Biophilic Design

The best kept secret of a healthy and sustainable workplace

Oxygen at Work AG

Whitepaper

Biophilic design: The best kept secret of a healthy and sustainable workplace

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1 Introduction

The world of work is undergoing an unprecedented transformation. Some are vast and visible, such as the recent surge of machine learning and artificial intelligence or the rise of "do anything from anywhere" technologies. Other ideas are just beginning to emerge, like monitoring content to ensure gender balance, or rethinking office design to promote air quality as well as to lowering operating costs.

The 1990's and early 2000's was the beginning of the green revolution in buildings which was all about optimizing the performance of the building and making it as energy-efficient as possible. Wellness in buildings is the new green that takes into account the human aspects, aiming to achieve greater efficiency and enhance the environment of the building's user. One that makes occupants happier, healthier and more productive. The workplace environment and its role in employer-employee relationships are becoming a top priority for today's business. According to a **global survey in 2019**, employees who are satisfied with their workplace are 16% more productive, 18% more likely to stay, and 30% more attracted to the company over competitors.

The heightened focus on human-centric buildings denotes a (new) tipping point in the evolution of the workplace design. Building owners and operators are shifting their focus away from technology towards individual use cases and their respective outcomes. For most employers, a healthy and happy workforce is a vital component of a productive, successful company. Thus, corporate real estate and facility management are inevitably becoming far more interested in increasing occupant's cognitive function. A recent **study in Environmental Health Perspectives** directly

quantified how the indoor environment quality, in which we work and live, affect our well-being and productivity. On average, cognitive scores were 61% higher in the green building and 101% higher in the wellness building than in the conventional building.

Today's business has a responsibility to itself and employees to look after its most expensive asset by making the work environment as healthy and nurturing as possible. Staff costs, including salaries and benefits, account for up to 90% of a business' overheads. Therefore, their productivity, or anything that affects their ability to be productive, should be a major concern. Even a 1% increase in staff productivity, or a 1% decrease in staff turnover, can have a noticeable effect on a company's bottom line. As the benefits and importance of building wellness increase, the incorporation of wellness into our buildings is no longer just a "nice-to-have". For an organization to operate most effectively, it is important that human resources and facility managers, two of the most important drivers of business performance, work in partnership. This white paper aims to help corporate real estate and facility management teams navigate their path towards more human-centric office building designs.

The Swiss company **Oxygen at Work** focuses on the development of biophilic workplace designs aiming to increase physical and psychological well-being and, at the same time, to reduce emissions in and from office buildings. Using a combination of suitable plants, sensor technology and big data, this innovative nature-inspired, science-driven design solution helps improve indoor air quality and achieve energy consumption efficiency in office spaces as well as to promote health and well-being in the workplace. The IoT-based biophilic design concept, which communicates with a user-friendly online software serving as a decision support system, enables engineering indoor environment through real-time monitoring and regulating local indoor air quality. Large national and multinational companies with office buildings in Switzerland and Germany have successfully implemented Oxygen at Work's solution to create a healthy and productive workplace with improved air quality. **Oxygen at Work** supports companies like Cognizant, Swissgrid, Lindt, Philippe Morris, ABB, JLL, and 3M, among others. Through collaborating with **Empa NEST, Oxygen at Work** is establishing a broad partner ecosystem with leading companies/institutes who share the vision to create sustainable and smart office buildings.

What makes a workspace healthy and productive?

According to **Future Workplace Wellness Study** in 2019, indoor air and office environment are of the biggest influence on employee health, productivity and engagement. In modern energy-saving airtight constructions, the concentration of indoor air pollutants can build up to dangerous levels, posing a serious threat to occupant cognitive abilities and health. This represents one of the priority concerns for human health today, given that people in industrialized countries spend more than 80% of their lives indoors. Continuous exposure to indoor air pollutants may cause the so-called "sick building syndrome" that can result in **headaches and loss of productivity in office workers**, eventually contributing to respiratory and cardiovascular diseases. Recent assessments by Health Effects Institute have placed indoor air pollution as the **8th largest global burden of disease risk**, exceeding malaria, violence and HIV/AIDS as a cause of premature death by a factor of 19, 17, and 9, respectively.

