FORUM FOR THE FUTURE

# POLICY AS A ROUTE TO CLEANER AIR

## WHY A SYSTEMIC, CROSS-SECTOR APPROACH MATTERS

CLEAN AIR FUND | Tavoli Pharmaceutical consulting

# Cross-Sector Policy Action on Air Pollution: a pilot case study centring health

## An opportunity to strengthen policies that mitigate health equity impacts of poor air quality from life science building design, construction and demolition.

This pilot study explored opportunities to strengthen policies that prevent and reduce outdoor air pollution from life science building design, construction and demolition, focusing predominantly on the UK and Singapore. Leverage points to create systemic change were explored within the three overarching themes of 1) governance and accountability, 2) health equity, and 3) an expanded place based approach. Consideration was also given to the importance of tackling the root causes of poor air quality, highlighting the life science sector as being in a strong position to influence wide reaching change across multiple sectors including construction and healthcare. Recommendations were provided to life science companies, construction companies and NGOs and philanthropies working on air pollution and health. Case studies were described to inspire businesses to scale up best practice actions, and take a wider preventative approach to innovation and policy action that improves air quality and health outcomes.

## 1. Introduction

Air pollution is one of the biggest causes of death globally, accounting for an estimated 18% of total global deaths in 2018 – a little less than 1 out of 5. Being cited by the Energy Policy Institute at the University of Chicago as "the greatest external threat to human life expectancy on the planet" it has been compared to the danger of smoking, and is more dangerous than alcohol or unsafe water. Urgent policy actions at every level are needed to prevent these risks to human health, especially within exposed and vulnerable communities. Yet policy actions to date are siloed within each sector and often fail to place human health and health equity in the centre.

In this pilot study, we aimed to explore opportunities for more integrated environmental and health policy mechanisms that prevent and reduce outdoor air polluting emissions across the buildings and life science sectors. We conducted desk research to review outdoor air quality policies, guidelines and regulations in the UK and Singapore, and interviewed 10 predominantly UK based stakeholders, see appendix table 1.

After an initial scoping exercise, we focused our research on the design, construction and demolition phase of the building's life cycle. A systems change approach was applied to identify emergent themes, make connections,

identify evidence or data gaps and consolidate the findings into recommendations for life science and buildings companies, and NGOs and philanthropies working on air pollution and health.

## 2. Tackling the Root Cause

"The world is a complex, interconnected finite, ecological-social-psychological-economic system. We treat it as if it were not, as if it were divisible, separable, simple and infinite. Our persistent, intractable, global problems arise directly from this mismatch." Donella Meadows, Pioneering American environmental scientist, Author of Thinking in Systems.

The scope of this report and the research that underpins it is intentionally tightly defined: examining outdoor air pollution policy mechanisms at the intersection of the life science and the building sectors, with a specific focus on the construction phase of buildings. However, in exploring a specific issue, the systemic context matters. In examining the barriers or enablers for change we must look at root causes of why taking action on air pollution at this intersection might be inhibited.

A number of systemic current barriers and potential future levers of change, or leverage points, emerged through the research and interviews for this project. Leverage points are places to intervene in a system in order to shape new outcomes. Donella Meadows, a leading systems thinker, describes nine main leverage points and orders them from 9 - least effective, to 1 - most effective at effectuating lasting transformative change.

9. Constants, parameters, numbers (subsidies, taxes, standards).
8. Regulating negative feedback loops.
7. Driving positive feedback loops.
6. Material flows and nodes of material intersection.
5. Information flows.
4. The rules of the system (incentives, punishments, constraints).
3. The distribution of power over the rules of the system.
2. The goals of the system.
1. The mindset or paradigm out of which the system — its goals, power structure, rules, its culture — arises.

We have included recommendations across these leverage points in this report and we strongly recommend future actions span across the nine leverage points. When effort is applied across multiple leverage points, the conditions for change become more likely.

In the research for this project, at the most macro level, the dominance of Gross Domestic Product (GDP) as the measure of progress, speaks to the mindset (leverage point one) out of which our global systems (leverage point two) have arisen. The goals of our systems - as measured by GDP - drive behaviours that can result in negative social and environmental outcomes at every level of the system, from individual construction worker health impacts, for example,

through to procurement policies favouring the lowest cost option, through to shareholders driving business activities that maximise profit whilst potentially causing damaging effects, through to national governments prioritising stimulating the economy (e.g. through new major construction projects) whilst potentially ignoring the potential social and environmental harms that may be caused.

Ultimately, the dominance of GDP inhibits progress on improving air quality because profits and growth take priority over environmental and social impacts, including air quality, and the impacts on planetary and human health. The true costs of the externalities of, for example, clean air, are not costed into our global economic models, resulting in behaviours that do not value these externalities.

