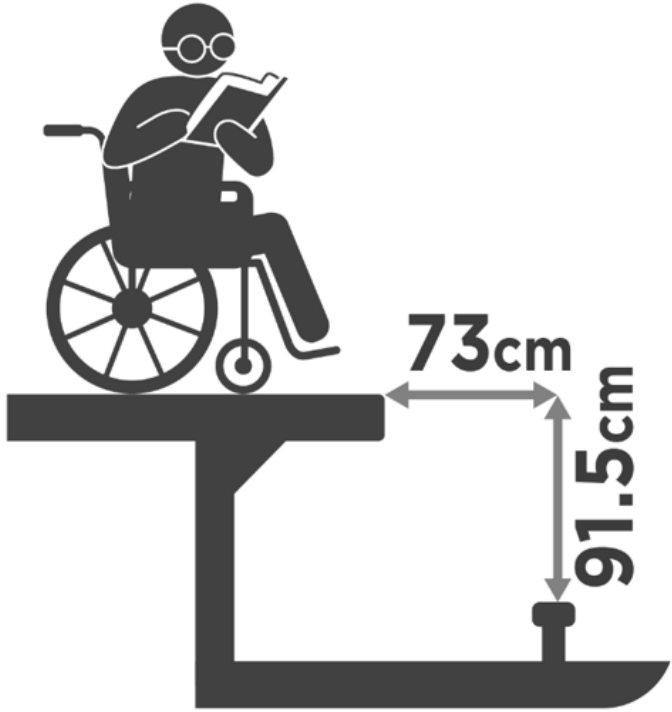
Platforms need to be offset at exactly 730mm horizontally and 915mm vertically from the closest rail. When platforms are built or remediated, they should be set to this exact placement, which is entirely compatible with freight trains, a commonly used, inaccurate justification as to why level boarding is impossible. Had Crossrail used this standard, it would have had step-free boarding and would have been fully compatible with freight trains. It should have used this standard and then bought trains with low floors to match. It chose higher train floors and two different platform heights instead.

Precise placement needs to be enforced when building or fixing platforms. Only 1 in 5 platforms currently meet this standard. There should be a rolling national programme of platform corrections to fit this standard. It would be compliant with all train types, including freight. The placement standards are known as GI/RT7016 and GI/RT7073 and relate to the platform edge being placed 730mm horizontally and Slab tracks should be used to further stabilise rail height.

When procuring new trains, make compliance with existing standards and infrastructure mandatory; it's particularly important to get trains with low floor heights that match the platform height. This is easier to do with electric trains, and as old diesel trains are getting phased out, now is a good time to do this. Thameslink and Crossrail are ongoing examples of non-compliant trains. The Merseyrail 777 trains are not only fully compliant but also have automatic edge-

filling extendable ramps 915mm vertically from the running edge of the closest rail. Curved platforms should use edge fillers or be straightened where possible.

Update policy documents, making standards mandatory. Unassisted access (level boarding) standards should be required when doing a retrofit. The policy document that would need to be updated is the Technical Standards for Interoperability (TSIRPM). The Office of Rail and Road would also need to update its station accessibility classification system to include level boarding. The Department of Transport should update its Inclusive Mobility document to include level boarding. Additional technologies should also be considered to improve safety, like platform edge gap fillers and “Toblerone” panels.



The Campaign for Level Boarding had the following technical recommendations:

“Mandate that unassisted access standards are used when doing a retrofit. The Technical Standards for Interoperability (TSIPRM) relate to heavy rail; they list a PTI gap of 75mm wide and 50mm high, which is what is considered “Unassisted access” (Known more generally as Level boarding). Unassisted access is not currently an enforced requirement, whereas other inclusive aspects like tactile paving are.

The TSIPRM should be updated to make unassisted access mandatory. This small regulatory change will be critical for preventing access inequalities going forward. Light rail already has these standards, in the Rail Vehicle Accessibility Regulations (RVAR) ,but these do not apply to mainline networks. Enforce existing guidelines relating to platform placement whenever building or refurbishing platforms.

Start a rolling national programme of platform corrections to fit current standards. This would need to target areas with specific train families. The standards of platform edge placement are GI/RT7016 and GI RT7073. These recommend that the platform edge be placed 730mm horizontally and 915mm vertically from the closest rail.

Straightening curved platforms should also be done where possible. When procuring new trains, make compliance with existing standards and infrastructure mandatory. It is particularly important to get trains with low floor heights.

This should be easy for anything going less than 100mph, especially if the train is electric. As the Diesel trains are phased out, this is an excellent time to get this done. Examples of the UK buying non-compliant trains that do not fit the infrastructure are Crossrail and Thameslink.

Economic benefits

According to a 2022 study by Motability, an additional economic benefit of £72.4 billion per year could be generated if the entire transport accessibility gap were closed for disabled people in the UK.

Level boarding will also empower the 14.1 million disabled people to live independent lives and contribute as workers and consumers, which should boost economic productivity. A 10% rise in the employment rate amongst disabled adults could contribute an extra £12 billion to the Exchequer by 2030.

The cost of implementing mandatory standards for future work is negligible. Buying new trains and building new platforms would have to be done anyway, so it makes sense to start having standards going forward, and there is no significant economic justification against that. The expensive part is the additional recommendation of the centrally funded rolling program to remediate old platforms as train families are replaced. This is likely to cost at least £ 30,000 per platform. Upgrading all stations to have access to the platform would cost a total of £6 billion.