According to the **US Environmental Protection Agency**, indoor air pollution is often between two and five times greater than outdoors; and can get at its extreme up to 100 times worse than the open air. That is despite the fact that low air quality can interfere with **occupant well-being and productivity** and lead to **lower scores and more absences in schools**. The quality of air in our offices, homes and schools can be poor due to the release of toxic gases and volatile compounds from furnishings, paints, solvents, varnishes, carpets, fumes from cleaning supplies and office equipment such as copiers and printers, particulates from gas cooktops and other sources, all compounded by poor ventilation. Air pollutants common to different

indoor environments include carbon monoxide and dioxide (CO and CO_2), volatile organic compounds (VOCs; e.g., formaldehyde, benzene, toluene, etc.), nitrogen oxides (NO and NO_2), polycyclic aromatic hydrocarbons (PAHs), and particulate matters (PMs). If, e.g., the density of VOCs exceeds a certain threshold, it can not only be classified as carcinogenic, but also lead to headaches, nausea, dizziness, fatigue and many other symptoms. Other pollutants like particles with a diameter of 10 microns or less (e.g., PM_{10} and $PM_{2.5}$) can penetrate deep into lung passageways and enter the bloodstream, causing serious cardiovascular and respiratory impacts. In extreme cases, poor air quality in workplaces accounts for **800'000 death worldwide every year**.

Besides fresh air, **interior architecture and design** has a dramatic effect on occupant psychological, physiological, and neurological responses, affecting their ability to process stressors. This is directly linked to how one feels and influences stress levels, tiredness, feelings of being overwhelmed, and the desire to give up daily tasks. Thus, in addition to indoor air, focusing on workplace environment design that supports mental health and well-being considerations, the promotion of productivity, and addresses workplace stress and disconnection from nature has become a global imperative.

Today, firms have become aware of the fact that an office is more than just a physical space. It is a tool to drive business, derive productivity, and ensure consistency. Putting people at the center when designing and delivering buildings of the future is crucial to unlock human potential and thereby unlocking the potential of new technologies, according to the **Buildings of The Future**. In a **survey** by Management Today magazine, 97% of respondents regarded their place of work as a symbol of whether or not they were valued by their employer. Yet, alarmingly, only 37% thought their offices had been designed "with people in mind". Buildings of the future will need to be both intellectually and emotionally intelligent, cognizant of the environment, social equity, and the health and well-being of the occupants.

3 Biophilic workplace design: Improving both architecture and psychology

While the incorporation of natural plants in exterior spaces is common, bringing them into interior spaces is of most opportunity for innovation. In the early 1960's, the workplace design started to shift towards meeting the needs of the workforce. This office design style known as Bürolandschaft is an originally German concept that translates to "office landscape". Bürolandschaft advocated a less rigid approach to office layouts, and as a result, the workplace became a more open space with desks and teams grouped together, with indoor plants replacing partitions to create more natural, organic boundaries. Although other office design approaches have been emerging since Bürolandschaft evolved, it is often referred to as a key principle of modern office design, with Gartner referencing to Bürolandschaft as **a top technology trend driving the digital workplace**.

In a society where we spend more than 80% of our time inside built environments, our exposure to a natural outdoor environment is obviously very limited. Yet, many **scientific studies** reveal that contact with nature is an almost vital need in order to maintain a healthy existence over time. Evidence suggests that exposure to indoor plants offers **a range of physiological benefits** to health and well-being through creating a biophilic environment that reduces the mismatch between human evolutionary needs (Biophilia) and contemporary indoor settings. Although the term biophilia, which refers to the inherent human inclination to affiliate with nature and seek connection with the rest of life, has been known for several decades, it has resurfaced in recent years with the revival of interest in comfort and health in buildings.

Biophilic design is therefore a concept used in architecture and the building industry to reconnect individuals with the natural environment by incorporating living organisms, natural lighting and organic shapes and features into the built environment. It supports both the sociological and psychological components of our humanity while unburdening the cognitive system, and thus benefits the business as a whole. There are many studies confirming productivity-based improvements of biophilia-oriented environments; however, indoor greenery is an item that features regularly as a **primary productivity booster**. Experimental evidence demonstrates that the placement of plants in the peripheral vision of employees can **improve the overall productivity of staff by 15%** and significantly reduce mental fatigue. If the workers themselves were involved in the improvement process, productivity increased by up to 30%. Additionally, people working in environments with plants experience notable **stress reduction, improved mood, and increased focus**. In a **widely recognized Norwegian study**, indoor plants were shown to reduce neuropsychological symptoms, such as fatigue and headache by 23%. Other symptoms related to coughs and dry throat were also reduced by 37 and 25 percent, respectively. Introducing plants into workplaces, even without visual access to nature, has been shown to **decrease employees' sick leave absence by up to 60%**.