Interview participants in the most proactive, mature businesses on the issue being examined spoke about the critical importance of their leadership and shareholders being willing to take purpose-driven decisions, at the potential expense of profit maximisation. This demonstrates the importance of leadership mindsets (leverage point one) that are prepared to set organisational goals (leverage point two) that encompass a wider definition of progress and positive impact than the dominant paradigm of GDP. In our wider work at Forum for the Future we frequently encounter leaders who are aware that the limits to their ambitions for positive impact are constrained by the dominant operating context of GDP. This collective frustration has the potential to be a collaborative force for change, if networked, connected and oriented towards influencing different systemic goals.

In order to maximise the likelihood of transformative change on the intersection being examined we therefore strongly recommend taking a deliberate systemic approach. Whilst more specific recommendations are contained within the relevant sections of this report, the systemic recommendations to tackle root cause barriers include:

- Engaging with those organisations who are advocating for, and shaping, alternatives to GDP approaches, including the Wellbeing Alliance, and the Doughnut Economics Action Lab (DEAL): and collaborating with these to ensure that air quality indicators are integrated into emerging frameworks (leverage point two).
- Identifying pilots at the city-level that are taking "beyond GDP" approaches, to create collaboration opportunities to ensure that air quality indicators are integrated into pilot design and evaluation e.g. Milton Keynes and Amsterdam (leverage points three, four, five and nine). This speaks to the place-based, whole ecosystem approach explored in section 7 below.
- For organisations in the UK, leveraging the UK Government Social Value Act 2021, identifying opportunities to influence the specific inclusion of air quality indicators - including in the building construction phase - in the commissioning of public services (leverage points five and nine). Identifying other similar initiatives in other markets is also recommended.
- Within the Clean Air Alliance, identify those private sector actors who are experiencing the constraints on their ambitions to have positive social and environmental impact, caused by our global economic systems and measures, and facilitate collective advocacy. For example, in support of the Better Business Act which is aiming to shift the UK Companies Act 2006 to ensure that every business aligns their interests with those of wider society and the environment (leverage points one, two and three). Or, the Good Business Matters campaign, aiming to bring in a

new supply chain law to hold businesses accountable for upholding human rights and protecting the environment (leverage points one, two and three).

## 3. The Potential of the Life Science Sector as a Lever for Change

In addition to being worth over £94 billion to the UK economy, the life science sector conveys wider benefits on health by bringing medicines to patients that need them. In 2023 the UK government announced a multi-million investment in Life Sciences, the "Life Sci for Growth" package. Yet pharmaceuticals contribute 25% of scope 3 GHG emissions within the UK healthcare sector, and companies themselves are increasingly recognising the role they must have in reducing unintended harms on human health from their direct operations and supply chain. Leading pharmaceutical companies are collaborating under the Sustainable Markets Initiative to accelerate the industry's decarbonisation and there is evidence that progress is being made, although scope 3 remains challenging.

Other external pressures are forcing the industry to change. New EU medicines regulation being developed is expected to strengthen mandated information provided by companies on the environmental impact of medicines - what this means in practice is not yet clear. Medicines tenders are beginning to include environmental impact as a procurement criteria.

However, the life science sector does not yet generally estimate or report air polluting emissions. Exceptions are large global companies that are members of the Alliance for Clean Air including GSK, Haleon, Biogen and Accenture.

Despite its lack of maturity in relation to air quality mitigation, the life science sector has strong potential to be a critical lever for systemic change. It has a wide reaching sphere of control and influence across multiple other systems, see figure below. Indeed the number of employees within the industry itself or across its supply chain are likely to run into the millions, and almost every individual worldwide depends upon access to healthcare, upon which access to medicines have a profound influence.

For example, Johnson and Johnson ranked as the second largest life science company by revenue, has 130,000 employees, 250 operating companies, sells in almost every country in the world and works with more than 78,000 suppliers globally. It is clear that the building infrastructure required to support these operations is significant - see table 2 in the appendix for top 5 companies by revenue. Accommodating the workplaces of around half a million employees, the 5 largest life science companies can be collectively viewed as a globally dispersed city with wide potential influence and impact from corporate level policies and regulations for buildings.

GSK has disclosed that 8% of its carbon footprint can be attributed to scope 1 and 2 emissions from running labs, factories and commercial offices. They believe that significant benefits on air polluting emissions are likely in parallel

