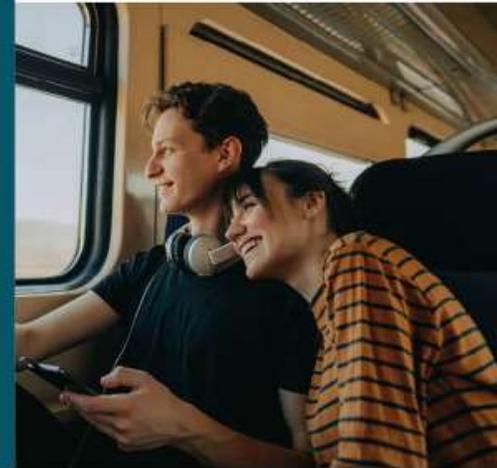


Leading the way on Rail Sustainability



SAQN Annual Meeting 2022 - Air Quality Challenge in Rail

Philbert Chan, Air Quality Specialist



Structure of presentation

- Introduction
- The Sustainable Rail Strategy and Air Quality Strategic Framework
- Why air quality is a priority in rail
- CLEAR
- Air quality onboard trains, in stations, and abrasion emissions
- Summary: key further research areas

Introduction

- **Rail Safety Standards Board (RSSB)**
 - Established in 2003
 - Vision: A better, safer railway
 - Not-for-profit company owned by major industry stakeholders
- To actively **help the industry work together** to drive improvements in the GB rail system
- Six strategic business areas, including **sustainable rail**

We help the whole rail industry work together



Exploiting unique capabilities



Across a range of challenges and issues



| | | | |
|---------------------------------------|---|---|--|
| Train and freight operating companies | Infrastructure managers and contractors | Rolling stock leasing companies and suppliers | A whole range of other stakeholders |
| Advice and experts | Funding and resources | Networking and communities | Research, knowledge, standards and tools |
| Safety, health and wellbeing | Sustainable development | Systems integration and innovation | Cost and efficiency |



The Sustainable Rail Strategy and Air Quality Strategic Framework

▪ Sustainable Rail Strategy (SRS)

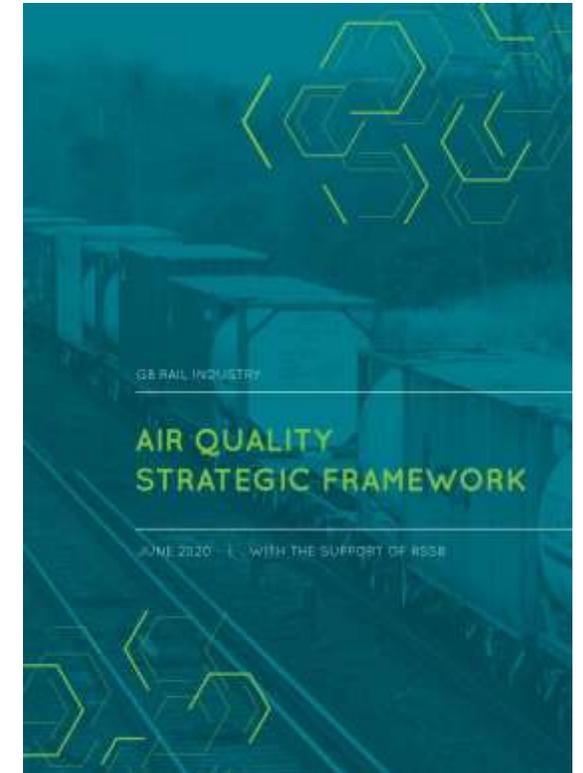
- The SRS is a comprehensive sustainability strategy for the rail industry across both **environmental and social** topics
- A key input to Great British Railway's **Whole Industry Strategic Plan**
- 11 sustainability topics, including Air Quality, each having its own **flagship goal**

Flagship goal: A railway that supports a positive impact on air quality

- **Consultation** on the Prototype is being held right now: [Sustainable Rail Strategy \(rssb.co.uk\)](https://www.rssb.co.uk)

▪ Air Quality Strategic Framework

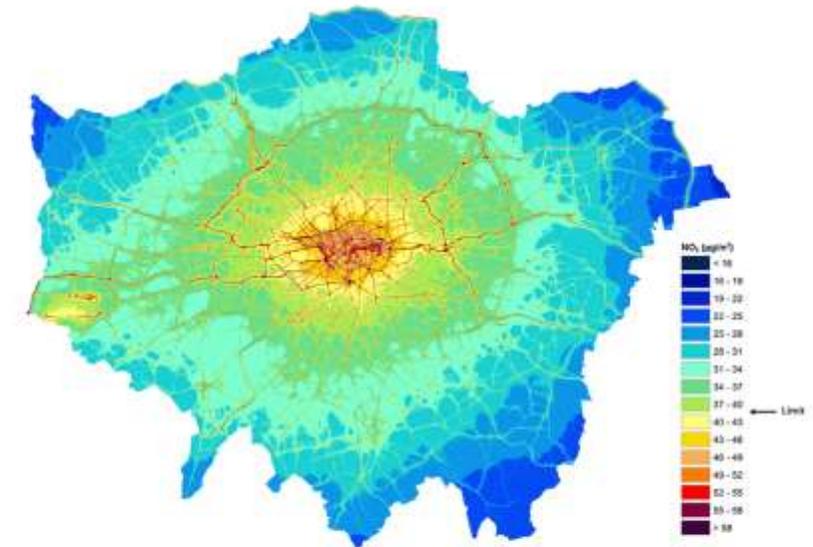
- Setting the future path for rail to achieve the flagship goal
- Underpinned by a **collaborative research programme (CLEAR)**