Besides significant improvements in employees' well-being and productivity, indoor plants represent a sustainable, but underexploited, solution to enhance indoor air quality (IAQ), opening new horizons for the **sustainable energy-efficient improvement of IAQ**.

4 Multi-sensor indoor greenery for sustainable improvement of IAQ

Air quality and energy efficiency have not always gone hand-in-hand. In recent years, incentives to improve energy efficiency have facilitated the development of thermally insulated buildings, which require less energy for heating, ventilation and air conditioning (HVAC) systems. However, the concentration of air pollutants can build up to dangerous levels in such modern airtight constructions, posing a serious threat to human health. On the other hand, the emerging increased level of air pollution and the increased awareness of health issues caused by polluted air have shifted the focus of HVAC industry on improving IAQ performance, with no significant energy efficiency advances. Thus, their application is often limited by high costs associated with their frequent maintenance and significant energy consumption.

HVAC systems are generally responsible for a significant proportion of total building energy consumption. A typical system accounts for around **40% of total energy consumption in an office building** and 70% of base building consumption. The obvious need to significant energy efficiency renovations in the building operations, which alone accounts for **30% of annual global energy consumption and CO_2 emission**, has sparked interest in the development of computerized self-sufficient biofilteration systems as a cost-effective solution to improve the quality of indoor air in smart and more sustainable buildings. Plant-based air-cleaning biosystems integrated with smart sensor technology offer unprecedented opportunities for a postmodern version of biophilic design, perceiving indoor plants as a key player in everyone's life (rather than only as a decorative tool).

Natural plants have long been recognized as nature's air purifier, drawing annually 25% of human-made CO_2 emissions from the atmosphere through photosynthesis. Photosynthesis is a process used by plants to convert light energy into chemical energy and simultaneously release oxygen. As a byproduct of plant growth, CO_2 is removed from the atmosphere and oxygen levels are maintained at a steady level. In addition to stabilizing the oxygen level and reducing the atmospheric CO_2 level, plants represent **a sustainable solution for ameliorating high CO_2 concentrations** in airtight indoor environments. Exploring plants' CO_2-removal capacity in 55 conventional office spaces has demonstrated that rooms with three or more potted plants had **10% lower CO_2 concentrations** in air-conditioned buildings and 25% lower concentrations in non-air-conditioned ones. Another study conducted in school classrooms indicated that the **classroom equipped with plants had a lower CO_2 concentration by 50%** compared to other classrooms with no plants installed.

Plants can also directly clean the atmosphere by intercepting PMs through increasing the surface area of the space. Particles settle on the surfaces of leaves as the airflow velocity decreases near plants (i.e., the retention mechanism). Leaf morphology plays an important role in phytoremediation as leaf surface rigidity or roughness affects the deposition of particles. The second mechanism is attachment based on the rough leaf epidermis and cuticle characteristics, which is relatively more stable to airflow condition and surrounding environment than the retention mechanism. PMs are also absorbed through adhesion by the leaf exudates, which is the most stable mechanism capturing and fixing PMs to the surfaces of plant leaves. Stickier leaves are better for efficient capture of PMs than other leaf types. Recent studies have demonstrated the moderate removal efficiencies of indoor plants in **laboratory chambers** and more practical **indoor environment** settings.

In addition to removing PMs, plants also make a significant contribution to reducing chemical air pollutants, such as VOCs, ozone (O_3), and NO_x. Seminal **studies by NASA** in 1989 and more recently by **University of Technology Sydney** in 2009 have successfully demonstrated plants' capacity to remove chemical airborne pollutants (termed phytoremediation) in laboratory chambers and conventional office environments. Evidence suggests that presence of plants in biofilteration systems can help **breakdown VOCs three times faster** than the natural decay rate. By systematically reviewing 88 related scientific publications, a recent study in 2020 identified comprehensive evidence that **indoor plants are of great potential to purify air and improve its quality**. According to this review study, plants primarily reduce pollutants level (in particular, formaldehyde, benzene, toluene, O_3 and NO_x),

in addition to increasing indoor air humidity and decreasing temperature.

