Air quality and emissions in construction

Centre for
Low Emission Construction

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Impact on Urban Health

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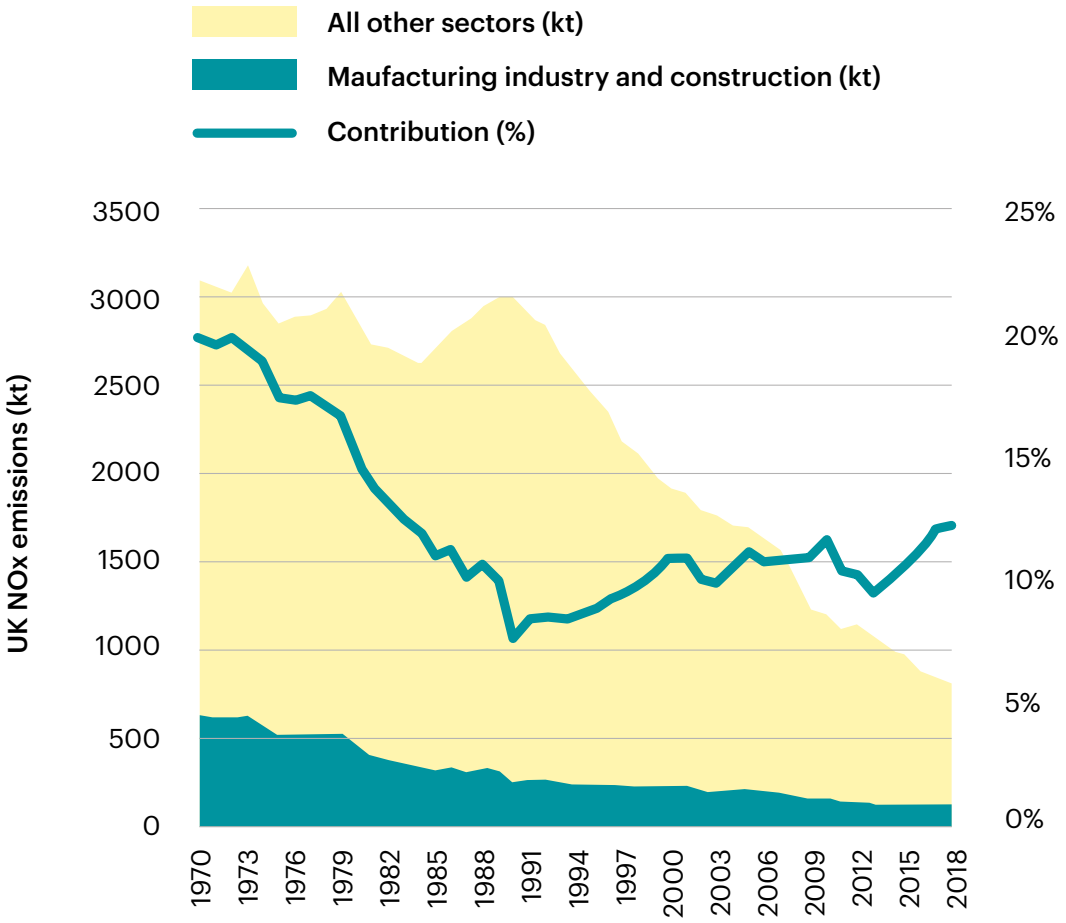
Executive summary

Air pollution is a public health crisis. It causes 36,000 premature deaths every year in the UK, 4,000 of those in London.