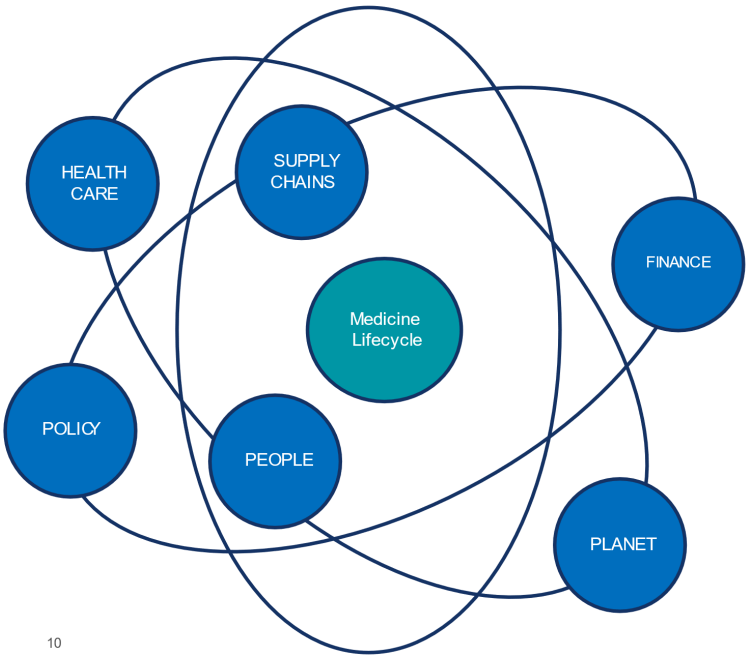
with a company-wide shift to cleaner energy sources, and are also in the process of creating global policies to avoid use of fuels that could worsen air quality where possible.

Whilst the shift to clean energy sources reduces air polluting emissions from buildings maintenance and use, it does not tackle air pollution from buildings construction or demolition, which are also significant contributors to poor air quality. In the UK, construction is responsible for 9% of NOx emissions and 12% of PM2.5 emissions, and unlike other sectors e.g. agriculture or other industries, often generates air polluting emissions where communities of people in urban centres are locally exposed to health impacts. This can in turn exacerbate health inequities for the construction workers themselves and local communities, including business employees. Companies therefore need to prioritise an air quality strategy in relation to buildings construction and demolition. Governance and accountability actions that the life science sector can take are outlined in section 4.

In a recent report by MedCity, the chronic lack of space for life sciences to grow in London was highlighted. The increasing clustering of life science activities in urban areas is motivated by a desire to co-locate with innovators, researchers and investors, to access talent sources, to access transport links and to attract and retain talent through local amenities. Minimising the impact of air pollution during construction to prevent additional health impacts on local communities is critical. In addition, an opportunity may exist to go even further towards purposeful design of life science parks to proactively improve air quality and address deeply ingrained health inequities even beyond its physical boundaries, in consultation with local people. This theme - taking a place based approach to benefit local communities - is further explored in section 6.

Finally, it is of note that in approaching life science companies to interview for this project, we found it challenging to engage for a variety of reasons. It appears that corporate sustainability teams are working near maximum capacity and struggling to take on additional workstreams. One alternative approach to tackling air pollution mitigation within the life science sector is to expand stakeholder engagement to include core business units such as medical affairs, market access and marketing that work at a product or portfolio level. Integrating air quality and its impacts on health into product and portfolio strategies linked to corporate purpose could create additional positive momentum within the organisation, see the case study B from Haleon in section 7.

**"Because of our (corporate purpose of) everyday health for humanity, what is clear here is that there is an opportunity for our brands to be more purposeful in what they do...once the senior leaders have that mindset, it carries through in all the parts of the organisation."** Interview with Haleon.




| System | Components |
|---|---|
| People | Healthcareprofessionals<br>Clinical academics<br>Consumers<br>Patients<br>Employees<br>Vulnerable groups |
| Healthcare | Hospitals<br>Primarycare<br>Communityhealthcentres<br>ScientificSocieties<br>Patient organisations<br>NGOs / non-profits<br>Peers<br>Universities |
| Policy | National Government<br>Local Government<br>Medicines regulators<br>PayerAuthoritiese.g. NICE<br>Public healthbodies |
| Supply Chains | Contract research organisations<br>Contract Manufacturing Organisations<br>Procurement<br>Production / distribution<br>Marketing/ comms |
| Finance | Investors<br>Investments<br>Funding bodies |
| Planet | Water<br>Air<br>Carbon<br>Biodiversity<br>Buildings |

*Sphere of influence of the life science sector*

## 4. Governance and Accountability

**Recommendations**

*Life Science Companies*

- Engage and develop the capability and understanding within leadership teams (Boards, C-Suites, divisional leaders) around social and environmental impact, aligned with company purpose - visionary leadership is a key enabler that flows down to tactical choice points such as adoption of ambitious voluntary standards (leverage point one).
- Ensure clear lines of responsibility and accountability, and associated reporting mechanisms to ensure standards on air pollution are being adhered to across company operations (leverage point four).
- Adopt voluntary standards - such as LEED, BREEAM and B Corps certification (leverage point nine).
- Advocate - through public affairs teams - for national regulation in countries of operation, in order to "raise the floor" of private sector operations (leverage points two, three, four).
- Develop company-wide global policies to mitigate air pollution associated with building design, construction, use, and demolition. Incorporate air quality mitigation and monitoring actions within procurement criteria for contracting of developers and construction companies (leverage point four).