Therefore, plant-based biofilteration systems are of great potential to not only enhance occupants' well-being and productivity, but also improve the quality and comfort of the indoor air, thereby contributing to reducing the energy consumption and CO_2 emission associated with HVAC operations. This technology's ability to remove VOCs and other airborne pollutants makes it superior to most non-biological systems as general air-quality maintenance devices. As a byproduct of removing airborne pollutants from indoor air, plant-based biofiltertaion technology allows conditioned air to remain in the building and avoid energy losses as in the conventional HVAC systems, thus reducing heating/cooling bills.

While plant-based biofilteration technology is still in its infancy, there is **clear evidence of potential**, and further developments that improve these systems' ability to match or exceed the efficiencies demonstrated by current air filtration methodologies should be possible. Recent studies by **NASA in 2007** suggest that combining green systems with mechanical fans and/or leveraging soil and plant microbiome can significantly improve air-cleaning rates by 200 times than that in a traditionally-potted green system. The possibility to **integrate smart sensor networks and computerized technologies** for air cleaning with highly performing indoor plant species provides the opportunity to improve indoor environment while also reducing energy consumption and CO_2 emissions. Furthermore, the development of such ecosustainable and cost-effective modular biofilteration technology would enable the engineering of indoor environments through the real-time monitoring of air quality retrieved from low-cost wireless network sensors communicating with logging stations. A user-friendly online software would serve as a decision support system to regulate indoor environment according to both pollutant levels and the physical characteristics of the interior space (such as volume, number of occupants, temperature, humidity, etc.).

5 Thermal comfort and biological humidifiers

In addition to their biofilteration capacity and the aesthetic component, plants can modify the microclimate of an environment by increasing air humidity, followed by reduced room temperature, making the indoor environment more comfortable and hygienic. Dry air and its associated respiratory effects are a major and abundant IAQ complaint in office-like environments. Typical dry air indoors, especially in cold climates, is known to provide a clear pathway for airborne viruses, such as COVID-19. There is now overwhelming **scientific evidence** that an optimal indoor air humidity level of 40-60% has significant health benefits for our respiratory immune system by enhancing its ability to respond to pathogens. Breathing dry air can cause respiratory diseases such as asthma, bronchitis, nosebleeds and/or overall dehydration, among others. Having the right balance of humidity indoors at all times will ensure occupant health and thermal comfort. During summer months, the average humidity should stay below 50%, while winter may require indoor humidity below 40% to avoid condensation on windows and exterior walls, potentially promoting mold growth. Therefore, a range of 30-60% relative humidity indoors is considered as comfortable level.

Natural plants **increase/improve humidity in the air** through a process known as transpiration. Plants constantly pull water from the soil so that they can keep all their aboveground parts hydrated. Nevertheless, only a small fraction of this water ends up in the plants' cells; up to 99% of it evaporates into the air from plant leaves through micrometric stomatal pores (termed transpiration). As water evaporates or converts from liquid to gas at the leaf cell-atmosphere interface, energy is released. This

exothermic process uses energy to break the strong hydrogen bonds between liquid water molecules; the energy used to do so is taken from the leaf and given to the water molecules that have converted to highly energetic gas molecules. These gas molecules (in the form of water vapor) and their associated energy are released into the atmosphere, thereby cooling the plant (i.e., evaporative cooling effect) and increasing humidity in the surrounding environment.

Therefore, transpiration from plants and its associated evaporative cooling effect can be utilized for **thermal comfort** and **humidity control** in the work environment. Studies on the integration of indoor plants with buildings' air conditioning and ventilation systems, in warm climates with periods of low air humidity, reveal that these systems can be used as natural evaporative coolers, obtaining drops in air temperature up to 5 Celsius degree while increasing humidity by up to 30% in the indoor environment. Recent field trials, including **Oxygen at Work**'s pilot studies in Swiss office spaces, suggest that appropriate indoor plants integrated with sensors and smart data analysis can contribute to indoor humidification by increasing air humidity by 15-20% on average.

Indoor plants can be used successfully as thermal and humidity control systems for indoor environments, provided appropriate plant species (i.e., with prescribed cooling and humidification capacities) and growth medium are selected. In general, plants with large, broad leaves (like many rainforest plants) provide a greater humidifying effect than those with needle-shaped or small, rounded leaves. One can take advantage of this pattern to humidify indoor air using rainforest plants and/or other large-leaved species. Some **studies on thermal control** of plant-based systems have noted the role of airflow on the efficiency of the evaporative cooling effect. Thus, a ventilation system can additionally be required to optimize the thermal comfort performance of the system.