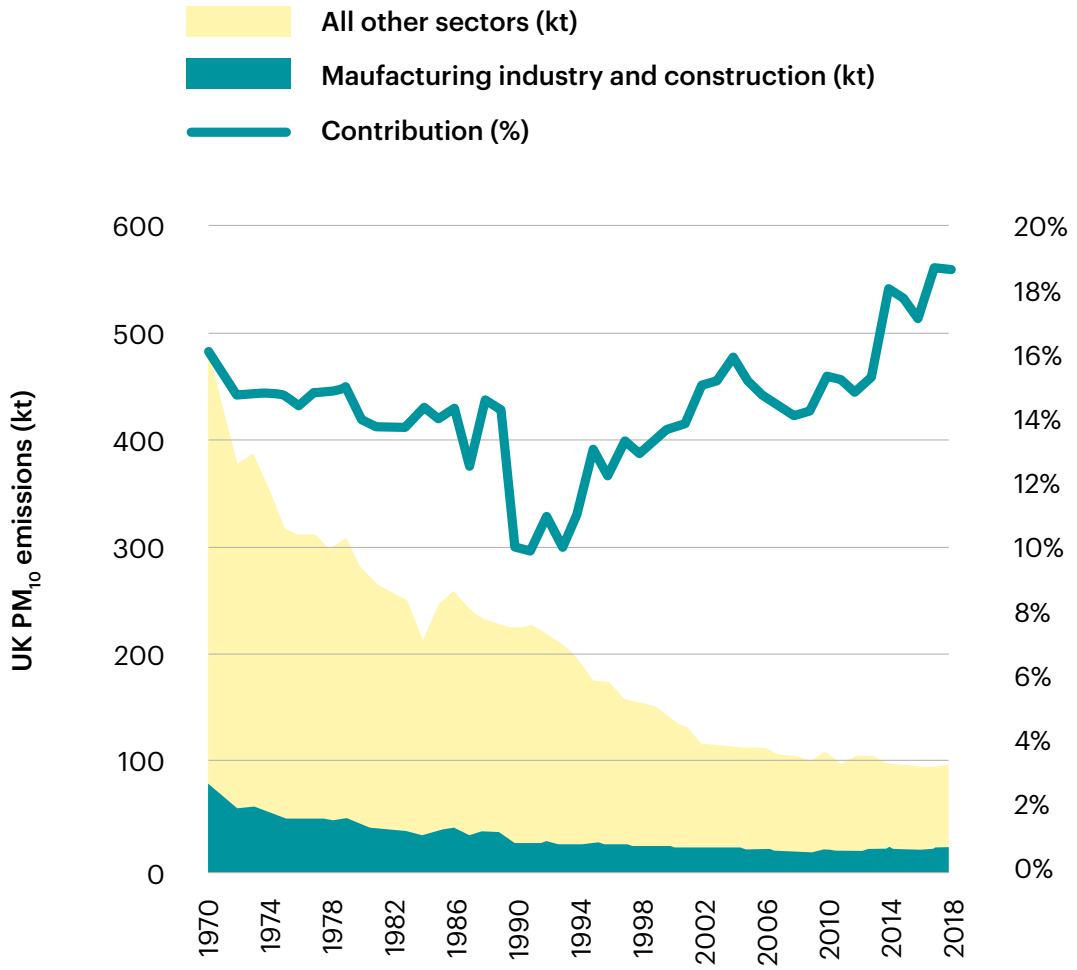
Construction contributes significantly to air pollution, particularly in urban areas. The 2019 London Atmospheric Emissions Inventory (LAEI) shows that approximately 30% of particulate matter (PM10) emissions come from construction, along with 8% of fine particulate matter (PM2.5) and 4% of nitrogen oxides (NOX).

Crucially while other major sources of air pollution – like transport – have rapidly decreased their polluting emissions due to policies like ultra-low emissions zones, the construction industry has increased its overall share of polluting emissions in recent decades.[1]



This report describes the findings of one-of-a-kind research that was designed in partnership between the Centre for Low Emission Construction (CLEC) and Impact on Urban Health.

The research aimed to understand attitudes toward air pollution among people working in the construction sector; to discover where people within the industry go to access information about air pollution; and, ultimately, to make practical recommendations for reducing polluting emissions from construction sites.



Stakeholders across the construction industry – including regulators, equipment suppliers and developers – have contributed through a web-based survey, a workshop and a series of interviews.

We found that attitudes to air pollution within the sector reflect the scale of the crisis: 97% of people surveyed said that air quality is an "extremely or very important environmental health concern"; and over 60% of survey respondents recognise the construction sector significantly contributes to air pollution.

Access to information is seen as a key issue for reducing polluting emissions, especially when it comes to government policy and new technologies. The industry needs clear guidance for reducing both air pollution and carbon emissions.

Based on our research, we recommend three approaches for reducing air pollution emissions from construction:

- Influencing government, the sector and stakeholders to ensure **compliance** with existing legislation
- encouraging **adoption** of low emission approaches
- and by developing a pathway to enhanced **regulation**.

Methodology

Our research involved surveying stakeholders, inviting representatives from industry to a workshop and, finally, interviews.

The survey aimed to understand whether stakeholders in the construction sector were aware of the links between air pollution and construction. The results of that survey informed the next phases of research.

The survey received 63 responses from a broad range of stakeholders representing industry, developers, landowners, and tier one contractors, from across the UK.

Following the survey, we hosted an online workshop with 47 attendees representing the wider construction industry.

Throughout the research, stakeholders described similar themes when asked about the links between construction and air pollution. We have grouped those themes into the following categories, which are all described in the 'findings' section below: awareness and understanding, access to information, practical steps and solutions, and regulation.

