The Effect of Healthy Workplaces on the Well-being and Productivity of Office Workers

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The Netherlands has a workforce of about 6 million people. More than a third work in offices, mostly eight hours a day, five days a week. For many, this means that the work environment can have a major influence on their health and well-being. 50,000 office buildings, covering an approximate total of 40 million square metres, also have a considerable environmental impact, not only while under construction (building waste, use of resources and materials), but also in use (consumption of fossil fuels and water, generation of waste), and, in all likelihood, during demolition or reuse as well!

From the organization's perspective, the quality of the workplace is an important consideration that can give rise to substantial direct and indirect costs: direct such as energy and waste treatment costs, and indirect such as non-productivity and sick leave.

This paper examines people's perception of the work environment, i.e. the environmental quality of office buildings, as well as the extent to which health problems and dissatisfaction with the work environment influence productivity in office buildings. The concept of "quality of work environment" is first examined from the perspective of the user:

- which aspects are relevant to the employee's perception
- how can quality be measured and evaluated?

The influence of the quality of the workplace on the incidence of (health) complaints and the ability to work in the environment (satisfaction level in work environment) will be indicated, and both aspects will be correlated with sick leave and loss of productivity. A survey carried out in the offices of a tax authority will be used to assess the contribution of plants to the well being and productivity of the office staff.

The article presents guidelines on how the facility manager can deal with these issues in existing buildings, and concludes with a look at a more preventive approach: how to create "healthy" - that is, productive - workplaces.

Health Complaints in Offices

Complaints by office workers have been on the rise since the seventies, which is when new office equipment and arrangements were introduced, such as new spatial concepts (open-plan offices), advanced climate control equipment, new materials, upscaling and computerization.

The actual activities performed in offices have also changed considerably, but buildings have

not been adapted accordingly. There has been a shift from routine work to work that demands concentration, performed with the aid of equipment that must be ergonomically incorporated into the workplace.

Scope of the Problem

The general scope of the problem is common knowledge. Results of studies conducted in Dutch offices reveal that, on average, approximately 35% of office workers are dissatisfied with the interior climate and approximately 20% suffer from health complaints (Preller 1990, Schermer 1992). Table 1 specifies these complaints.

A "complaint" or "dissatisfaction" is understood here as a response given a score of 1 or 2 in a scale from 1 (very dissatisfied, constant problems) to 5 (very satisfied, never problems).

Dissatisfaction with/complaint	Wageningen Agricultural Univ. [1]	Government Buildings Agency
Health		
Eye complaints	19.5	28.1
Nose/throat complaints	23.5	24.1
Neurological complaints	20.3	16.4
Climate		
Dry air	43.5	43.3
Temperature fluctuations	35.3	21.7
Temperature too high	29.1	35.3
Air quality (stuffy, uncomfortable)	27.0	27.9
Draught	26.7	22.7
Dusty air	18.4	32.3
Other		
Light, reflections	13.1	29.8
Static electricity shocks	10.5	24.7
Noise	25.1	23.2

Table 1: Percentage of complaints and dissatisfaction with office environments in the Netherlands.

Most of the differences between the results of both studies can be clarified. The results of these Dutch studies correspond fairly closely with results of comparable foreign studies, especially (Wilson 1987). Recent active research indicates that whereas there has been a reduction in certain aspects of individual problems (e.g. reflections in monitors), the overall picture has not really altered.

If the results are viewed at the building level, the conclusion can be drawn that, of the buildings studied (in both studies), about half can be considered unhealthy and uncomfortable. Some researchers have a more optimistic view of buildings. Woods (1990) estimates that 20 to 30 per cent of Western European and North American buildings are

"problem buildings" (buildings in which more than 20-30% of the employees have health complaints).

Causes of Complaints

National and international research into problem buildings reveals that most of the complaints about the work environment have a direct technical cause. Most of the complaints relate to air quality and comfort in terms of temperature. In addition to these usually specific complaints, non-specific health complaints such as headaches, irritation of the respiratory tract and eyes, fatigue, etc. can generally be traced back to the same technical causes. It is estimated that for 90% of the *problem buildings*, an explanation can be found for most of the reported complaints.