6 Planning and selection of plants for indoor air phytoremediation

Plant selection is a crucial first step for successful implementation of air phytoremediation strategies. Plants mainly intake environmental components from either soil or water, but the focal point of entry for air pollutants are the aerial parts. The stomata and cuticles present on leaves serve as the main entry point for any air pollutant. However, intake and subsequent assimilation within plant cells are specific to the physicochemical properties of the pollutant, particular plant species, and environmental factors (i.e., the physical characteristics of the interior space). The entire process of phytoremediation involves several separate, yet complementary, processes that vary considerably based on the nature of the pollutant and the physiology of the plant. Thus, plant choice should take into account different plants' ability to remove particular pollutants as well as design considerations: smaller installations may need plants that are more efficient while larger systems proportional to the number of occupants may perform adequately with less efficient but more aesthetically pleasing species.

Since **NASA's pioneering study** in 1989, there has been several laboratory and field reports on using specific plants for efficient phytoremediation of indoor air pollutants. To effectively remove **carbon dioxide (CO_2)**, *H. forsteriana*, *D. lutescens*, *F. benjamina*, *D. deremensis*, and *A. elatior* are among species with high CO_2 removal efficiency. For the removal of **formaldehyde**, spider plant (*C. comosum*) is often reported to have the highest potential. Besides spider plant, other efficient species for removing formaldehyde are: *Osmunda japonica*, *Davallia mariesii*, *Selaginella tamariscina*, *Polypodium formosanum*, *Lavandula* spp., *Pteris dispar*, *Pteris multifida*, *Pelargonium*

spp., *Aloe vera*, and *E. aureum*. Phytoremediation of **benzene** may be achieved through *Crassula portulacea*, *Hydrangea macrophylla*, *Cymbidium* "golden elf", *Syngonium podophyllum*, *Euphorbia milii*, *S. trifasciata*, *C. comosum*, *Dracena sanderiana*, *H. helix*, and *Clitoria ternatea*, with *C. comosum* reportedly having the highest efficiency. **Toluene**, which is a common VOC found in homes and offices that represents a serious health hazard, may be effectively removed by *Schefflera elegantisima*, *Philodendron* spp. "sunlight", and *H. helix*. To remove **xylene**, *Zamioculcas zamiifolia* may be used, which also has the potential to phytoremediate **ethylbenzene** to some extent. *Hoya carnosa*, *Hemigraphis alternata*, and *Asparagus densiflorus* efficiently remove **VOCs like benzene, toluene, octane, TCE, and a-pinene**. Others, such as *Fittonia argyroneura*, can also be used for benzene, toluene, and TCE removal, and *Ficus benjamina* for octane and a-pinene. The popular indoor potted plant *D. deremensis* "Janet Craig" is **reported** as an excellent species for the removal of VOCs. For passive removal of **ozone** with adverse effects on lung function, *Epipremum aureum*, *Dieffenbachia* and *Calathea* are reported with highest removal efficiency.

We note that in situ phytoremediation is typically a long-term process, in which continued contaminant exposure could result in toxicity or other damaging impacts to the plants. While conventional indoor plants may be viable for low pollutant interior commercial applications, the air pollutant tolerance of the plants may be compromised in high pollutant environments, and thus plant species need to be screened prior to larger scale commercial applications. Therefore, the selection of plants for maintaining IAQ and thus optimizing HVAC operations is a rather complex process. Our in-house algorithm (Figure 1), serving as a decision support system, analyzes plants data sources as well as physical characteristics of the interior space in real time retrieved from low-cost wireless network sensors. It provides detailed information on the current HVAC operations and potential saving scenarios (using plants and/or optimizing HVAC operations) for office building's energy consumption and CO_2 offset. The solution provides scalable greenery design configurations according to building's HVAC demand and saving goals, and frequently monitors and reports IAQ status through an online dashboard (login required).

Do you want to figure out how much energy and CO_2 emission you can offset by bringing plants into your office space? Please visit our **demo calculator** and/or **contact us**.