Findings

1. Awareness and understanding

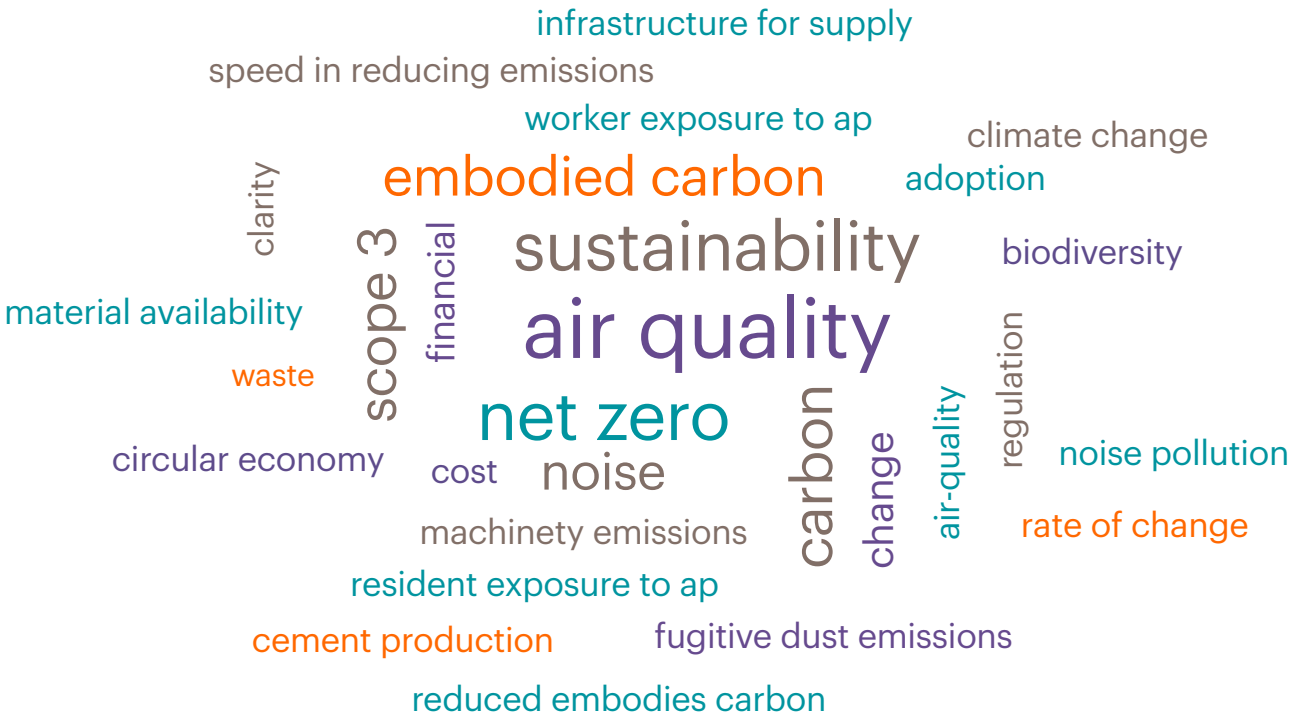
There is widespread consensus on the severity of the air pollution crisis, and the extent to which the construction industry contributes to emissions. Almost all (97%) of people surveyed said that air quality is "an extremely or very important environmental health concern"; and over 60% of respondents recognised the construction sector significantly contributes to air pollution.

Meanwhile, 84% of respondents indicated their organisation has policies in place to mitigate air pollution. Others said air quality is included in an overarching environmental policy or that policies are being developed. Only 6% had no policy in place to mitigate air pollution.

The survey suggests people within the construction industry feel that reducing carbon emissions is an opportunity to also reduce air pollution from sites.

Over 70% of respondents considered the construction industry to be a significant contributor to carbon emissions, with over 95% stating they already had a policy to reduce carbon emissions in place. Most respondents felt the industry already has the information and skills to improve air quality and reduce carbon emissions with a slightly lower number stating that they have the tools required.

During workshops, stakeholders were asked what they thought is the greatest environmental challenge facing the construction industry. 'Air quality', 'sustainability' and 'net zero' were the three most popular answers. Other responses can be seen in the word cloud, where the size of the word demonstrates how popular it was as an answer.



2. Access to information

Access to information about the nature of emissions and mitigation measures was seen as one of the most important factors for reducing air pollution from the construction sector. Stakeholders cited the potential impact that information about emerging technologies, carbon neutral products, and dealing with fugitive dust could have on reducing air pollution and carbon emissions.

Respondents referenced the Government's policies and guidance as their main source of information, followed by guidelines from the Institute of Air Quality Management (IAQM), local authorities and the construction industry.

Whereas the survey results indicated high levels of understanding of the links between air pollution and construction, respondents felt that raising awareness of how to improve air quality on construction sites would encourage change across the sector.

The 'progressive' areas of industry – which adopt low emission technologies prior to regulation – described a lack of information relating to available technologies that improve air quality, reduce carbon non-road mobile machinery (NRMM) emissions, and mitigate fugitive dust. Where technology is available, the cost and effects on operations (for example, whether retrofitting an engine with 'after-exhaust reduction technology' invalidates a machine warranty) are not well known and are viewed as the major barrier to adoption. **Disseminating and promoting effective, low emission approaches and technologies would encourage wider adoption**.

Market availability and large capital cost were also seen as barriers for uptake of low emission technologies. During workshops, stakeholders emphasised the point about a lack of evidence of effectiveness and explained how **an independent assessment of low emission solutions would be useful**.

We spoke to Sarah Morris, from the Greater London Authority (GLA), and Rhiannon Ford, from the GLA Group Responsible Procurement Team, based at Transport for London (TfL). They explained how the GLA introduced a Low Emission Zone (LEZ) policy for non-road mobile machinery (NRMM) on major developments in 2015. The GLA's analysis of the NRMM LEZ has demonstrated reductions in PM, NOx and CO2.[2] Such evidence could enable similar schemes to be adopted more widely, potentially even across the UK.