*Construction and Developer*

- Engage and develop the capability and understanding within leadership teams (Boards, C-Suites, divisional leaders) around social and environmental impact, aligned with company purpose - visionary leadership is a key enabler that flows down to tactical choice points such as advocating for ambitious voluntary standards with clients (leverage point one).
- Advocate for evolution in leading green building certification schemes to strengthen and mandate criteria on outdoor air pollution during construction and design (leverage point nine).
- Ensure clear lines of responsibility and accountability, and associated reporting mechanisms to ensure standards on air pollution are being adhered to across company operations (leverage point four).
- Advocate - through public affairs teams - for national regulation in countries of operation, in order to "raise the floor" of private sector operations (leverage points two, three, four). This removes the uncertain element of whether a client will adopt voluntary standards.

*NGOs and philanthropies*

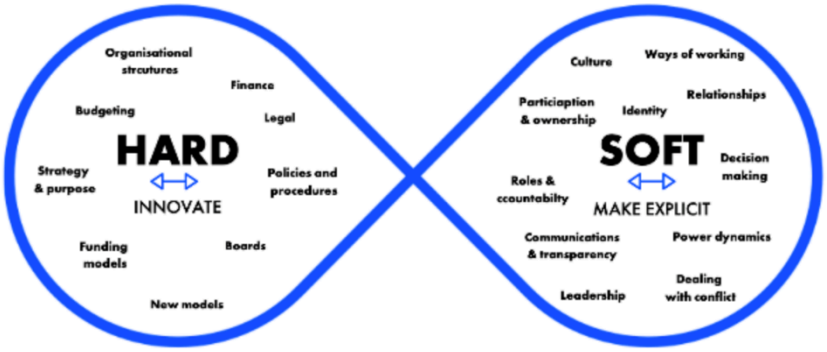
- Engage with leading green building certification schemes - such as LEED and BREEAM - to strengthen and mandate criteria on outdoor air pollution during construction and design (leverage point nine).
- Engage with B Labs (B Corp certification scheme) to influence the adoption of external air pollution indicators (leverage point nine).

- Consider approaching existing B-Corporation companies to encourage them to "go beyond" requirements to tackle air pollution from building construction in order to set good examples and to develop case studies that can be adopted by other organisations (leverage points two, four, nine).
- Engage with national governments to influence specific regulation on external air pollution indicators that relate to building construction (leverage point nine).

**Rationale**

Key to the effectiveness of policy-based approaches and voluntary standards is the governance and accountability that underpins the implementation of them. Without clear governance processes to effectuate, monitor and ensure compliance, even the most detailed and specific policy or standard will likely fail.

In recent years, governance as a route to transformation has emerged as one of the most critical drivers of change. Governance encompasses the "hard" forms and structures (such as hierarchies, policies and procedures, budgets), and the "soft" cultures and practices (such as relationships, leadership vision, culture and identity). See visual below. The hard and soft forms of governance interact constantly, and need to be coherent and aligned in order to be most effective. These hard and soft forms of governance can be overlaid with the leverage points, with mindset - the deepest lever of change - sitting within the soft forms, and being key to shaping the hard forms of governance.




Governance - at multiple levels - came out strongly in this research as critical to success in taking action on external air pollution in the building construction phase. A comprehensive, multi-level approach to governance and accountability emerged as the most effective way of ensuring that governance supports delivery of policy and standards. These encompass national regulation, voluntary standards, and organisational policies.

**National regulation**

Whilst voluntary standards and the policies of ambitious, leading organisations with strong commitments to positive social and environmental impact are important for "raising the ceiling", national policy and regulation is critical for "raising the floor" - for setting the threshold for compliance. Voluntary standards can shape the trajectory of ambition for national regulation but are insufficient in isolation if they are not also coupled with strong national regulation.

**"Anything that's voluntary is difficult as there's then a value decision to be made. If you're struggling on the viability of affordability then you can opt to forego voluntary standards. It needs to be legislation (to be mandated). Biodiversity Net Gain is a classic example of how a voluntary standard has now become statutory."** Interview with a construction company.

**Voluntary standards**

The LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method) standards were cited as the two most important building standard certification schemes. Interviewees from both healthcare and construction sectors spoke about meeting these voluntary standards as a proxy indicator for taking action on external air pollution. However, interviewees from the construction sector also indicated that they were unaware of external air pollution indicators in either BREEAM or LEED during the construction phase specifically, demonstrating a potential gap and opportunity to include and shape specific external air pollution indicators in this phase (and potentially in other phases beyond the building life cycle phase, such as in retrofitting and demolition). Overall, there is an opportunity to collaborate with BREEAM and LEED to shape specific indicators.

**"External air quality (criteria) are minimal, mostly on responsible construction practices, measuring things like fuel usage, electricity usage, transport emissions and compliance with construction schemes."** Interview with a construction company.

