

## Every Breath We Take – Transforming the Health of China’s Office Space

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### ABSTRACT

Air pollution in China continues to be a major health risk for people across the country, with millions of premature deaths each year linked to the bad air. Continuous exposure to dangerous levels of PM2.5 – or ambient pollution dangerous to health – has also been proven to lower productivity, as well negatively impact talent attraction and retention, making it harder for companies in China to operate under a slowing economy.

With a majority of the PM2.5 outdoors making its way into the office buildings we work at, it is crucial for us to be aware of the fact that we are not safe indoors unless the air inside is properly managed. As China shifts to a service-oriented economy, even greater numbers of people will be working overtime hours in office towers, and thus, the importance of ensuring good air in the workplace will have greater implications ahead.

In the first in-depth industry look at how stakeholders in the China office market can improve indoor air quality by strategically incorporating the use of mechanical systems, professional commercial real estate services firm JLL and environmental consultancy PureLiving China present their findings on the subject. The publication also speaks to the level of action needed to be taken by landlords, tenants, and occupiers to create safer workspaces in China.

By taking the lead in this area, China has real opportunity to not only address the challenges it faces with air pollution head-on, but also to serve as an example for other industrializing nations to follow – as they, too, struggle to cope with bad air. Finally, while we cannot change conditions outside, we can all do something to control the situation indoors, which also happens to be where we spend most of our time working.

**Keywords:** *indoor air quality, China office market, indoor environmental quality*

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### 1. OPPORTUNITY CALLS ON CHINA’S OFFICE MARKET

In the modern business world, people in China are spending more time indoors than outdoors. At work, employees from 90 percent of the country’s industries are clocking in overtime hours on a weekly basis (Beijing Normal University, 2015). Meanwhile, outside of the office, the air in China is a serious problem. Air pollution in China contributes to some 1.6 million fatalities in the country annually (Rohde et al., 2015). While the number of premature fatalities linked to the air that we breathe indoors is difficult to quantify, we know that spending time inside, in places where the air is not properly managed, also exposes us to harmful levels of outdoor pollution – and the ubiquitous PM2.5. The real danger is that 75% of PM2.5 outdoors – or particulate matter sized 2.5 microns or smaller – makes its way into buildings (Wallis, 2015). PM2.5 penetrates deep into our lungs, enters our bloodstream, and has sobering long-term health implications. Consequently, pollution remains at the forefront of public health concerns in the country and continues to be a focal point of China’s 13th Five-Year Plan (2016-2020), with targets curbing reliance on coal-fuelled power – a chief source of PM2.5 – reaffirming the Chinese government’s deep commitment to the “war on pollution”.

As pollution continues to strongly influence China’s plans for the future, indoor air quality is a critical issue that deserves greater attention, especially as high public awareness on pollution continues to increase and dramatically change people’s expectations toward health. Moreover, pollution is no longer primarily a concern among just foreigners working in China; everyone is worried about the bad air. In just a short time, the general public has gone from a state of near indifference to possessing to world-leading levels of knowledge on air quality indexes, and this is particularly evident in major cities like Beijing and Shanghai. Though China is not that far behind India and Pakistan, which suffer the highest PM2.5 concentrations in the world (World Health Organization, 2014), it is head

and shoulders above in both awareness and policy, making it best-positioned to act on indoor air quality in a global context so that other industrialising nations can follow.

While environmental reform in China is a long-term endeavour, we can all take proactive measures now to improve indoor air quality and create office space that employees will want to work in – and choose over others. In this white paper, we explore how sound investments in indoor air quality today pays immediate and future dividends, giving employers an important edge needed in China to attract and retain top talent in the increasingly competitive marketplace. Though our findings are far from providing all of the answers to indoor air quality problems, we have looked at the outside air in China and assessed how it is of concern to both landlords and tenants in the office market. Supported by data analysis of indoor air quality samples collected by our partner for this paper, indoor environmental consultancy PureLiving China, we address indoor air quality challenges for the China office market and offer potential solutions for companies operating in the country.