Other stakeholders described how responsibility for improving air quality and reducing carbon emissions falls on the developer and tier one contractors, particularly in London, and there needs to be a better assessment of the contribution from the construction supply chain. **Better education and regulation of the supply companies would be part of the solution to reduce emissions.**

3. Practical steps and solutions

Most respondents said they are using clean machinery – which is a London-wide requirement of the GLA – as well as using alternative fuels. Most respondents also said they have dust management plans in place.

The following methods were all referenced as ways to mitigate air pollution on construction sites:

- The use of retrofit and hybrid technology
- Electric machinery
- Anti-idling campaigns
- Generator bans
- More efficient construction logistics plans
- The Construction and Agricultural Equipment Security and Registration (CESAR) emission tagging scheme
- Off-site manufacturing and carbon calculators.

Robust standardised reporting for energy savings opportunity scheme (ESOS) and carbon – as well as identifying and addressing scope three emissions from hotspots within the supply chain – are all necessary actions. **The industry is already familiar with the concept of carbon reporting and one of the fastest ways to raise awareness and introduce change would be to incorporate air quality reporting into that.**

During workshops, stakeholders were asked what they thought would be the most beneficial step toward improving air quality and mitigating the climate crisis. Stakeholders answered via an online tool, and the results are shown in the below graphic:

1	Increased regulation (UK/London/ borough-wide)
2	Reduced costs due to increased scale
3	Producing and disseminating general best practice and guidance
4	Air quality reporting, aligned with carbon targets
5	Case studies – evidence of 'what works'
6	Information on occupational exposure and health risks
7	Accreditation schemes and awards
8	Information on health impacts on local residents

4. Regulation

Significantly, in both the survey and breakout rooms, the need for clearer and stronger regulatory frameworks was seen as the most important tool for the construction sector reducing air pollution emissions.

Representatives from different parts of the industry were concerned about the lack of a 'level playing field' and suggested improving regulation and investments in measures that ensure compliance with existing regulations. This was reflected in comments from local authority representatives who felt additional power and resources were needed in this area.

As well as ensuring compliance with existing regulations, stakeholders described how **new regulations would create a clearer pathway for industry technology and investment. Compliance with existing regulation would help to reduce air pollution emissions and would create a 'level playing field' across all projects nationwide.**

Grace Ferris, Climate Change and Sustainability Officer at the London Borough of Lambeth, said a major issue for regulators is that the Public Protection Officers (or Environmental Health Officers) have limited capacity or power to act proactively ahead of complaints being made to the council and have not yet established an optimal monitoring strategy to access and respond to real-time data on pollution spikes.

Creating a new role of Construction Compliance Officer, who would be an air quality champion working at borough level and within planning or enforcement teams, would help to solve this problem. They would have a role in assessing dust management plans, as well as construction and demolition plans, and would ensure sites are compliant for NRMM. Crucially, they would have powers to act.

Dale Camsell, Senior Technical Consultant at the Construction Equipment Association (CEA) believes the industry is proactive at producing clean machines but, without regulation, they have no engine emission limits to comply with. Dale suggested an effective short-term measure would be to introduce local emission regulations through policies such as the GLA's Low Emission Zone (LEZ) for NRMM. This would drive demand for original engine manufacturers and the rental sector and would help to clearly define what is required from manufacturers through end user requirements to adopt measures with immediate air quality benefits.

Kevin Minton, Chief Executive at the Construction Plant Hire Association (CPA) suggested one effective method for reducing air polluting and carbon emission from construction could be to set targets for air quality and carbon on sites so the contractor can mix and match solutions to stay within this limit. This approach puts the responsibility on the contractor but allows for more innovation and flexibility. Prescriptive regulation may be more effective than goal setting and could mean progress is made more quickly.

As the industry is accustomed to responding to environmental regulation (either from a compliance or product development perspective) **stakeholders felt government regulation was the most effective way to reduce air pollution emissions.**

For instance, there are currently no defined engine limit values for the next set of EU emission standards (Stage VI), a proposed date for implementation, or even an understanding of whether the UK Government would adopt EU standards or set their own. Industry adoption is therefore currently being led by customer demand.

Meeting regulatory requirements, reducing costs, and benefiting local environments were all seen as the primary drivers for adopting cleaner machinery and working practices.

Interviews

We spoke to key stakeholders – who were chosen because they offer views from different regulators and industry bodies – to give some thought to what they considered the biggest challenges and potential solutions facing their respective roles or organisations.

Grace Ferris, Climate Change and Sustainability Officer – London Borough of Lambeth

Lambeth's climate change and sustainability team have responsibilities for Lambeth's air quality strategies, plans and associated projects.

Grace explained there is a lot of uncertainty about the sources and scale of emissions that come from construction sites.

Grace talked about the potential to create a new role – Construction Compliance Officer – that could help ensure compliance with existing regulation. You can read more from Grace about Construction Compliance Officers in the findings section of this report.