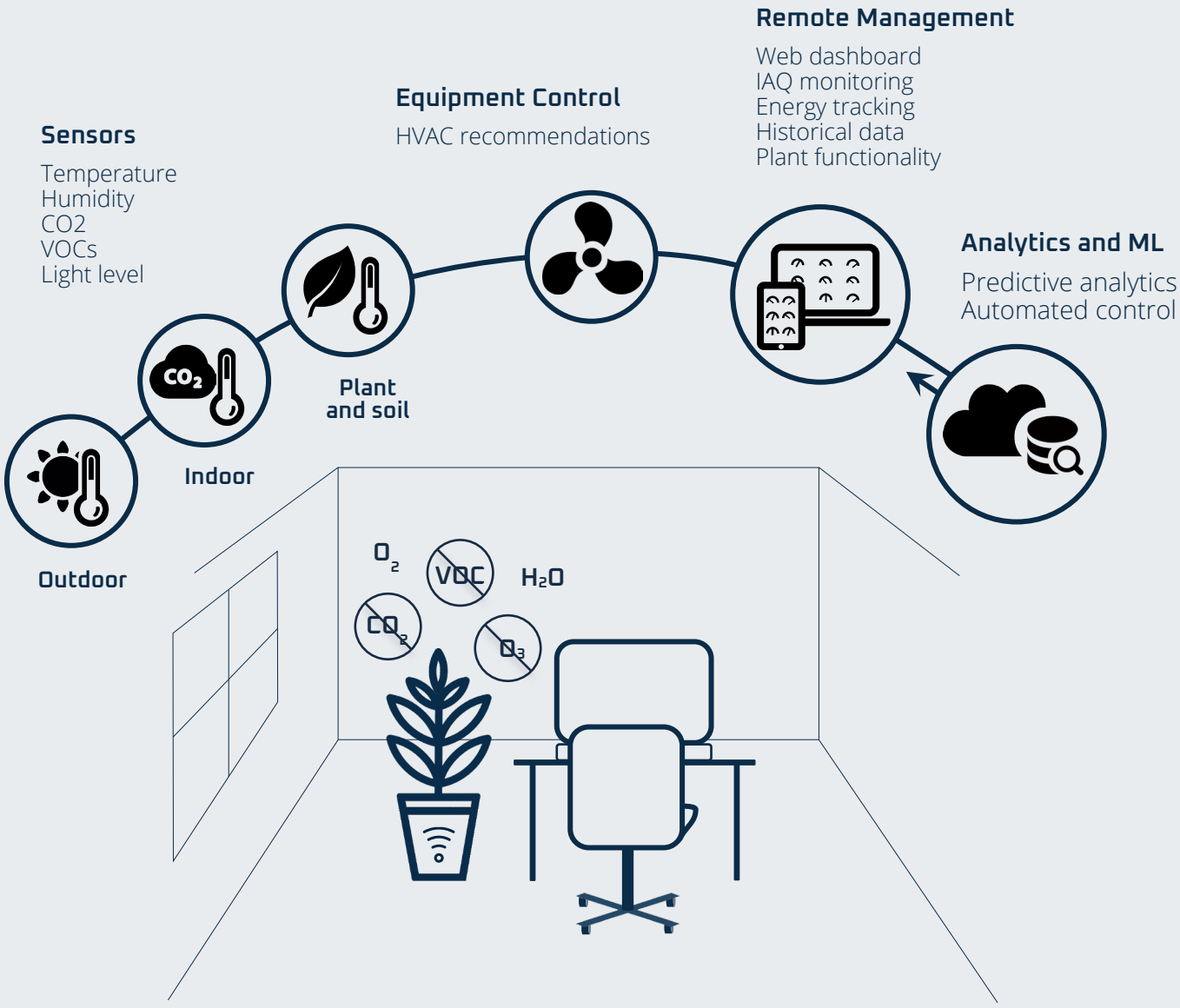


Figure 1: Multi-sensor indoor greenery as a new edge to the IoT-based IAQ monitoring systems

7

The bottom line: Why you need plants in the workplace?

Greenery does more than just make the work environment more attractive; it also provides a range of health and psychological benefits. We briefly summarize how the following have been found to be affected by office and building interior greenery:

Beauty: One of the most obvious reasons for incorporating indoor plants is the beauty. Plant life provides visual interest, while also softening the look of a typical office environment. Plants are aesthetically pleasing and help create a more hospitable and comforting environment for employees and clients, making your workplace stand out among the competition.

Fresh air: Another benefit of adding natural plants is fresh air. Many modern office spaces are enclosed and dry, especially ones without operable windows. Plants add moisture to the air, creating a physically more comfortable space in offices dominated by electronic equipment and other digital devices. Right number of high performing plant species also clean the air by filtering out nearly 90% of air pollutants while also maintaining (or increasing) oxygen levels in the area. Adding greenery can greatly decrease the amount of sickness among employees while keeping the air fresh and sanitized.