Concepts from the field of psychology, primarily based on American research from the seventies and eighties, have been rediscovered in recent years and have shed new light on the issue (Vroon 1990). This expands our comprehension of office workers' complaints and their underlying mechanisms. In essence, no regard is paid to people's "basic functioning" and "instinctive behaviour", survival skills learned over the course of evolution: the need for change, the ability to act on the environment and see the effects, identifying the meaning of stimuli, and the need for one's own territory, a place with its own identity and contact with the outside world (view). Steele mentions other aspects as well, such as (group) identity, pleasure, natural environment, protection, safety and growth (Steele 1973).

- Need for *change.* An environment with insufficient or no signals or stimuli (e.g. temperature, air, light, sound, visual contact) makes people uncomfortable.
- Ability to *act* on the environment and see the *effects*. If this is impossible, people have to suppress their needs and desires and constantly adapt their behaviour. This causes stress.
- *Meaningful* stimuli. An ever-present non-identifiable smell causes a chronic state of distress.
- One's own *territory* to satisfy the need for an identity, safety and protection. Open-plan offices are virtually void of these elements.
- An *environment* that is *as natural as possible* with contact to the outside (view).

Table 2: Psychological aspects that play a role in complaints related to office buildings (Vroon)

Based on both the technical causes (e.g. air quality and comfortable temperature) and psychological mechanisms, it is easy to point the finger at climate control equipment. The literature has revealed that the more the interior climate is technically (centrally) controlled (i.e. the less the users can adjust themselves), the greater the chance of complaints. This holds true in particular for health complaints and somewhat less for comfort-related complaints. Both of these groups do, incidentally, overlap to some extent: an unhealthy building is

usually an uncomfortable building, although the inverse is not necessarily true.

Quality of the Workplace

The concept of "quality of the workplace" can be interpreted from different angles. Until recently, scientific interest focused on threats. As is so often the case in the traditional sciences, knowledge gathered about a specific phenomenon stems from something negative: knowledge about health is gained from studying sickness, knowledge about safety from accidents and hazards, etc. The threats at issue here are: physical agents (e.g. temperature, humidity, noise, light and radiation), chemical agents (e.g. bothersome and toxic substances), and biological agents such as microbes. Physical (ergonomic) aspects also play a part. Acknowledgement of the significance of psychological aspects to complaints in buildings has added psychological elements to the list.

Taking cues in part from the international change in attitudes towards the issue from Sick Buildings to Healthy Buildings (Stockholm 1988), the Netherlands Government Buildings Agency compiled the various aspects in a document entitled "Healthy Building Quality", which contains all the quality aspects of buildings that can be of consequence to complaints about health, comfort and well-being.

The quality aspects mentioned mainly have to do with the design of buildings (to be managed in a healthy manner, of course). Management can involve other aspects, however, that design has no bearing on. In effect, well-designed buildings can become problem buildings. It is important to bear in mind that design specifications may be deviated from in daily practice: for instance, more people may work in the office than are supposed to, all kinds of equipment may be installed (generating heat, emissions), or the building and arrangement of the workplace (furniture, computer screen position) may be unhealthy. Energy management, facility management and maintenance must also be taken into account.

In addition to *building features* and aspects of management and maintenance, other factors can help determine whether health complaints occur in buildings, especially before they become spontaneous complaints and lead to sick leave. One example that comes to mind is work perception (organization and nature of work, time pressure, career prospects, salary, management, etc.).

So what factors are regarded important to Healthy Building Quality?

Expert or User

The basically traditional approach is that of the expert, who generally proceeds on the basis of commonly accepted regulations, standards and guidelines. It appears that many complaints can still occur in buildings that satisfy all the accepted standards and guidelines. There are some notable reasons.

Although most fields have gathered extensive and substantiated knowledge and information, standards and regulations always lag behind actual developments. If an expert only operates on the basis of standards and laws, there is a good chance that the cause of the problem could lie in an aspect for which no standard exists. Besides the fact that the standards system is incomplete (take electromagnetic radiation, for instance), some standards are not (yet) geared

to the office situation. For example, (sections of) standards are often "borrowed" from housing or industry (MAC values). In addition, other temporary aspects such as a move into a new office or a re-organization could dominate and sway the occurrence of complaints. So it is necessary that there be expertise and understanding in addition to standards, measurements and guidelines in order to cover the areas these do not affect. If office workers complain about dry air, for instance, an "expert" can measure the relative air humidity. If the result, say an RAH of 40%, is compared with the norm, the situation might be considered satisfactory, leading one to write off the complaints as a case of bellyaching employees instead of attributing the problem to "the building". Studies have shown, however, that complaints about dry air often have nothing to do with relative air humidity (humans do not "sense" this directly, but experience dry mucus membranes), but are often caused by high temperatures, sometimes in combination with dust or air pollution.