According to the Permanent Rail Engineering organisation, if the Department of Transport followed its 'Common Safety Risk' rules, it would be spending £770 million per year on fixing gaps to reduce the risk of accidents. It would also save Network Rail at least £1.5m in fines for delays every year.

Social benefits

Around 5% of rail journeys are made by people with a disability or long-term illness. There are millions of disabled people in the UK, and accessible transport dictates where they can live, work and study. Disabled people pay tax, which helps to maintain and build infrastructure that then excludes them, essentially subsidising non- disabled passengers. Level boarding currently only exists on less than 2% of the national rail stations.

There are 14.1 million disabled people in the UK. 5.1 million are pensioners, with that number set to double in the coming years. There are 1.2 million wheelchair users in the UK, and mobility impairments are the most common type of disability. One of the most common barriers to work for disabled people is difficulty with transport. A 10% rise in the employment rate amongst disabled adults could contribute an extra £12 billion to the Exchequer by 2030.

With universal level boarding, disabled people can live and work anywhere, and not have to worry about being forgotten on the train; they can even use unstaffed stations. If the

toilet is broken, or the train is rerouted, or is on fire, they can just get off at the next station. There will be a reduced need to try to find carers with driver's licenses, which has been significantly more difficult since Brexit. Disabled people will be less reliant on personal vehicles. Motability has 630,000 cars. Accessible public transport can help to reduce this number and help fight climate change.

Disabled people would be able to travel at more times of the day, many stations are only staffed at peak times and staffing levels fluctuate based on political decisions so previously accessible stations can become inaccessible without notice.

Level boarding is essential for some but beneficial for all. It would make boarding safer and more convenient for prams, children, pensioners, dogs, luggage and bikes, but for disabled people it means a lot more.

Level boarding means faster boarding, reduced dwell time, fewer accidents, fewer delays, less reliance on cars and is good for the planet. It frees up station staff for more important work and reduces training costs.

"Removing these barriers will open the doors to greater social and economic independence for disabled people and greater dignity."

“Stakeholders cited secondary benefits that could be realised as a result of providing more step-free access, such as environmental benefits resulting from a modal shift from car to rail, a reduction in accidents, and an increase in the amount of railway revenue to the benefit of station operators, and benefits to central government through savings on the welfare budget.”

What is standing in the way

Widespread myths about it being impossible, about incompatibility with freight and needing to raise platforms are still believed at high levels where decisions are made.

The Department of Transport deeply believes the freight train myth, even bringing it up as a response to the first version of this zine, which had already debunked it.

Buying trains with matching platforms is unlikely because buying trains is more to do with political challenges and procurement laws than engineering. The trains and the platforms are owned by different parts of the industry so it is challenging to coordinate. At time of writing the trains are still private.

Unions might not be in favour, as it could potentially lead to job loss, as access to stations was a justification for preventing cuts, as somebody needs to be around to put a ramp down. But it would reduce the risk of injuries to workers. Although this was not an issue with Merseyrail, where the unions showed no resistance.

The UK government does not consider the human rights of disabled people a priority, for example, refusing to implement the changes the UN investigation recommended after finding “Grave and Systematic” violations of the rights of disabled people in the UK in 2016.

Accessibility is seen as impacting a very small group, and so it is the first to go whenever the government needs to make cuts. So, fully funded accessibility programs often have funding reduced after they are implemented. Accessibility is always considered an add-on instead of something critical to a public infrastructure project.

For the same costs, other more efficient upgrades could be made, which would lead to increased savings.

An expensive up-front investment for long-term gains is not popular with party politics, where parties only care about the short term.

The listed status of many train stations makes adaptations to platforms more challenging.

It is not a standard practice across the train manufacturing industry, and so very few suppliers provide it.

Industry knowledge and understanding are still limited to the challenges, solutions and myths. You can help to address this by sharing this zine.

Would you like to know more?

Youtube lectures

#RailNatter Episode 31: Is level boarding on trains really that hard to achieve? - Gareth Dennis

Academic papers

Cepeda, E. P., Galilea, P., & Raveau, S. (2018). How much do we value improvements on the accessibility to public transport for people with reduced mobility or disability?. Research in Transportation Economics, 69, 445-452.

Holloway, C., Thoreau, R., Roan, T. R., Boampong, D., Clarke, T., Watts, D., & Tyler, N. (2016). Effect of vertical step height on boarding and alighting time of train passengers. Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit, 230(4), 1234-1241.

Karekla, X., Fujiyama, T., & Tyler, N. (2011). Evaluating accessibility enhancements to public transport including indirect as well as direct benefits. Research in Transportation Business & Management, 2, 92 -100.

Martens, K. (2018). Ageing, impairments and travel: Priority setting for an inclusive transport system. Transport Policy, 63, 122-130.

Chowdhury, S., & Wilson, D. (2020). Gap between policymakers' priorities and users' needs in planning for accessible public transit system. Journal of Transportation Engineering, Part A: Systems, 146(4),04020020.

Industry papers

Atkins - Significant Steps -Research (2004a)

RSSB - An Assessment of the Cost and Benefits of Adopting a Standard Uniform Platform Height of 1115mm (2007).

RSSB - T866 Investigation of platform edge positions on the GB network

RSSB - T1037 Stepping Distance Study (2014).

RSSB – T1166 Minimising the Impact of'High and Tight'Platforms (2019)

TRL - Qualitative study of platform-train interface incidents (2014)

UCL - Train Dwell time and Passenger Crowd Management (2008)

Organisations

Campaign for Level boarding https://www.levelboarding.org.uk/

SPARK (RSSB research hub)https://www.sparkrail.org/

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