Difficulty contacting sites is another obstacle to ensuring compliance with existing regulation. Grace suggested creating local area **construction forums** – which would bring together environmental health officers, planners, councillors, and developers and their contractors – in an informal setting to discuss issues that affect air quality, such as fugitive dust, utilities, and supply chains, and would potentially enable the development of construction logistic plans (CLPs).

The forum could include stakeholders from adjacent boroughs to cover transboundary issues, which would help to identify challenges and opportunities regarding sustainable practices and would help to build working relationships with site personnel and council air quality and public protection officers.

> *"Greater regulatory powers and resourcing would enable local authorities to better deal with non-road mobile machinery and construction emissions."*

Dale Camsell, Senior Technical Consultant – Construction Equipment Association (CEA)

The Construction Equipment Association (CEA) is the trade association that represents the UK construction equipment sector and is recognised by HM Government as the voice of the industry.

Dale stressed there is a lack of regulatory pathways as an external driver for the industry to reduce air pollution emissions.

Dale explained that, since 1999 (the first of the EU emission stages), there have been progressive dates for cleaner engine stages to be launched on the market and/or the sale of older engines to be subsequently phased out. This ended in 2019 with EU Stage V engines. The five-year interim steps previously allowed the industry time to develop technology that met the new compliance requirements and then align the new engine release with the launch of the latest construction models.

The next step in this process is due in 2025 and will report on the effectiveness of Stage V engines through in-service testing. The outcome will define the Stage VI requirements, although this is not expected until at least 2030.

That means until that time the industry is no longer driven by regulation but by user and market demand, which, in turn, may be driven by policies such as the GLA's Low Emission Zone and HS2's minimum emission stage requirements. But crucially, these are local and isolated measures.

The industry is proactive at producing clean machines but without regulation there are no engine emission limits to comply with.

DEFRA have held consultations and the industry has provided data but there are still no top line policies from government to guide the process. If new regulation is introduced too soon it would not be effective as the technology is still emerging and not ready for mass market supply yet. A longer lead time is required for a national policy.

Therefore, as a **short-term solution it may be most effective to introduce local emission regulations through policies such as the GLA's Low Emission Zone (LEZ) for NRMM**. This would drive demand for original engine manufacturers and the rental sector and would help to define what is required from manufacturers to adopt measures which would have immediate benefits for air quality.

Kevin Minton, Chief Executive – Construction Plant Hire Association (CPA)

The UK plant-hire industry is the most established in the world and is worth over £4 billion to the UK economy. The Construction Plant hire Association (CPA) is the leading trade association for this sector in the UK and CPA members supply over 85% of hired plant to the construction industry.

Kevin suggested one effective method for reducing air pollution and carbon emissions from construction would be to set targets for air quality and carbon on sites so the contractor can mix and match solutions to stay within this limit. This approach puts the responsibility on the contractor but allows for more innovation and flexibility. Prescriptive regulation may be more effective than goal setting and allows for faster progress.

It was noted during the discussion that the red diesel fuel exemption being removed in 2022 will increase focus on alternative fuels within the industry.

The timing of any government policy is critical because the industry requires predictability and certainty. Many projects with contracts already awarded have fixed machine procurement and costs during the tender stage. A change in policy requirements before the project is delivered could greatly increase hire costs. This would have a bigger effect on small plant hire companies who are unable to offset costs elsewhere in the business.

The bottom line is that **clear regulation is required across the supply chain to give certainty.**

This includes on machinery, knowledge motivation, and capital. There needs to be less risk for companies investing in infrastructure. There also needs to be a realistic approach to future policies that takes the best available technology into account. There is limited availability of new machines. Alternatives, such as hydrogen, are not yet commercially available. Large infrastructure projects have the benefit of long planning times and lots of machines to deploy but small businesses are constrained by project deliverables, timescales and budget. If a compliant machine breaks, often the only quick alternative is non-compliant but delays to the project have great cost.

Future policy should give equal opportunities to all and not just favour the larger companies. The Government has invested in on-road machines with grants for plugin vehicles and charging infrastructure. Funding would be a good incentive for early adopters of new technology and would help to reduce risks for businesses.

Kevin recognised there needs to be better knowledge capture and transfer across the supply chain, but it requires external funding. This sort of information may include better understanding of machine telematics and specific machine operational requirements and would feed into future training programmes such as the 'eco-operator' scheme.

> *"The bottom line is that clear regulation is required across the supply chain to give certainty."*

Sarah Morris, Senior Policy and Programme Officer – Greater London Authority (GLA)

Rhiannon Ford, Responsible Procurement Manager – Greater London Authority, based at Transport for London

The GLA is a strategic regional authority, with powers over transport, policing, economic development and fire and emergency planning. It is responsible for the strategic administration of Greater London and shares local government powers with the councils of 32 London boroughs and the City of London Corporation.

TfL is a statutory body created by the Greater London Authority (GLA) Act 1999. This Act gives the Mayor of London a general duty to develop and apply policies to promote and encourage safe, integrated, efficient, and economic transport facilities and services to, from and within London.