Our key takeaways include:

- Good indoor air quality correlates with nearly twice the level of productivity compared to average air quality and is of increasing significance for talent attraction and retention in China.
- Good indoor air quality can be achieved by following our three As: Assess, Act, and Assure.
- Investments in indoor air quality further differentiate office buildings from competitors, better enabling them to retain value.

Good indoor air can double productivity levels

While the benefits of a healthy workspace can be difficult to measure in terms of directly correlating gains, new research indicates that working environments with better ventilated clean air helps raise the level of productivity for analytically intensive tasks by as much as twice that compared to just average air quality (see Figure 1; Allen et al., 2015). The study is significant because it suggests that air quality has far more of an impact than previously thought, as previous studies only linked better airflow to a limited improvement of productivity for repetitive tasks such as typing speed (World Green Building Council, 2014). Furthermore, instead of relying on performance of rote tasks, the study measured performance on standardised tests assessing analytical skills highly relevant to professional services firms. This is particularly relevant for China, as it shifts towards a service-oriented economy.

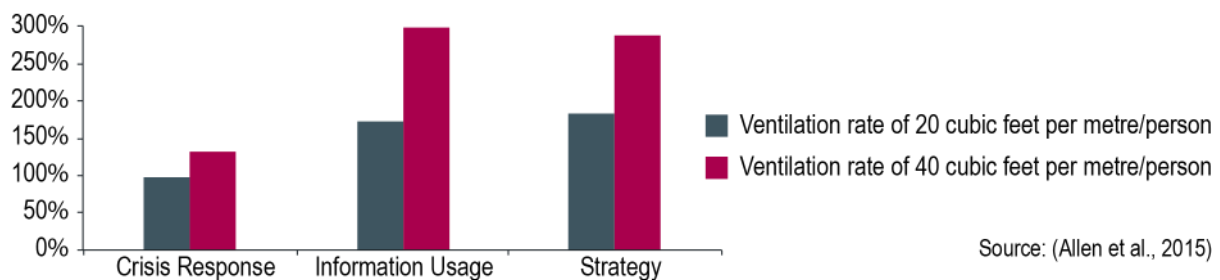


Figure 1: Productivity increases in analytical tasks

A boost for talent attraction and retention

Under a slower economy, productivity gains from good indoor air are also especially significant given that staffing costs make up the bulk of a company's operating costs. Moreover, investments in improving air quality can pay for themselves in as little as three to six months through increased productivity, reduced sick days, and lower health insurance premiums (Wallis, 2015). Though technologically advanced buildings with filtered fresh-air systems tend to be higher rent-buildings, these properties typically only demand marginally higher rent than the market average. Thus, a small premium in office rent could go a long way in creating big cost-savings for firms as greater productivity leads to better performance.

## 2. OUR 3As STRATEGY ACHIEVES OPTIMAL RESULTS

Achieving good indoor air quality at work is as simple as following our 3 As: Assess, Act, and Assure. While the actions taken by employers to improve indoor air quality in a new or old building will differ, the process undertaken to get there will be the same. Though many employers have a tendency to cut corners at some stage of the process, believing that budgetary requirements will be beyond their reach, this is perhaps unwise. Skipping over a step could lead to serious repercussions – the circulation of dirty and dangerous air – that could prove much costlier and painful to fix at a later date. It is also important to note that not all undertakings to improve air quality are necessarily costly. Moreover, as companies face added pressures to run on lower operating budgets to increase their competitiveness in the market, we expect more employers in China to seek a better a balance between achieving good indoor air quality, energy-efficiency, and cost-savings.

First: assess your workplace situation.