What was unanticipated was the potential importance of the B Corps certification as a mechanism for creating holistic organisational change, including on air pollution. Two of the organisations who provided interviewees - Chiesi (biotech) and Prime plc (developer) were B Corps certified and spoke about how the reinforcing feedback loop of the ambition to be an organisation delivering social and environmental benefit had led to the desire to become a certified B Corps, which in turn had shaped specific policies and practices within the organisation due to the stringent nature of certification.

**"The Better Building Programme was born out of a request for how to measure sustainability related to buildings. We wanted to go beyond measuring to (instead) set a standard. We then needed to develop the internal policies and the right roles who would ensure specifications were**

**carried through. The strong commitment of the Board to share-value - the intersection between business and the social value (was key). All of this was a catalyst."** Interview with Chiesi.

**"Our Board and the Chief Executive had initiated B Corp. You need to have visionary leadership. And in the absence of this, you need legislation. Raising the floor is key and the ceiling can still be higher. It's important that people know why they're doing things. But even if they don't then the standards need to be clear."** Interview with Prime plc.

As with BREEAM and LEED, interviewees (and subsequent research) indicated that B Corps certification does not specifically include indicators on external air pollution during the construction phase, but the approach is intended to encompass a company's entire social and environmental impact so it becomes probable that these dimensions would be considered during the certification process. However, this lack of specificity also offers NGOs and philanthropies an opportunity to work with B Labs on specific indicators.

**Organisational policies**

With multinational companies operating in multiple regulatory jurisdictions, ambition and consistency for positive social and environmental impact may be set at the organisational level, rather than only aligning with variable national standards. Interviewees spoke about the importance of clear and consistent organisational standards. Chiesi is highlighted as a best practice case study in section 7 below, case study A.

**"We work with many different construction companies and we set the standard in the tender. A constant is our minimum requirements - they are always the same. Our company policies are set irrespective of national policies (in the different locations)."** Interview with Chiesi.

Similarly, whether or not national regulation or voluntary standards are in place, at the practical implementation level clear lines of accountability within an organisation are key to ensuring adherence. Interviewees spoke about reporting lines, mandated frequency of visits, and mandated site check indicators linked to pollution.

**"For site construction activity we have particular mitigation measures that we require. There are two visits per month to ensure practices are being adhered to. The responsibility sits with the Local Manager that appoints a Project Manager who is responsible for documenting that standards are being met. Whilst the construction company is responsible for carrying out the work, a Chiesi Project Manager is responsible for monitoring."** Interview with Chiesi.

## 5. Health Equity

**Recommendations**

*Life science companies*

- Educate healthcare professionals, consumers and patients on the health risks of air pollution, and empower individuals and families to take action locally to improve air quality, connecting campaigns to existing national and regional strategies to promote health rather than treat disease (leverage points eight and five).
- Partner with patient organisations and scientific societies to develop advocacy positions and tackle issues of health equity from poor air quality (leverage point five).
- Shift to decentralised operating models to ensure preventative healthcare investments address localised issues of health inequity (leverage point eight).

*NGOs and philanthropies*

- Consider co-funding models with life science companies to explore how air pollution from construction affects health outcomes in local families and communities exposed, and specifically in vulnerable climate exposed minority groups, see evidence gaps below (leverage point six).
- Ensure that local clean air policies do not disadvantage surrounding areas e.g. introducing incentive schemes for retrofitting of non-compliant engines outside the London area (leverage point eight).

**Evidence gaps**

Two main evidence gaps have been identified that would be informative for establishing more equitable buildings design and construction policies.

- The extent to which air pollution from buildings construction impacts health outcomes (especially respiratory and cardiovascular outcomes) in local communities, families and individuals, with analyses stratified by socioeconomic vulnerability factors and climate risk exposure;
- Quantify the health impacts of short term but high impact pollution exposure during construction vs longer term but lower impact pollution exposure from building use to inform trade off decisions in rapidly growing urban centres.

**Rationale**

According to the Chief Medical Officer's Annual Report 2022, research has found big differences in air pollution across communities, with deprived areas often the worst affected. Children, the elderly, individuals with pre-existing cardiovascular and respiratory conditions are particularly vulnerable to the effects of poor air quality.

Some locally driven air quality policies could exacerbate the problem of health equity. For example the London's Low Emission Zone for Non-Road Mobile Machinery was reported by interviewees as displacing the problem, because

non-compliant engines were being deployed outside the London area. Incentivising retrofitting of engines was offered as a solution.

Best practice guidance from the Institute of Air Quality Management encourages developers to evaluate the magnitude of dust, sensitivity of the surrounding area and sensitivity of people to the health effects of PM10. Equal weighting is given to residential areas, schools and residential care homes, and no distinction is made based on the level of vulnerability or other social and environmental drivers of health. Best practice guidance for water stewardship, in contrast, emphasises the importance of stakeholder engagement, including those who have a common interest. The Alliance for Water Stewardship recommends a stakeholder mapping exercise listing any water related concerns they face, and planning on-going communications with them. It states:

**"Pay particular attention to traditionally disadvantaged and potentially less vocal groups, such as indigenous communities, women, children and the elderly."** Alliance for Water Stewardship, AWS Standard 2.0 Guidance 2020.