The GLA introduced a LEZ policy for NRMM on major developments in 2015. As part of the policy, the GLA states all machinery that is used on construction sites in the LEZ needs to be logged online via the NRMM register.[3]

Rhiannon and Sarah made two points about the NRMM register:

Firstly, internal analysis of the NRMM LEZ has demonstrated its effectiveness in reducing particulate matter (PM), nitrogen oxides (NOX), and carbon dioxide (CO2). Such evidence could enable similar schemes to be adopted more widely, potentially even across the UK.

Secondly, the GLA's NRMM LEZ uses the planning process to condition the use of the register. However, this only captures information about machinery on construction sites, and is missing data on machinery used on infrastructure projects and roadworks.

The GLA Group have recognised the need for a **mirror register** that would capture these additional sources internally. But there are challenges – both internally within the procurement teams and externally with suppliers – in upskilling and educating the workforce before introducing any new contract requirement to the GLA Group supply chains for it to succeed.

There was interest in selecting specific contractors to take part in a pilot scheme where additional data – focused on machinery used for infrastructure projects and roadworks – can be incorporated into the NRMM register. The register is the only way that site operators can obtain an exemption or approval to use retrofitted or specialist equipment.

> *"A key driver to catalyse change is to influence the industry supply chain through sustainable procurement and contract conditioning."*

Conclusions and recommendations

Our research shows that effective emission reduction can only be achieved by influencing government, industry and stakeholders to ensure **compliance** with current legislation, to encourage **adoption** of low emission approaches, and to develop a pathway to enhanced **regulation**.

Compliance

Ensuring **compliance** with existing regulation is the most effective way to reduce local emissions over the next one to three years. This could take the form of an enhanced dust measurement reporting system or more local authority officers visiting sites to ensure compliance with dust management and NRMM emission policies.

Adoption

Encouraging **adoption** of low emission approaches prior to regulatory changes would lead to a more widespread reduction in emissions on a regional scale over the next one to five years.

While this may not provide the certainty for large scale investment in new technologies some parts of the industry require, the adoption of existing and emerging technologies will provide the demand required to influence supply change. This could be supported by educating and training key groups within the industry, making them aware of the available technology, its impacts, and benefits.

Regulation

Enhanced **regulation** to define or adopt new emission standards would encourage more significant investment in the development of cleaner machinery and construction methods. This would result in lower emissions across the UK in the long term.

Justification for enhanced regulation would need to be underpinned by a robust scientific knowledge base describing the impact of policy, regulation, and approaches on emissions.

Recommendations for future work

The following section highlights project areas which, if they were developed, would improve air quality. These are recommendations, which, unless stated otherwise, are suitable for across the UK.

While progressive organisations in the industry may adopt these willingly, **widespread use will only be delivered through a regulatory framework**. The development of the policies that underpin this framework require a scientific evidence base. The evidence programme is designed to provide the necessary data which can further inform industry and government discussions on future standards.

Compliance

Recommendation 1: Control and management of construction dust

Rationale

As machine emissions are reducing because of fleet renewal and the adoption of cleaner technology, the issues around dust from construction will become increasingly important.

Improved coordination and dissemination of measurement of construction dust within sites – as well as improved transparency with residents – would enable better dust management practices and compliance with planning conditions. A need to quantify fugitive dust emissions more accurately from construction activity was raised several times during the stakeholder interviews.

Outputs

- A coordinated and consistent approach to measuring and monitoring dust for analysis and dissemination.
- Engaging major developers and accessing their data on dust would create a resource that could be used to quantify dust measurements.

Outcomes

Improved dust management and reduced site emissions. Reduced particulate matter concentration in and around constructions sites, which will deliver positive health benefits and improved awareness of air pollution emissions.

Recommendation 2: Support for a Construction Compliance Officer

Rationale

A Construction Compliance Officer would review dust management plans, assess onsite activity, check for NRMM compliance, and respond proactively to real-time data on air pollution emissions from construction sites. They could also review and enforce planning obligations and would work with both environmental health teams and planning officers but have specialist training in air quality.

The recommendation would be to work closely with local authorities to create a template job role for other boroughs to adopt. Starting the role in Lambeth and/or Southwark would create a learning legacy to create a unique training and support resource for construction compliance. Previous work in this area, such as the GLA-funded project led by the London Borough of Merton, has demonstrated that providing additional support to the sites has led to a better understanding of requirements and therefore an increased compliance score. Funding for this project has now ended.

Outputs

The Construction Compliance Officer roles and duties would be defined with contributions from the local authority. An assessment of current rates of NRMM compliance could be conducted across major developments in the key boroughs of Lambeth and Southwark. This would be both a desktop exercise, involving a review of the GLA's register, followed by site audits.