In addition to the above-mentioned "expert method", a different angle is possible: basing the approach on what users think is relevant. The so-called Building in Use method is an example of such an approach and is being developed further by DHV (Vischer 1989).

The Building in Use factors playing a role in the user's perception of quality in the workplace came to the fore in a study conducted in 19 buildings, which aimed to develop a method for determining quality of existing buildings in terms of health, comfort and well-being (Bergs 1993).

Relevant Factors; measuring and Evaluating Quality

The relevant factors describe the way the users perceive their work environment: a dynamic interaction between the building and the user in the context of task, organization, etc. (work perception). These factors are stated in Table 3. In addition to factors related to the building and workplace, six health factors (see Table 4) and one work perception factor are distinguished. The work perception factor encompasses aspects such as work atmosphere, contact with co-workers, managerial style, appreciation by co-workers and supervisor, and assessment of chances for promotion.

- **privacy**: nuisance caused by other people at the workplace, incl. interior noise
- **comfortable temperature:** feeling chilly, cold feet, temperature fluctuations and draught (summer and winter), feeling hot (summer and winter)
- **air quality:** dustiness, cleanliness (no odour), satisfaction with cleaning and relative air humidity
- **arrangement (functional and aesthetic)**: size of working and storage space and satisfaction with and influence on the arrangement and furnishings (posters, plants, etc.)
- **individual climate control:** the control workers have over sun-blinds, ventilation and temperature
- **siting**: accessibility of the building and amenities in the vicinity of the building
- **noise:** noise nuisance from adjacent rooms and noise from outside the building
- **natural light and view:** satisfaction with the amount of natural light, quality of view
- **visual comfort:** amount of artificial light, quality

-	**radiation:** electromagnetic fields.

Table 3: Ambient factors of building and workplace

-	**eye complaints**: tired, irritated or watery eyes
-	**mouth and throat complaints**
-	**skin complaints**: itch, rash, dry skin
-	**nose complaints**: stuffed-up nose, runny nose
-	**neurological complaints**: fatigue, headache

Table 4: Health factors

The building factors mainly comprise quality aspects related to the building and workplace and their use. The consequences of these manifest themselves more clearly in the other factors. There is a correlation between the three groups of factors: workplace (climate), health, and work perception. This means that a high score in a problem building for one aspect goes hand in hand with a high score for a different aspect. The building and workplace factors form a combination with technical aspects mentioned above (such as comfortable temperature and air quality) and psychological aspects (privacy, arrangement, individual control). Consequently, the Healthy Building Quality can be presented in terms of the factors mentioned, making sure to do justice to both the expert and Building in Use methods. Below, the factors are clarified in more detail (Bergs 1992).

The evaluation method was developed as a means of determining the quality of office buildings in terms of health, comfort and well-being (healthy building). Added to that is quality of building amenities. The method can be used for various purposes, such as complaints handling, inventory, decision support relating to changes, inventory support and risk evaluation in accordance with the Health and Safety at Work Act.

The method was evaluated (for reliability and validity, etc.), adapted and expanded in association with the Technical University of Eindhoven (Bergs 1993).

Relationship of Quality of the Workplace and Reduced Productivity

A low-quality workplace can lead to reduced productivity. Sick leave is regarded here as 100% loss of productivity. Whereas absence due to illness is fairly simple to express in terms of money, reduced productivity is more difficult to define in these terms.

The (indirect) costs resulting from sick leave and non-productivity are not involved in accommodation expenses. These costs are difficult to pin down and not clearly visible, and are at the expense of the organization. Reducing these costs can boost operating results. Since accommodation aspects (air quality, comfortable temperature, individual control, etc.) have such a great influence, the facility manager is the best person to take on this challenge together with, for instance, the department or consultant charged with verifying compliance with legislation on health and safety at work.

Sick leave
No national figures are available on total sick leave among office workers, who are not considered a separate category for statistical purposes. Figures are available about the group working in the "service industry". The percentage of sick leave in this group is about 4% (Central Bureau of Statistics). A fair amount of information is now available on the relationship between sick leave and the quality of the workplace.