When considering a space for lease, tenants should be proactive in asking landlords about what has been done to provide good indoor air quality in the building. For example, does the office tower have a fresh-air system in place, and what is the effectiveness of its filtration system? The more tenants ask these questions, the better, as it motivates landlords to consider these specifications when they do upgrades. It also applies pressure on them to change their property management practices. Yet, even if a landlord assures you of excellent air quality, it is not possible to detect the indoor air quality of a space solely by relying on their responses. Even in cases where the landlord has answered truthfully, differences in design, operation, and maintenance can produce varying outcomes. Thus, due diligence is important. Having air quality tested not only provides a snapshot of the situation, but also helps to form the basis of a solution to improve the indoor air quality of the space in question. For the best results, PM2.5-auditing should be conducted by a credible third party, not just before occupation as is most commonly done, but actually prior to fit-out commencement to ensure that solutions can be implemented during the fit-out period (or afterwards as a retrofit). This assessment is critical to knowing how to act.

Second: act on that information.

With a sample of 100 data points collected at some 50 commercial offices around the country in Beijing, Shanghai, Chengdu, and Suzhou from indoor air quality testing carried out from 2013-2015, PureLiving China considered almost a dozen factors contributing to indoor air quality. This helped us determine what has the biggest impact on PM2.5-reduction indoors. Surprisingly, several factors, including building height, occupant density, and green certification had little correlation with the reduction of PM2.5 indoors. Statistical analysis revealed that as a group, mechanical systems, specifically the heating, ventilation, and air conditioning (HVAC), and filtration functions, make the most meaningful contributions to cleaner indoor air at offices in China (see Figure 3). Therefore, these should be the prime focus of efforts to improve the air where we work.

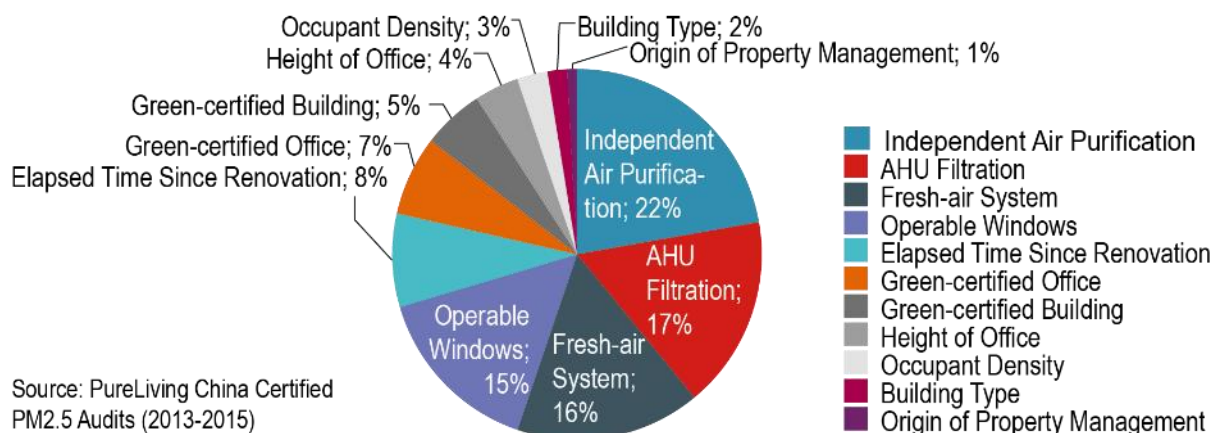


Figure 2: Relative impact of factors on PM2.5 reduction

Improving the indoor air quality of an office can be as simple as ventilating the space with fresh air from an open window. While this may work in other countries, in China, opening a window often means bringing polluted air into the workspace. As a result, many office towers rely on a fresh-air system to ventilate the air within their building. The easiest way to purify the air inside is to exploit existing equipment and retrofit higher efficiency particulate

filtration media into existing air handling units (AHUs) of a central HVAC system. AHUs utilising high-efficiency filters deliver large amounts of purified air at a minimal cost, but retrofitting the central ventilation or air conditioning system is not always an option; sometimes, the fresh-air delivery rate is already low and should not be further reduced, or the landlord is unwilling to allow modifications. This leads many tenants to assume that control over their environment is beyond their reach, but is untrue. Tenants can, in fact, significantly benefit from installing independent purifiers that filter the air within their offices. Depending on the size of the space or the time permitted for the upgrade, different methods can be used to filter the recirculating air.