Reduce toxins: In addition to controlling humidity and temperature, indoor plants can act as filters helping prevent dust and purify the air. Right number of plants of certain species are great for absorbing CO_2, VOCs and PMs in the workplace that can be harmful to employees' health and well-being. Occupants, cleaning supplies and office equipment such as copiers and printers, typically emit these pollutants.

Improve employee morale: The connection to plants in the workplace and lower stress levels and increased productivity are widely recognized. Adding indoor plants to your office will provide emotional aid to employees and help reduce the amount of absenteeism in the office. They add an additional sense of life while bringing a part of the outdoors in for everyone to enjoy and relax. People working in environments with plants experience notable stress reduction, improved mood and increased focus. Couple that with reduced fatigue and increased cognitive function, and you have a recipe for a more productive workforce.

Act as a sound barrier: Indoor plants of high green leaves (and/or vertical green walls) can dampen sound between work areas as well as acting as a visual barrier. This is especially helpful in large or loud workspaces. Indoor plants of high greenness naturally block high-frequency sounds and reduce low-frequency noise. Thus, they can help keep an office quitter, promoting a less stressful and distracting workspace.

Save money: Indoor greenery will help you save money, as well. As a byproduct of removing airborne pollutants from indoor air, indoor plants allow conditioned air to remain in the building and avoid energy losses, resulting in 75% decrease in wind chill and 25% decrease in heating demand. This could help decrease the cost of energy bills, especially in colder climates or cooler months. In the warmer months, indoor plants can help keep the air cool and moist through a process known as evapotranspiration. Evapotranspiration is the process of water being transferred to the air through soil evaporation and leaf transpiration. Installing plants next to walls (either indoor or outdoor), can potentially reduce wall temperature by nearly 10 Celsius degree, greatly reducing the air conditioning cost.

8 Case studies (2017-2019)

With extensive experience in creating biophilia-oriented office environments, **Oxygen at Work** is well versed in interior landscaping installation.

