Soft values of nature meeting mental needs of wellbeing and profitability gives incentives for improvement planning supporting most sustainability goals

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ABSTRACT

Soft natural values are often neglected in planning. One approach has been to aim for a balance of natural resources. However, balancing is no longer sufficient, as global consumption continues to deplete resources, reduce biodiversity, and drive severe climate crises. Instead, every project must actively contribute to improvements. But how can we expect property owners to deliver environmental qualities that exceed previous standards? Achieving this requires economic incentives—a win-win for all stakeholders, from developers to tenants, employees, municipalities, and even nations. Our approach summarizes research findings from the past half-decade on how natural qualities meet fundamental human needs for mental well-being and health. Two resources have been particularly valuable: the Alnarp Rehabilitation Garden and a large Public Health Survey of the Scania Region in southern Sweden, which enabled validation of eight specific sensory dimensions. One key finding is that university productivity is significantly associated with tree cover near campus buildings and with the density of sensory dimensions across an entire campus. These scientific insights led to the development of an assessment protocol for restorative workplaces. A group of property owners and tenant companies formed a mutual partnership for a testbed of an evaluation protocol. Practical implications now show that the tool effectively supports improvements. When stakeholders and staff discuss evaluation questions together, they gain a deeper understanding of how specific characteristics meet specific needs. Achieving social, ecological, and economic goals while improving one's workplace proves highly motivating for all involved.

Keywords: *Belonging, Creativity, Inspiration, Mental health, Mental needs, Nature-impression, Productivity, Sensory dimensions, Stress-prevention.*

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Highlights of this paper

- Most people today recognize that they feel well in nature, however, they often cannot explain why or how, as the processing of nature-related information occurs unconsciously.
- This paper outlines background research on how individuals can collectively transform unconscious perceptions into conscious improvement strategies for their workplace, and our approach to utilizes a set of one hundred questions designed to capture shared experiences across eight sensory dimensions that support diverse mental needs for work and daily living.
- In the long term, repeated evaluations of how environments support mental needs across different functions can collectively enhance the development of cities and nations, while contributing to the achievement of most of the global sustainability goals.

1. INTRODUCTION- OUR ISSUE

Soft values are mentioned in social cost-benefit analysis since the 60s and still today, however often neglected as being hard to estimate. Noise and noise reductions is often included but not the positive effects of nature exposure, e.g. sounds of nature. Another way to handle soft values is the German method for impact regulation, a calculation method not about costs and benefits, but to reach natural resource balance. Their soft values are sorted in the five resources soil, water, biotopes, air/climate, landscape. The principle is that a developer not reduce values from these resources without giving back equivalent amount of value (Rundcrantz, 2007) and must show how to reach a balance after the finished project. Impact on a resource should be balanced with mitigation measures for the resource concerned, if that is not possible it can be balanced with compensation measures to improve another of the five resources.

Today balancing is not enough since we overconsume global resources, reduce biodiversity and cause enormous climate disasters far beyond a sustainable resource household. Instead, in all projects we must contribute to improvements.

Today most people live in cities. Mental wellbeing is in decline across many countries, driving the use of antidepressive drugs, including among children. To what extent does that have to do with diminishing nature in people´s surroundings? Physical activity is one recipe for better health (Hansen & Sundberg, 2014). Humans in high stress situations react positively to certain nature qualities (Anna Bengtsson & Grahn, 2014). These two research areas together give soft values a stronger position. In this paper we can show how findings from several cases support mutual implementation in planning.

Our main issue is to focus on the soft values of nature as a resource in daily work and living. Our Criteria are our perception of nature-based characteristics through our senses, and how we can apply such values in physical workplace design. Our research findings show how such implementation simultaneously can benefit the species´ diversity, climate and other sustainability goals.

The incentive for stakeholders to engage in this issue is that better well-being is good for all involved and society. Several studies in environmental psychology and garden therapy show that natural environments reduce stress and improve wellbeing (Patrik Grahn, Stoltz, Skärbäck, & Bengtsson, 2023). Recent research shows that several characteristics together in a campus area are significantly associated with student performance (Amcoff, Alm-Fjällberg, Sang, Lundin-Kleberg, & Skärbäck, 2025).

This research shows that soft values of nature and materials meet basic human mental needs of wellbeing, safety, companionship, creativity in the local scale. To connect this to global sustainability requires economic incentives at all levels, from the individual to social justice internationally.