There are two ways to approach this. One is the use of portables, which can be highly effective, but carries cost, maintenance and human error drawbacks. A second option is to install in-ceiling recirculating solutions which our data found to be the most effective and cost-efficient. The in-ceiling approach has been found to be significantly more effective for big areas compared to portable air purifiers at floor level due to their higher capacity and therefore sweeping coverage area. In-ceiling systems can also be spaced apart without any airflow obstructions from furniture. This allows for evenly distributed filtration at a faster rate and minimal sources of interruption. By comparison, portables are frequently found turned off, without a filter, with a dirty filter, or with a filter incorrectly inserted, making it difficult for the machines to work as designed. The results of our analysis (see Figure 4) demonstrate a combination of in-ceiling purification, AHU filtration, and a fresh-air system is most likely to lead to the most meaningful reductions of PM2.5 indoors.

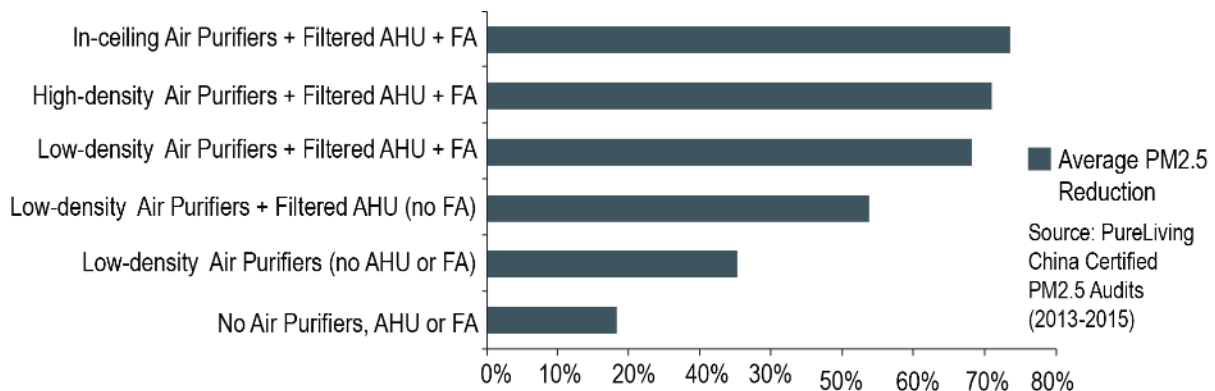


Figure 3: HVAC and filtration combination efficiencies

The use of mechanical systems is most compelling when extreme spells of pollution hit. Figure 4 shows the actual recorded PM2.5 levels in a 1,000-sqm Grade A office in Shanghai during a historic “airpocalyptic” episode in December 2013. This is the true stress-test of the equipment. By using in-ceiling air purifiers to filter the recirculating air, the company’s office effectively achieved a 93 percent-reduction. Indoor PM2.5 levels never exceeded 40 micrograms per cubic metre, while outdoor levels soared up to 570 micrograms per cubic metre.