Two Dutch studies revealed that a considerable proportion of sick leave can be attributed to quality of the workplace (complaints). The Preller report (1990) showed that 25 to 30% of total absence can be attributed to (building-related) health complaints, while the Schermer report (1992) concluded that about half of all employees occasionally stays home because of such complaints. Averaged over the total group, this works out to 3.6 days per employee per year. The results of Preller were analysed more closely with regard to this aspect (Preller et al 1990), revealing a close correlation between sick leave (both number of occurrences and number of days) and building-related health complaints. A link has also been found between sick leave and the ability to adjust the temperature oneself, the presence of humidifiers and computer screen work.

The Swedish intervention study (Wyon 1993) shows that a relatively slight reduction in the temperature (1.5 ^{o} C) reduces absence due to health complaints (and thus bolsters productivity). Recent research (including Milton, 2000) indicates that in an unfavourable indoor climate there is a greater tendency for employees to report in sick sooner and to stay away sick longer. A healthy indoor climate leads to a drop of 2.5% in absenteeism.

Productivity
It should come as no surprise that a poor quality workplace causing health and comfort complaints reduces productivity. This aspect has been the subject of several studies. The concept of productivity is often measured differently, however. Sometimes in a more subjective manner, by asking about the degree to which the work environment influences productivity (Vischer), sometimes in a more objective manner by asking about the number of hours or percentage of time that is lost (Raw 1990, Learnan 1994, etc.). Some researchers use the term "job performance". A number of indicators are scored to provide an indication of this. Brill (1984) uses: the quantity of work, quality of work, meeting deadlines, frequency of errors, responsibilities, creativity, interpersonal relations, independence. Becker (1990) also uses the term performance and measures this with indicators related to such aspects as an organization's strategic objectives: space-efficiency, lost time, costs, response time (e.g. from complaint report to repair), quality and quantity of the work, absence and innovation. Marans and Spreckelmeyer (1981) also refer to performance and measure this indirectly by looking at the degree to which employees consider themselves productive and asking about the ambient factors and the extent to which these are bothersome or distracting.

In the Schermer report, productivity is measured by inquiring into the degree to which ambient factors (scored on a scale from 1 to 5) influence productivity. Building-related sick leave was another subject of inquiry. In the follow-up studies conducted by DHV, questions were added concerning quantity (number of hours lost) and quality. These studies revealed

that, on average, 15% of employees report that building-related complaints have a (highly) inhibiting influence on their productivity.

Further research into this data shows that this assessment generally goes hand in hand with the incidence of health complaints (neurological, eye and mouth and throat complaints) and with satisfaction with light, air quality, temperature (heating), possibility for individual climate control and the functional arrangement. Table 5 shows that, as respondents report a higher degree of dissatisfaction, a parallel loss of productivity occurs. This is particularly true for light, followed by comfortable temperature and air quality. The differences between the scores in the three columns are all significant. This means that, although the differences are slight for some aspects, they are based on a statistical relationship (probability). In this population a score of 3.0 for the productivity question corresponds with approx. 30% of the respondents reporting a (highly) inhibiting influence.

The analyses also show a correlation between satisfaction with complaints handling, as has been demonstrated in various other studies.

Ambient aspects	Ave. score for influence on productivity (5-point scale) dissatisfied with ambient aspect (1 and 2) neutral (3) satisfied with ambient aspect(4 and 5)		
Light	1.70	2.76	3.49
Air quality	3.04	3.15	3.34
Comfortable temperature, cold	2.98	3.17	3.23
Comfortable temperature, hot	3.09	3.15	3.25
Individual control	3.05	3.09	3.27
Functional arrangement	3.05	3.11	3.26

Table 5: Influence of ambient factors on the productivity in non-problem buildings. Source: non-published DHV study; more detailed analyses of Schermer.

Loss of productivity was not asked in terms of hours in the Schermer study, which explains why scores and not hours are indicated in the above table. The study was conducted in non-problem buildings, which means that there are no major differences between the buildings studied.

In the study conducted by DHV in *problem* buildings, loss of productivity was asked about. This revealed that the reported loss of productivity, expressed in lost work time per week, was comparatively low in comparison with foreign figures. The margin observed was between 5 and 10%.