Especially within rapidly growing urban areas, this is an approach that could be adopted for air, introducing a management approach for air quality in the local community as a "common good". The existing process of seeking planning permission for construction work could be leveraged as a critical intervention point to engage broader stakeholders, especially vulnerable groups, and implement strategies that address long-standing equity issues to improve air quality, rather than just reducing further harm.

**"We do a lot of work on water stewardship by engaging with local stakeholders. The issue is not solved unless all stakeholders are involved. Air is just another common good (like water). Even if we do it (air pollution mitigation) well, it doesn't matter when there are others down the road creating more dust."** Interview with a healthcare company.

Businesses reporting on air pollution can use a generic approach to financially value air quality impacts - known as damage costs. This is standard practice for construction but estimates the general (average) impacts and does not take into account disadvantaged groups. To address this, there may be an opportunity to integrate local air quality data collected during planning permissions for construction with national air quality monitoring data and health surveillance data to better understand how air quality affects specific people groups, see evidence gaps above.

In Singapore a major reform called "Healthier SG" is being implemented, which aims to nurture an ecosystem that supports better health by leveraging primary healthcare systems and community partners. Additional skills in motivational interviewing and counselling are part of the training program for healthcare professionals, and an opportunity may exist to embed targeted education to vulnerable exposed groups on air pollution and health.

Case studies C and D in section 7 below represent research work ongoing or completed that could be built upon to address the evidence gaps.

## 6. Looking to the future: placed-based approaches

*Life science companies*

- Integrate green infrastructure elements such as green roofs, living walls, urban forests, and vegetated swales into the built environment to improve air quality (leverage points seven).
- Support policies that reduce emissions from transport including public transit and electric vehicles, and having 'no traffic zones' (leverage point eight).

*NGOs and philanthropies*

- Expand the boundaries of policy making to more place-based approaches that recognise specific challenges, opportunities, or priorities within a particular geographical area or community (leverage points one, three, seven).

**Rationale**

A number of representatives we spoke to from life sciences companies highlighted that their facilities were centred around or took the form of life science parks. Life science parks share many similarities with cities in terms of their infrastructure, economic activity, innovation ecosystem, and that they are placed in communities. By looking to emerging trends in urban policies for inspiration and guidance, and recognising the importance of engaging the local community, life science parks can build more robust measures to reduce emissions, promote sustainability, and create healthier, more resilient environments for their stakeholders and surrounding communities.

Urban policymakers are recognizing that many of the challenges faced by cities cannot be effectively addressed through sector-focused approaches alone. There's increasing understanding of the interconnectedness of various factors that contribute to a single issue. Instead of adopting one-size-fits-all solutions, place-based approaches expand the boundaries to take into account local context to achieve more sustainable outcomes. Place-based approaches for urban areas are strategies, policies, and interventions that prioritise the unique characteristics, needs, and assets of specific urban areas to promote environmental, social, and economic sustainability.

By expanding the boundaries of governance to include a wider range of issues, policymakers can better address the underlying determinants of health and well-being in urban environments. This broader perspective acknowledges that factors such as housing, transportation, education, employment, environment, and social equity all play critical roles in shaping health outcomes.

**"We (as developers) have limited power to improve air quality when working at a building level, because we cannot change the infrastructure that surrounds the building or any pre-existing inequalities. In many ways we will contribute to worsening it, causing more traffic in and out. Master planning at a city level is more effective."** Interview with a construction company.

New York's innovative approach to addressing food insecurity provides a good example of expanding the boundaries of governance to address a health related challenge. When Mayor Bill de Blasio took office in 2013, New York City shifted its focus towards equity and social justice, influenced by factors like economic inequality and racially unjust policing practices. The administration's commitment to equity led to initiatives like *One New York*, which emphasised reducing inequality in all municipal actions. This approach affected diverse planning processes, such as directing funds to neglected parks and revising performance reports to reflect social equity impacts. The integration of equity into all policies has expanded and deepened food policy, leading to initiatives like improving school food, enhancing access to Supplemental Nutrition Assistance Program (SNAP), benefits and prioritising equity in food procurement. Additionally, non-food equity initiatives, like those supporting job security and affordable housing, indirectly contribute to food security by improving economic conditions. This holistic approach underscores the interconnectedness of various policy domains in addressing social equity issues.

To draw the comparison to life-science parks, there is an opportunity to similarly 'expand the boundaries' from purely focussing on the direct emissions of the life science sector and to identify other root causes that influence overall environmental sustainability and public health impact of life science parks in the places they occupy, see case study E below.

For instance, implementing accessible low-emission transportation options for people commuting to and from life science parks can significantly reduce air pollution emissions associated with daily travel. This could involve promoting public transit, carpooling, cycling infrastructure, and electric vehicle incentives to encourage cleaner modes of transportation among park employees and visitors.