Swissgrid, 2018

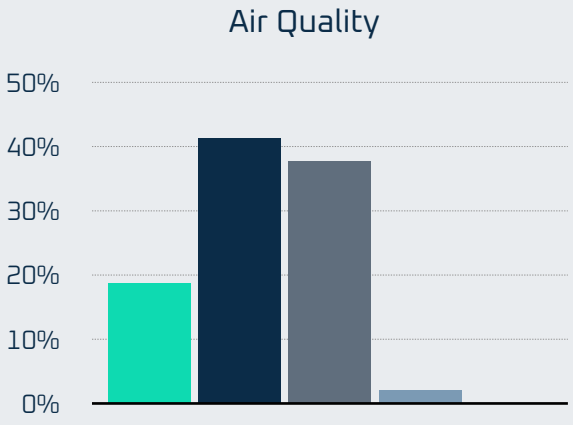
SRF, 2019

Who’s mcqueen, 2017

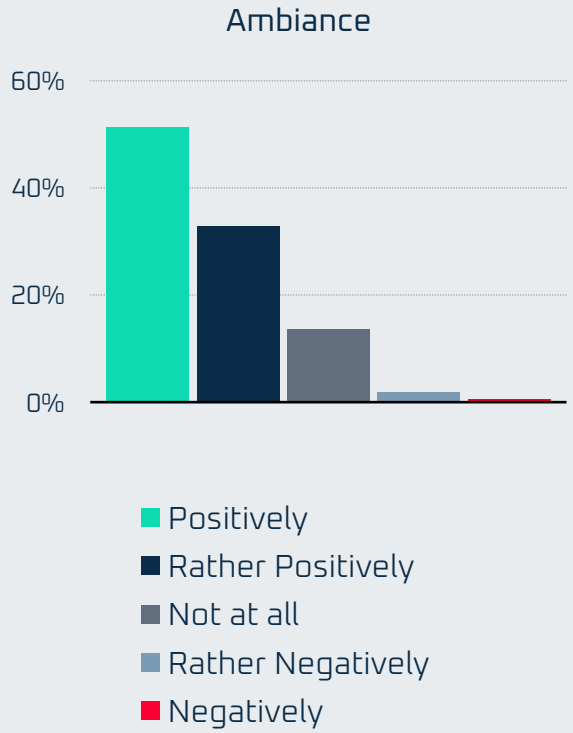
Locatee, 2019

Philip Morris, 2019

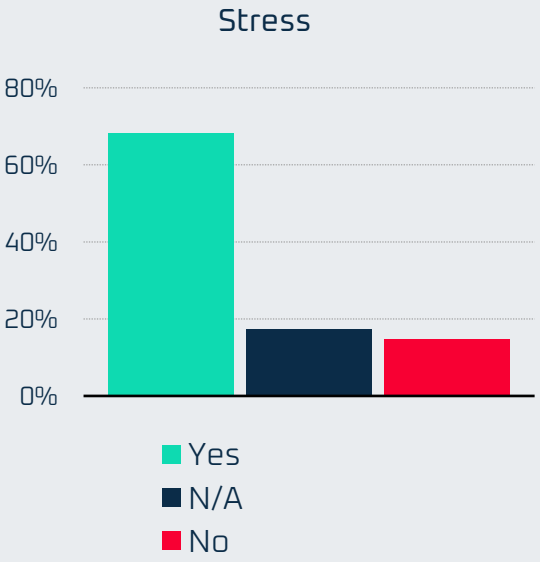
In our latest survey among more than 300 office employees of our clients in Switzerland, 60% of the employees report an overall improvement in indoor air quality after greening their workplace. Nevertheless, 2% of the respondents reported worse air quality, with the rest felt no difference.

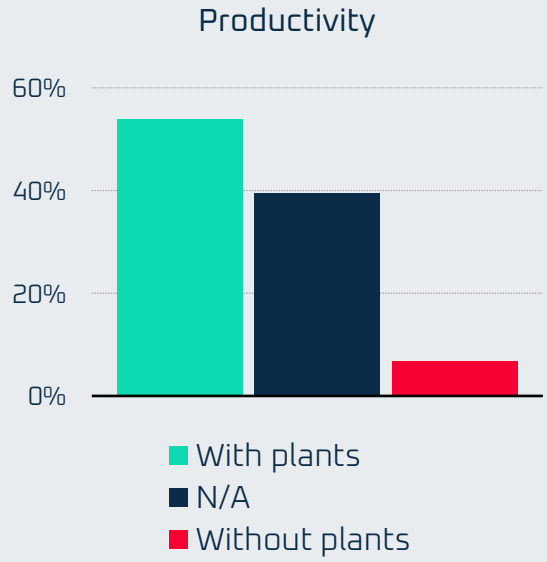


Moreover, more than 80% of the employees report an overall improvement in the workplace ambiance thanks to natural green plants brought to their workplace.

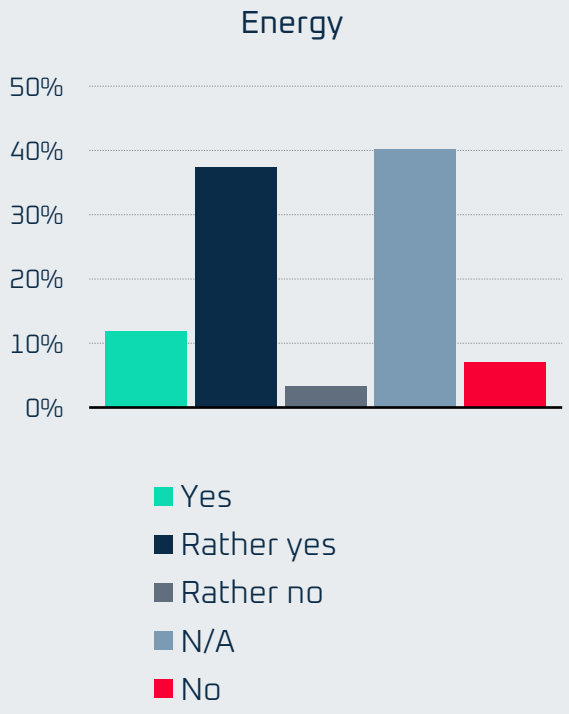


Of the respondents, around 70% feel more relaxed and less stressed at work upon workplace greenery. This positive perception of indoor plants is also (intuitively) reflected in employees' productivity, with around 55% reporting enhanced productivity in the presence of indoor plants at the workplace.





Additionally, around half of the respondents feel more energized upon installing indoor plants, while only 10% report a slight decrease in their energy level. Nevertheless, the latter group acknowledges the positive effects of plants, given comments like: "I didn't feel it myself but I can tell that my colleagues are more relaxed".



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