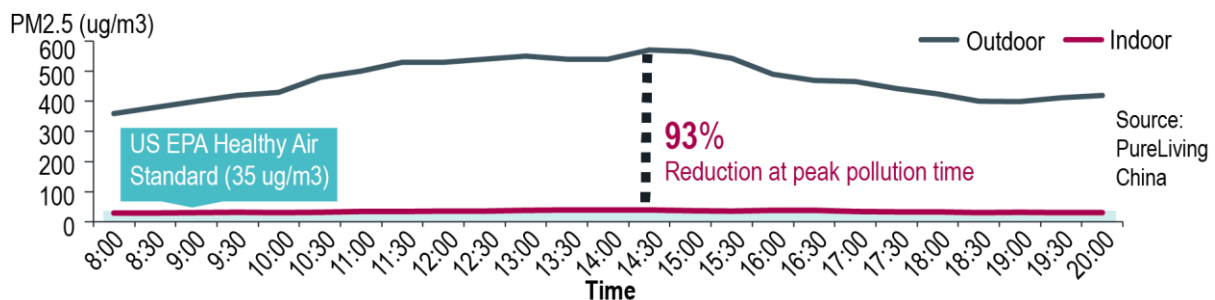


Figure 4: Dec. 2013 Shanghai “Airpocalypse” – PM2.5: outdoor vs. indoor

While portable filtration units are quicker to set up and cheaper by the unit than ceiling units, more portables are required to cover a larger space. Therefore, portables are most suitable for smaller rooms (typically working best in spaces smaller than 20 square metres in size) or temporary offices requiring flexibility in deployment. In-ceiling units, on the other hand, take comparatively longer to set up, but their installation is still relatively quick, and they can be hidden with drop ceilings to reduce their visibility and distraction to employees. Though the capital investment required for these systems is more upfront per unit than portables, they offer greater longer-term cost-savings due to lower maintenance costs and higher coverage per unit (see Figure 5).

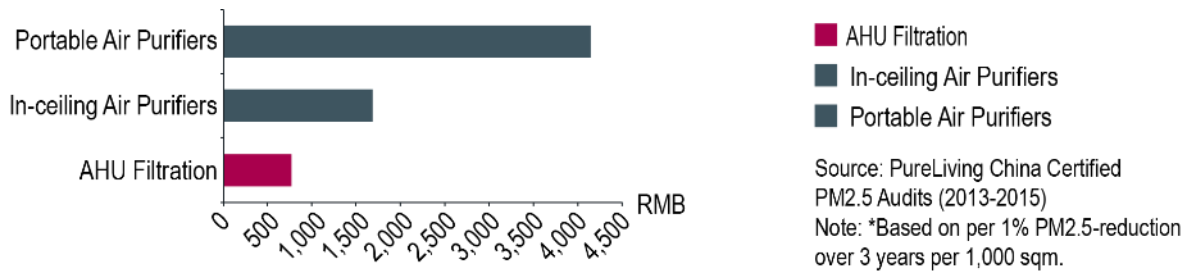


Figure 5: Relative cost for mechanical system filtration options\*

Meanwhile, on-demand automation is the latest tool in the market. Strongly preferred for its ability to reduce human error or mistakes commonly made when it comes to manually operating purifiers, such as cleaners accidentally turning units off on “good-air days” and people fighting over the control switch without understanding how the machines work. On-demand automation is also highly efficient and energy-saving as pre-programmed functions enable air filtration systems to function based on real-time air quality (see Figure 6). Given that the machines do not need to be kept on at all times, on-demand automation also lowers operating costs through energy savings. Therefore, we expect interest in on-demand automation to grow as the number of employers investing in better indoor air quality rises.

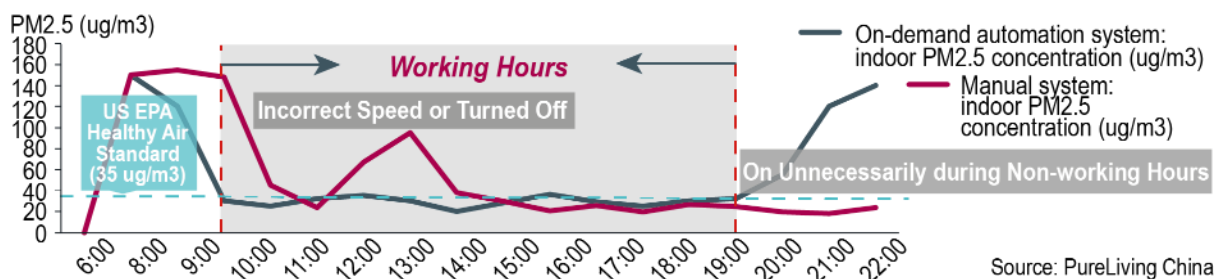


Figure 6: On-demand automation vs. manual operation

Third: assure that good air quality is maintained by continuously monitoring your accredited space.