Research conducted into open-plan office environments shows that other aspects are more

important than they are in more or less "traditional" offices with cubicles or separate rooms. Besides the aspects stated in Table 5, such things as privacy, bothersome reflections, furnishings and the appearance of the work environment, as well as other aspects of open-plan offices (being heard, being seen, people walking by, trouble concentrating) detract from productivity. Studies of Dutch open-plan offices also demonstrated that extra negative influences on productivity relate to dissatisfaction with ancillary services like reproduction, quality and availability of copiers, of conference rooms and service related to climate aspects.

These studies also looked at a large number of the above-mentioned qualitative aspects of productivity (Brill, Becker, Marans and Spreckelmeyer). It appears that in open-plan offices, loss of productivity is manifest mainly from the indicator for the quantity of work performed. All indicators correlate to some extent with privacy and work perception. The quantity of work performed is closely tied to functional arrangement and, to a lesser extent, to air quality and aesthetic arrangement.

The best-known study in this realm (Raw 1990) shows that productivity declines sharply as building-related health complaints rise. The number of people in the room and the possibilities for controlling the climate (which often go together) also influence productivity, as do climate conditions (temperature, ventilation, humidity and air quality). The conclusion of this study is that improving the quality of the workplace leads to higher (employee-reported) productivity. The average loss of productivity of the total studied population that can be estimated from this data is approx. 12%, and can run upwards of 30% in some individual cases (in about 9% of the population).

The summary of 47 studies into this subject presented at the '93 Indoor Air conference (Wyon 1993) emphasized the influence of (un)comfortable temperature (particularly overly warm temperatures and vertical temperature gradient) and individual control over the work environment. It was reported that the effects discovered were sometimes surprisingly high (up to 50%); the more common range was between 5 and 15%.

A recent presentation by Leaman (1994) more closely analysed results of studies conducted in the past decade in about 25 buildings, looking specifically at the link between dissatisfaction and (employee-reported) productivity. The outcome roughly corresponded with the results mentioned above. According to this data, dissatisfaction with air quality, both in the summer and winter, has the greatest influence (12% production loss), followed by temperature, also in summer and winter (11% productivity loss), comfort overall (10%), noise (8%) and lighting (6%). The average percentages of those dissatisfied vary from 23% (lighting) to 55% (air quality in winter). The respondents who gave these ambient aspects a positive or neutral score indicated a much lower loss of productivity or a slight productivity gain (noise and comfort overall). This is illustrated in Table 6.

	Productivity (dissatisfied)	Productivity (satisfied or neutral)	Per cent Dissatisfied
Temperature summer overall	-10.85	-3.97	46
Temperature winter overall	-10.36	-3.62	47

Air quality summer overall	-11.6	-2.31	51
Air quality winter overall	-11.66	-1.02	55
Lighting overall	-6.82	-1.06	23
Noise overall	-8.07	+0.98	36
Comfort overall	-10.06	+1.74	34

Table 6: Influence of dissatisfaction on productivity in per cent - = loss of productivity + = increase in productivity

Source: Leaman

An important element of the Leaman study was the influence of individual control. If respondents are more satisfied with their perception of control, productivity increases. The differences in the productivity score between a low and high level of control are the most significant for aspects of cooling, heating and noise. As regards the influence of noise on productivity, Leaman's results do not seem to correspond with Dutch studies conducted in offices with cubicles or separate rooms, although they are in line with findings in open-plan offices. It should be noted that Leaman's results are based on a study of complaints (see the high percentages of dissatisfied), probably conducted primarily in open-plan offices, rendering the correlations quicker and easier to see.

The influence on job performance of the (functional) arrangement, particularly how enclosed the work space is and its layout, also becomes clear in an American (BOSTI) study (Brill 1984), which, however, came to the conclusion that job performance is mainly influenced by this aspect (and possibly by light, as well) and not by other ambient factors.

Recently a number of laboratory studies have been carried out on the effects of individual elements such as temperature, air quality, lighting and noise levels, on staff productivity. The studies show that improving the quality of the air can already lead to a rise in productivity of 3 to 7% (Wargocki, 1998). Research, using objective parameters to measure productivity (typing speed, number of processed files, number of calls in a call centre), has shown that in situations like these a good indoor climate can promote increases in productivity of between 10 and 15% (Clements-Croome, 2000)

The Role of Plants

Plants or greenery is not an independent factor in the perception of quality in and of itself. Greenery can have an influence through the other factors, especially air quality and arrangement of the workplace (aesthetic). Plants can also have an indirect influence on neurological health factors (influencing stress).