Outcomes

- Creating a specialist role to support and educate the industry in best practice and best available technologies would help to reduce emissions.
- Improved communication with the sites, and better contact with developers and contractors, would enable issues around air pollution to be more resolved more quickly.
- Improved understanding of site requirements, compliance checks on NRMM and the potential to develop a more accurate local inventory would improve the understanding of total emissions from the construction sector.
- A co-ordinated training programme would be developed in partnership with a lead authority on NRMM to make sure the latest available information is shared and regularly updated as new research is delivered.

Recommendation 3: Construction forums

Rationale

A major issue highlighted throughout this research has been the lack of communication and transparency between the local planning authorities, environmental health officers and the contractors delivering work on the ground. Often the boroughs do not have details for individuals at each site to contact when there have been complaints leading to long delays in resolving any issues.

Outputs

Construction forums would help to address this issue. They would improve communication between local authority officers and contractors and would improve communications between the contractors working on neighbouring sites in a redevelopment area.

Construction forums would help to build in best practice principles when engaging with residents. This can be positively approached as it allows for information sharing, area wide issues to be raised and addressed, as well as providing an opportunity to showcase emerging technologies and mitigation techniques.

Outcomes

- Better communication between the local authority and contractors.
- Air quality issues can be more rapidly resolved without the involvement of the planning enforcement.
- The forum would provide a platform to promote emerging technologies and improved working practices. It may also lead to indirect benefits such as better collaboration in future and stronger relationships between stakeholders.
- Learnings from the construction forum would be used to improve the whole process of area management, inform regulators as well as support and inform local communities affected by the development.

Adoption

Recommendation 4: Development of an NRMM emissions inventory and GLA register

Rationale

Several of the interviewees spoke about the need for better quantification of emissions from construction sites.

This could be delivered by using emission inventories, which would be focused on specific sites in Lambeth and Southwark and would capture a broader range of NRMM used, including that which falls outside the current NRMM register such as sub 37kW machines and diesel-powered tools.

It is unknown how much these individual sources contribute to overall NRMM emissions in London. They could be contributing significantly to air pollution.

This research would set a baseline to measure future policy intervention targets against and measure improvement.

Outputs

- Research into the benefits of existing schemes, such as the GLA's NRMM register, would provide the evidence needed to implement them elsewhere.
- The research would provide insight into the barriers and incentives required to increase uptake across the construction sector to inform policymakers of the best approaches to adopt.
- Research would also explore the potential to incorporate other machinery that is not currently included in local authority planning requirements such as that used in road and utility works and events.

Outcomes

- This research would identify where the biggest air quality impacts could be gained across construction, roadworks and events and may include modelling fleet renewal, use of retrofit technology, and the benefits of accelerating the current policy requirements.
- There would be interest in these results from policymakers and across the supply chain. This evidence could support the need for further regulation in machinery not currently included in planning requirements.
- The research would also be used to assess where the fleet is most rapidly changing to cleaner machines and help identify where further opportunities to reduce emissions exist.

Recommendation 5: Effectiveness of intervention measures and known mitigation techniques

Rationale

The survey highlighted a need for independent information about the benefits of using low emission and emerging technologies to displace diesel driven machinery.

Most information on the efficacy of measures is provided by the manufacturer or their supplier and there are low levels of confidence in the real-world benefits by the end users and their procurement teams. This has been particularly evident in the marketing of products that claim carbon reduction potential without transparency of how the benefits were calculated.

Outputs

- A review of available information, including online literature and surveys, would identify emerging technologies and abatement measures that have the potential to reduce emissions.
- Trials could demonstrate reduction potential. The knowledge generated through these trials could then be reported back to the industry.
- After-exhaust retrofit technology used on NRMM in London is currently required to be approved by the Energy Saving Trust's endorsed product scheme and this provides assurance to end users that the product has been independently assessed and meets the correct emission standard. No such scheme exists for other emerging low emission technologies.
- Creating a new accreditation scheme for London and the rest of the UK would give confidence to the end user of benefits and help to promote new solutions.

Outcomes

Awareness of emerging technologies, leading to wider industry adoption of improved working practices.

Recommendation 6: Supply chain and construction logistics plans

Rationale

Construction Logistics Plans (CLPs) use a combination of measures that focus on the supply chain to reduce air pollution. These are adopted by all contractors across a wider development area to maximise impact. Measures can include construction traffic routes, clear area signage, gate management systems, out of hours deliveries, vehicle holding areas, off site material storage, consolidated loads, and 'just in time' deliveries with 'last mile' on the cleanest available vehicles to reduce vehicle numbers.

There is further information on these measures from TfL[4] and these not only mitigate air pollution emissions but also increase road user safety.

More efficient working practices can reduce costs for the contractors because of less project delays and double handling of stored materials on sites where space is often a premium.

The Institute of Civil Engineering recommend that a CLP should be produced as part of every development planning submission and should embed air quality as a key part of health and safety assessments to be an effective measure.

One of the issues with uptake of these measures is, although there are many known interventions available to reduce the effects on air quality from the supply chain, there has not been an assessment on their effectiveness.