Many landlords and employers mistakenly assume that once the installation is complete, there remains nothing left to do. In fact, the real work begins after a designated system is up and running. Continuous monitoring of the indoor air quality allows operation teams the ability to fine-tune performance of the equipment and staff operating the machines the ability to improve how the machines are used. It also ensures that landlords, employers, and employees are getting the most out of the systems. The good news is that ongoing monitoring has never been easier, due to the convenience of online applications that are able to capture live indoor air quality readings. This is rapidly driving the industry toward performance-driven solutions, exerting greater pressure on landlords to deliver consistently desirable results as employers are pushed by employees to provide safe air during working hours. In turn, demand for industry certifications like RESET ([www.reset.build](http://www.reset.build)) or WELL ([www.wellcertified.com](http://www.wellcertified.com)) is mounting, as these accreditations have been proven to help protect occupant health with specific requirements for criteria affecting indoor air quality. Apart from providing a road map and standard for the creation of healthy spaces, these certifications provide marketing benefits and recognition for those who make the effort and achieve real results. Moreover, real-time monitoring apps, particularly those which allow accredited spaces to be followed online by employees, further offer a high degree of transparency, and thus, these apps also serve as a powerful feedback tool in holding both landlords and employers accountable for the indoor air quality of their space on a regular basis. This ultimately encourages both sides to work together to make certain that problems are rectified quickly as they arise, additionally helping to minimise interruptions to good indoor air quality.

### 3. MARKET DIFFERENTIATION IS KEY TO SURVIVAL, SUCCESS

Investments in indoor air quality further differentiate office buildings from competitors, better enabling them to retain value in any market. While we have discussed why employers have numerous reasons incentivising them to act quickly, it should also be recognised that landlords, too, have a very persuasive case to be proactive in leading the market. As more landlords consider HVAC upgrades, making the right level of investment in system upgrades will be essential. Under-investing has been the case historically and should be avoided – as should over-investing from

an insufficient assessment of the situation. The bottom line is that office towers with good indoor air will only be more appealing to tenants. Buildings without good indoor air quality will provide tenants with less incentive to sign or renew their leases, particularly in older buildings where tenant leases are nearing expiry. In the worst-case scenario, tenants will move into buildings with cleaner air. Even buildings with high occupancy are still susceptible to losing tenants.

Today, office buildings with good indoor air quality are able to set themselves apart from competitors. Later, as more buildings upgrade their systems, those with the best equipment (specifically fresh-air systems and AHU filtration) will be able to maintain their relevance to the market. Moreover, properties with good indoor air quality will be more resilient in periods of economic downturn or slow growth, thus extending their long-term market viability, particularly as health and safety concerns remain a priority for building satisfaction among tenants (BOMA, 2013).

#### 4. WE ARE NOT POWERLESS AGAINST AIR POLLUTION

While we cannot change conditions outside, we can control the situation indoors, which also happens to be where we spend most of our time working. In the interim, this means that the onus will be increasingly placed on landlords and employers to be proactive in providing effective and sustainable solutions to safeguard people from the major health risks that come with the bad air, especially as more employees demand that the welfare of their health be taken seriously in the workplace. With all there is to gain, we are cautiously optimistic that more office stakeholders will act and lead the pack with the delivery of sensible indoor air quality solutions.

In this paper, we have examined the subject of indoor air quality, with a dedicated focus on its relation to pollution in the China office market within the context of commercial real estate. Considering that pollution is an ongoing concern, however, our intent is not to be overly conclusive, but rather to help provide a better understanding of the bigger picture and how the issue is growing in significance for companies operating in China. We have also outlined practical options in our 3 As strategy that are available in the market which can help improve the situation – now. Though more landlords and employers in the office market are increasingly getting on board, the reality of the situation is that those currently acting to achieve good indoor air quality continue to make up the minority, when in actuality, the pursuit of clean indoor air should really be a mainstream priority.

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