Designing life science parks with the aim of reducing private vehicle use can further mitigate air pollution and traffic congestion in surrounding areas. This might entail incorporating features like pedestrian-friendly infrastructure, convenient access to public transit, bike-sharing programs, and carpool lanes to incentivize alternative transportation modes and discourage reliance on single-occupancy vehicles.

Urban gardens and other nature-based solutions that can help to absorb pollutants from the air and release oxygen, thereby improving air quality. Urban gardens can also help to mitigate extreme heat, an increasingly significant health hazard due to climate change, and reduce the need for air conditioning, ultimately contributing to lower overall emissions. As an example in Seoul, city leaders have announced plans to create the first "wind path forest" by planting trees close together along rivers and roads to channel air into the city centre. The forest is expected to absorb particulate matter and provide cooling breezes for downtown Seoul.

**"There's a lot of work that has been done to see how we can design and build better, with a regenerative approach. This requires thinking of the entire process more holistically. It's not just about the building itself anymore; it's about the impact on traffic flow, ensuring people can get where they need to without solely relying on driving. It's about transforming the urban landscape**

**to prioritise pedestrian-friendly spaces, rather than just focusing on square footage and construction progression."** Interview with a construction company.

**Singapore's approach**

City-level interventions, particularly in urban design and planning, are at the forefront of efforts to mitigate air pollution and improve public health. Singapore's proactive stance on urban development provides a compelling example.

The "Geneo" life sciences and innovation cluster in the 55-hectare Singapore Science Park (SSP) provides a good example. Geneo adopts several low carbon technologies and sustainable innovations during the construction process. To lower Geneo's embodied carbon footprint, mass engineered timber (MET) harvested from sustainably managed forests is used to construct the canopies and columns at Geneo's event plaza. Compared to traditional construction materials, MET produces relatively lower net carbon emissions, with an estimated embodied carbon savings of 88% over steel and 63% over concrete. In addition, certified Singapore Green Building Product (SGBP) materials such as green concrete, architectural finishes and M&E equipment are used in the construction of Geneo. These help to improve indoor air quality and reduce energy consumption, making it healthier and more cost effective for building occupants. The project will adopt carbon dioxide mineralised concrete, a type of low-carbon sustainable concrete that uses carbon capture and utilisation technology to chemically convert carbon dioxide into a mineral embedded in concrete, producing harder concrete. Instead of diesel generators, a battery energy storage system is used at Geneo's construction site to provide power to construction machinery, lowering carbon emissions by about 78% while maintaining a productive worksite.

Climate change will drive the need for more place-based solutions

As climate change intensifies, its effects become increasingly localised and variable across different regions. From rising temperatures and changing precipitation patterns to more frequent and severe weather events, each locality faces unique challenges that require tailored responses. Place-based solutions recognize this diversity and should enable policymakers to develop targeted interventions that address the specific vulnerabilities, risks, and opportunities of individual communities.

In conclusion, adopting a holistic approach to policy making, informed by principles of equity and lessons from diverse domains, is essential for effectively addressing the complex challenges posed by air pollution. By embracing innovative strategies and collaborative efforts at various levels, policymakers can create healthier and more sustainable environments for all.

# 7. Case Studies

**Case Study A: Chiesi & The Better Buildings Programme**

***Systemic leverage point***

1) The mindset or paradigm and 5) The rules of the systems

***Approach***

Chiesi is a family owned, research-oriented biotech seeking to integrate sustainability into everything they do. Launched in 2020, the Better Building programme *(page 59)* aims to elevate Chiesi global sites to high sustainable building standards, such as LEED and Green Building. This initiative enhances occupant well-being and reduces environmental impacts on local communities. It adopts a holistic approach to energy reduction, water conservation, waste management, and human experience, addressing the entire building lifecycle from design to operation.

***Impact***

The new Chiesi Headquarters was designed and built following the principles of the six LEED categories. During construction, contractors implemented an erosion and sedimentation control plan to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust. Examples of mitigation measures included provision of gravel in temporary roads and pathways to avoid erosion and soot, vehicle wheel washing before leaving the site, installation of a dust proof fence around the site, and watering of the site to reduce the generation of dust and consequent dispersal by air.

The standard for mitigation of air pollution during building construction was raised across the business.

**Case Study B: Haleon & Raising awareness of the impact of air pollution on respiratory health**

***Systemic leverage point***

1) The mindset or paradigm and 8) Regulating negative feedback loops

***Approach***

Otrivin, a decongestant nasal spray, launched its Actions to Breathe Cleaner at COP26 in 2021 with its Air Bubble educational exhibit. As children play in the Air Bubble, micro-algae purify the air. The Actions to Breathe Cleaner program teaches young people about the everyday actions they can take to minimise the health impacts of air pollution.