Sites near each other are often blind to what their neighbours are doing, whether it's the construction project phases, individual work packages, modelled vehicle movements across a phase, agreed haulage routes, utility works on the roads or one-off events such as over-size load deliveries for machines or building components. Any combination of these events rapidly leads to local congestion and increased idling, as well as reducing safety for other road users.

Outputs

- Local area CLPs need to be developed with achievable intervention measures and supported by developers and contractors through the construction forum.
- Behaviour change at sites and quantification of benefits should be assessed through activity data.

Outcomes

This research would encourage contractors to adopt the measures or for borough planners to condition their use as a requirement. It would allow greatest air quality benefits and any cost benefits for the contractors to be identified.

Regulation

Recommendation 7: Inclusion of low emission technologies in government and industry procurement

Rationale

A barrier to introducing low emissions machinery – which is not covered through the planning process – is a lack of knowledge within the procurement teams. Those teams require training so they can include new requirements within contracts.

Simultaneously, there are no minimum emission stage requirements for events, road, and utility works. The below recommendation for construction equipment could therefore also be applied to events, road, and utility works.

Outputs

We recommend that procurement teams identify where there are knowledge gaps and think about what the barriers to adopting new contractual requirements are, both internally and through contractor organisations.

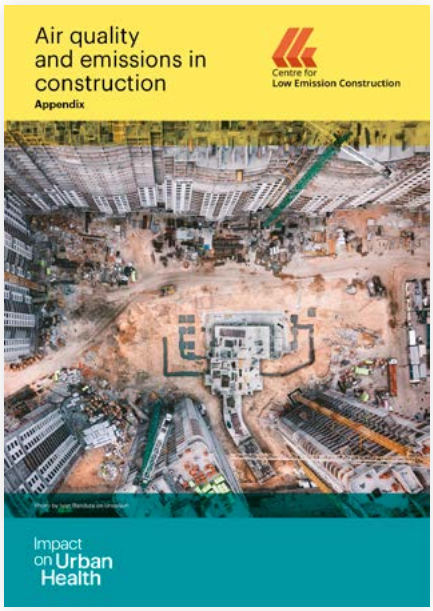
We also recommend that a training programme be adopted within relevant organisations such as the GLA and TfL to increase internal understanding of cleaner machinery requirements and allow this to be adapted for external use within contracts for the on-road construction sector.

Outcomes

- Inclusion of minimum emission standards for machinery used in the highways and events sectors.
- A 'level playing field' of requirements for all NRMM used in London.
- Improved understanding of NRMM emissions from sector areas that not currently captured by GLA's NRMM scheme. This data will be used to further improve the London Atmospheric Emissions Inventory and would support policy development.
- Procurement teams would hold power to impose emission requirements for construction projects.
- Plant hire companies would be willing to improve their fleet if there is sufficient evidence and demand. Increasing regulation into the highways and events sectors will drive demand for cleaner machinery that will be used elsewhere and in other sectors bringing wider benefits.

Appendix

A detailed appendix for this report is available on request. Please contact Impact on Urban Health at communications@gsttfoundation.org.uk for more information.



This report is authored by Daniel Marsh and David Green from the Centre for Low Emission Construction (CLEC).

CLEC works with the construction industry to assess the efficacy of mitigation and abatement techniques in real-world working environments. It provides independent scientific evidence to support the sector in decarbonisation and achieving net zero targets, while also delivering improvements to local air quality, health and the environment.

CLEC is part of the Environmental Research Group at the School of Public Health, Imperial College London. It has over 15 years' experience working closely with policymakers, local planning authorities and partner organisations across the construction sector and supply chain.

Impact on Urban Health works to make urban areas healthier places for everyone to live by removing obstacles to good health. Its health effects of air pollution programme explores how people's health is affected by poor air quality and tests solutions to reduce this harmful impact.

[1] https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2019

[2] https://www.london.gov.uk/sites/default/files/ulez_evaluation_report_2020-v8_finalfinal.pdf

[3] https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/nrmm

[4] https://content.tfl.gov.uk/construction-logistics-plan-guidance.pdf

Acronym guide

Acronym	Meaning
CO2	Carbon dioxide
CLEC	Centre for Low Emission Construction
CESAR	Construction and Agricultural Equipment Security and Registration
CLPs	Construction Logistics Plans
CPA	Construction Plant Hire Association
DEFRA	Department for Food, Environment and Rural Affairs
ESOS	Energy savings opportunity scheme
EU	European Union
PM2.5	Fine particulate matter
GLA	Greater London Authority
HGV	Heavy goods vehicle
IAQM	Institute of Air Quality Management
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LAEI	London Atmospheric Emissions Inventory
LGVs	Light goods vehicles
LEZ	Low Emission Zone
NOX	Nitrogen oxides
NRMM	Non-road mobile machinery
OEM	Original engine manufacturer
PM10	Particulate matter
TfL	Transport for London
ULEZ	Ultra-Low Emission Zone

Centre for
Low Emission Construction

@ConstructDustUK

clec.uk

Impact on Urban Health

The Grain House
46 Loman Street
London SE1 0EH

@ImpUrbanHealth

urbanhealth.org.uk