Why air quality is a priority in rail

- Rail contributes approx. 2% of total UK NO_x and <1% of total UK PM emissions at a **national level**
- Generally not considered to be a key contributor to local air quality issue
 - Nonetheless rail's contribution known to be **more significant locally** in certain areas, e.g. stations
- Road sector is improving quickly
 - Rail needs to be proactive to maintain its position as one of the most **environmentally friendly** modes of transport
- Air quality issues known at certain locations within rail

London's air pollution before ULEZ



Reference: LAEI, 2016





CLEAn Air Research (CLEAR) Programme

| Project | | 2020 | 2021 | | | | | | | | | | | | 2022 | | | | | | | |
|-----------------|-------------------|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|--|--|
| | | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | | |
| Projects | Modelling | Rail air quality mapping (T1186) | Where (and why) do we have emissions hot-spots? | | | | | | | | | | | | | | | | | | | |
| | | Fleet wide assessment of rail emissions factors (T1187) | | | | | | | | | | | | | | | | | | | | |
| | Monitoring | | Analysis of air quality onboard trains (T1188) | What does AQ look like in key rail locations? Worker exposure, depots, onboard trains | | | | | | | | | | | | | | | | | | |
| | | | Rolling stock emissions testing (T1189) | | | | | | | | | | | | | | | | | | | |
| | | | Assessment of air quality at depots (T1190) | | | | | | | | | | | | | | | | | | | |
| | | | Air quality personal monitoring (T1191) | | | | | | | | | | | | | | | | | | | |
| | | | Stn Mon (TBC) | | | | | | | | | | | | | | | | | | | |
| | Mitigation | | Rail standards review for Air Quality (T1232) | Are rail standards sufficient? What legislation applies to rail? How will AQ improve over time? What are we aiming for (and by when)? Industry modelling capability to improve onboard AQ What do we need from mitigation technology and how do we test it? What are rail's external AQ costs? How do we incentivise emissions reductions? | | | | | | | | | | | | | | | | | | |
| | | | Air Quality and Emission Targets (T1233) | | | | | | | | | | | | | | | | | | | |
| | | | Air Quality on Trains- HVAC and Exhaust Interactions Study (T1234) | | | | | | | | | | | | | | | | | | | |
| | | | Performance requirements and testing protocols for emissions mitigation (T1235) | | | | | | | | | | | | | | | | | | | |
| | | | Rail emissions mitigation – incentivisation feasibility study (T1236) | | | | | | | | | | | | | | | | | | | |
| | Strategy | AQ Strategic Framework - v2 | | | | | | | | | | | | | | | | | | | | |



Air quality onboard trains

Pollution on some new UK trains '13 times one of London's busiest roads'

Nitrogen dioxide levels far exceed average recorded on traffic-clogged Marylebone Road, according to a study



- **Elevated concentrations of NO₂** seen on some rolling stock
- Improvements being investigated
- No current legal limits exceeded
- Review of standards and targets is in progress
- **Key questions:**
 - Ongoing monitoring: continuous vs spot checks, and how?
 - What about PM level? How to carry out source speciation for PM onboard train?

Air quality in stations



- High level of NO₂ seen at some key stations
 - PM is less well understood
- RSSB is operating a national **Stations Air Quality Monitoring Network (AQMN)** covering 105 stations
- Targets, Priority Locations and Air Quality Improvement Plans
- **Key questions:**
 - Interaction of ambient and internal AQ for enclosed stations, approach for source apportionment study
 - Data from AQMN - what academic study can be carried out?
 - Deployment and best use of low cost sensors



Abrasion emissions



- **Less well understood** for GB rail
 - Research has been / is being carried out elsewhere (e.g. UIC)
 - Applicability of such research in the UK?
- **Key questions:**
 - Emission rates / emission factors for abrasion emissions from trains in the UK
 - Chemical composition
 - Health effect (if not known)

Summary: key further research areas

- **Onboard trains**
 - Approach for ongoing monitoring: Continuous vs spot checks and appropriate methodology and equipment
 - Further study on PM levels onboard trains, source speciation to differentiate PM different sources, e.g. exhaust/abrasion emissions and human activities
- **Train stations**
 - Interaction of ambient and internal AQ for enclosed stations, e.g. setting up approach for source apportionment studies for representative stations
 - Further academic study making use of the vast amount of data from the AQMN project
 - Deployment and best use of low cost sensors
- **Abrasion emissions**
 - Determination of emission rates or emission factors for abrasion emissions from trains in the UK
 - Determination of the chemical composition of abrasion emissions from GB rail, and their health effects.

Thank you!

- Any other research ideas are welcomed!
- Please contact Philbert Chan (philbert.chan@rssb.co.uk) or James Wright (james.wright@rssb.co.uk)