***Impact***

The program has engaged thousands of school children across multiple markets on actions they can take to breathe cleaner, such as changing their routine to school to reduce exposure to air pollution hotspots. Now in its third year, the program is focusing efforts on indoor air quality, where statistics show a disproportionate impact on human respiratory health in homes, schools and offices.

In India, air purifiers have been installed in schools and 10,000 'pollution capture pencils' were created by mixing graphite with residue collected from air purifiers installed at three schools with the poorest air quality in Bengaluru. Additionally, the team collaborated with Ecologi Action Ltd to fund Improved Cook Stoves (ICS) in Assam, India, designed to help 35,000 households to breathe cleaner air, while reducing carbon emissions. Otrivin continues to engage academic and healthcare partners on their findings, recently presenting results from an interactive study conducted in UK schools at the European Public Health Conference in Dublin in 2023.

**Case Study C: AI4 Healthy Cities, Singapore**

***Systemic leverage point***

2) The goals of the healthcare systems and 8) Regulating negative feedback loops

***Approach***

This project, established by the Novartis Foundation, works with cities around the world, including Singapore, to help identify true drivers of health in urban environments and help inform impactful health policies. In their research they recognise that only 10-20% of health outcomes are determined by the healthcare received, and the remainder is driven by social and environmental determinants of health, including exposures to poor air quality.

***Impact***

Using artificial intelligence, the main drivers for health at individual, family and community level can be analysed to help healthcare professionals intervene most effectively to prevent disease. These data driven insights can be shared with other governing bodies e.g. urban planning, transport and education.

**Case Study D: Buro Happold & C40 Cities**

***Systemic leverage point***

1) The mindset or paradigm and 2) The goals of the healthcare systems

***Approach***

Buro Happold was appointed by C40 Cities to lead a 2 year programme of technical assistance for 26 global cities. Within the programme, Buro Happold and C40 Cities assisted cities to evaluate air quality, health and socioeconomic benefits of urban climate actions. An extensive literature review was undertaken to inform a list of co-benefits from which selections were made to be modelled.

***Impact***

The analysis of climate actions being taken by participating cities was estimated to reduce greenhouse gas emissions by 3.5MtCO2e whilst bringing about a sizable improvement in air quality for 77 million citizens. This would prevent 2655 annual premature deaths due to air pollution, translating into 31,135 life years gained across all the cities, generating a total economic value of USD 1 billion dollars per year.

**Case Study E: Oxford Road Corridor, Manchester**

***Systemic leverage point***

2) The mindset or paradigm and 2) The goals of the systems

***Approach***

Manchester's Oxford Road Partnership was formed in 2007 as a collaborative ecosystem between universities, hospitals, City Council and the private sector. It is intended to be a place where "knowledge, business and culture thrive". The city centre along Oxford Road houses one of the largest clinical academic campuses in Europe and includes universities, teaching hospitals, research facilities, cultural and leisure facilities and green public space.

***Impact***

Oxford Road Corridor partners have invested heavily in their estates in recent years, transforming the area through new public realm, green spaces and improving permeability. This campus feeds a strong cluster of life science start-ups, scale-ups and global corporations located in Citylabs 1.0 and 2.0. Developed by Bruntwood and MFT, Citylabs delivers nearly 200,000 sq. ft of specialist lab and office space to help satisfy growing demand. One of their aims in their strategic vision is to reduce the carbon footprint of Corridor Manchester and innovating green technology.

## About Forum for the Future

Forum for the Future is a leading international sustainability charity with offices in the UK, US, India and Singapore. We aim to transform the way our world works. For over 25 years we have been partnering with business, government, and civil society to catalyse deep and urgent change for a more sustainable world.

However, we believe greater ambition is needed to tackle today's escalating challenges. That's why we're looking beyond long-established but no longer fit-for-purpose notions of 'sustainability' and even 'net positive'. In India, Southeast Asia, the UK and Europe and the US, we are now responding to a world in crisis by accelerating the shift to a just and regenerative future – one where both people and the planet can thrive.

## About iovoli pharmaceutical consulting

iovoli pharmaceutical consulting has a mission to inspire and facilitate medical leadership at the nexus of climate, health and equity.

Contributing courageous, creative and unique thought leadership on sustainable healthcare systems transformation, we passionately believe that medical leaders within the Life Science sector can be a proactive catalyst for societal change that places health in the centre.

Working with purpose driven organisations and individuals we write white papers, facilitate systems change processes, conduct research, provide strategic advice, share business-critical & future-orientated insights, dismantle siloes and provoke those we work with to think with a broader lens about what is possible.

## About Clean Air Fund

We all need clean air to live and thrive. Yet 9 out of 10 people breathe air that is harmful and dirty, making air pollution one of our biggest health threats. Over 8 million people die every year as a result of air pollution – more than twice as many as from malaria, tuberculosis and HIV/AIDS combined.

It doesn't have to be this way.

The Clean Air Fund works around the world with governments, campaigners, researchers, funders and businesses to deliver clean air for all as fast as possible.