Air Quality

Plants are capable of absorbing numerous (chemical) pollutants in the air. Many laboratory studies and experiments have demonstrated this (Wolverton). Unfortunately, these results have not yet been scientifically confirmed in actual office buildings.

Plants increase the relative air humidity. Especially in the winter, when complaints about dry air are most frequent, plants can help alleviate the problem. Their influence is only limited in offices with natural ventilation systems, but the effect on both air quality and relative

humidity can be larger in buildings with mechanical ventilation.

Arrangement
In light of results of studies into the psychological benefits of plants, this seems a plausible assumption that plants can influence people's perception of a building and workplace (Wood 1995) and, by extension, their wellbeing and productivity.

Productivity and Plants
The direct relationship between office workers' productivity and the presence of plants was, until several years ago, somewhat speculative and was not been demonstrated in scientific research.

In recent years research results have become available that throw some light on the effects of plants on the wellbeing of people in offices and schools (Fjeld, 1999). A similar study was carried out in the Netherlands, at the Winterswijk Tax Office, where the influence of plants on productivity was closely monitored (Van Dortmont, 2001).

The study was carried out using a control group (without plants) and a test group (with plants) in comparable areas of the building. Before and after measurements were taken with the help of a questionnaire. Physical measurements were also taken. 250 employees were involved in the test.

The before measurements showed that the building scored lower than standard for air quality and equipment. This led to a higher than standard rate of health problems in terms of eye, throat and nose complaints.

The most significant findings of the study are:
- the test group rated the factor wellbeing more favourably than the control group (the factor is made up by giving ratings to feelings such as calm, harrassed, relaxed, cheerful, depressed, self-assured, stressed)
- the same applied to the ratings for the quality of the working area
- the differences that were found are more explicit for the group of employees who work for more than 4 hours a day in front of a computer screen
- their productivity improved, especially in terms of efficiency; the strongest links were found in the context of functional equipment and privacy
- the strongest link was found with experimental group (R^2=0,65) those working at computer terminals. The most explicit variables are the ratings assigned for quality of the working environment and wellbeing
- loss of concentration dropped, i.e. concentration improved, in the test group
- no findings with regard to any significant improvement in health
- other environmental factors: static electricity and daylight were rated better
- results of physical measurements:
- the humidity indoors depends on the humidity outside
- plants make a (small) contribution to the reduction of CO_2 concentrations

Tips for Facility Managers
Results of studies into perception of the work environment, with negative complaints being

expressed about health, comfort, well-being, sick leave, productivity loss and less studied aspects such as reduced motivation, creativity, etc. do not usually make their way to facility managers.

The subjects raised for discussion at national and international FM conferences attest to this, although a slight improvement is noticeable. That is why information from these studies having relevance for facility managers has been summarized in the tips below:

- Complaints must be taken seriously. It has been shown that rapid, adequate response promotes overall satisfaction with the work environment and influences productivity.
- Call in the expertise needed to solve complaints in buildings in time.
- Before moving into new premises (lease signed), have the building inspected on the basis of its (healthy building) quality.
- When new premises are to be constructed, have the Programme of Requirements and Final Design assessed. Better yet: see to it that the optional guidelines of the Healthy Office Buildings are followed down the line, so that a healthy programme and design can be made.
- See to it that a healthy building stays healthy through adequate management: cleaning, maintenance, adaptations, arrangement, equipment (computer monitors, printers, copiers), furnishings, etc.

Office building management must be grounded in a preventive approach and the endeavour to have a healthy, productive work environment.

From Healthy to Environment- and Employee-friendly

In view of the relationships between the physical interior environment, on the one hand, and a number of aspects of the "bigger environment" such as energy consumption (ventilation, isolation of the shell), materials emissions, radiation fields from certain materials, use of plants and water in buildings, etc., on the other, these aspects should no longer be seen a discrete elements but taken as an integrated whole.

A wide range of aids has now been developed for this purpose, both by designers and managers of office buildings. In this context please see the Praktijkboek Gezonde Gebouwen (Healthy Building Manual) published as a platform for discussion by ISSO/SBR

Healthy building takes a short-term view (the individual person), while ecologically sound (environment- and employee-friendly) building focuses on the long term (global sustainability). It should be evident that greenery, in combination with water, is crucial.