2. THEORETICAL BACKGROUND - MENTAL NEEDS OF WELLBEING

A series of studies from 1960 until 2025 added knowledge to this definition of soft values. Searles (Searles, 1960) found that patients with serious mental illness reacted most positively to natural water, boulders and rocks, ancient elements not claiming any demands on people. In England life expectancy, all causes for premature death, is associated with the green coverage in the citizen´s neighbourhood (Mitchell & Popham, 2008).

Ulrich (Ulrich, 1984) shows that patients recovering after orthopaedic operations needed less medicine and could be discharged earlier if they had a view of green trees outside the hospital window compared to patients who saw just a facade and no trees from the window . Ulrich´s theory is that nature signals to our brains today that we can relax.

When traveling by car, even short "relieving" views have a positive effect reducing stress, so-called "micropauses" (Parsons, Tassinary, Ulrich, Hebl, & Grossman-Alexander, 1998). Blood pressure drops already after a few minutes of walking and jogging. Activity, the tactile sense to feel with your feet and fingers, always has a very direct connection to brain development.

Professors Rachel and Stephen Kaplan (Michigan University) have presented their Attention Restoration Theory saying that four qualities recover from stress: feelings of being away to another world, feeling of space giving freedom, fascination- giving stimulation, and feeling of compatibility that people fit into the environment. (Stephen Kaplan, 1995).

An intervention study at a retirement home in Lund (Sweden), shows that after an hour in a green outdoor environment the elderly had better concentration and short-term memory compared with sitting resting an hour indoors in their favourite chair after the same intervention (Ottosson & Grahn, 1988) and recent intervention study in Berlin provides support this idea by showing that an hour's walk in a forest reduces stress by half, while a walk in an urban environment does not reduce stress at all (Plank, 2024).

An observational study of preschool children´s motoric and mental skills (Alnarp, Sweden) compared a hundred children at four nature rich preschools with a hundred children at seven nature poor preschools. It showed that the children at nature rich preschools had significantly better motoric skills at 8 of 11 tests and failed less at 4 of 6 social tests: Impulsiveness, concentration, dangerous behaviour and lack of consideration when socio-economic factors were controlled for (Grahn, 2007).

Ingegerd Ericsson and Karlsson (2012) showed in an intervention study, at an elementary school in Bunkeflo (south of Malmö, Sweden) that classes with children in first and second class, 7-8years, having sport each day had better scores in language and mathematics compared with a parallel class with the same teachers. Several of the children, especially boys, scored higher in the final 9th class at the age of 15.

Analysing exposure and outcome reported from previous research projects over the last 60 years have given inspiration to several studies at SLU Alnarp (Sweden) from the 90s. Interviews about people´s preferences for certain landscape qualities and perceived values were conducted in different parts of Sweden from 1995 to 2005. 51 qualities were distilled by factor and cluster analysis that resulted in eight landscape characteristics named serene, wild, spacious, lush, the common, the pleasure garden, culture and festive responds to basic human preferences – Figure 1 (Grahn & Stigsdotter, 2010).

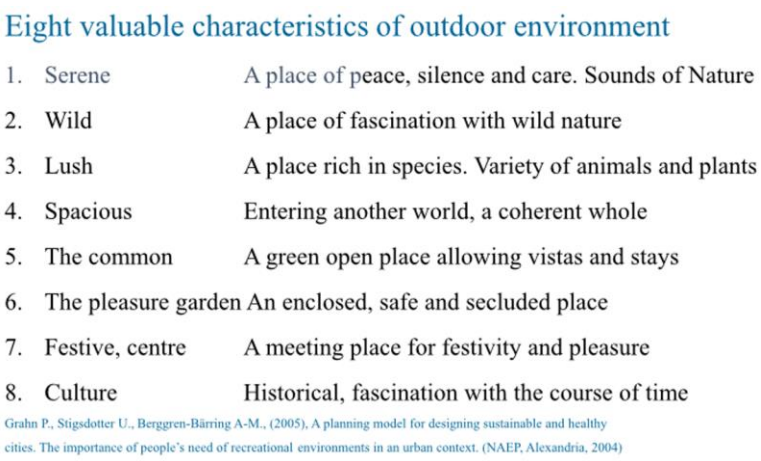

Figure 1. Eight characteristics responding to basic human preferences.
Source: Grahn and Stigsdotter (2010) **and** NEAP (2004).

Later, factor analyses showed that the eight characteristics reduced stress to varying degrees: Strong experience of wildness, pleasure garden and tranquillity/serenity reduces stress to great extent, sense of space reduced to somewhat lower extent, while the center/fest rather can be stressful (Grahn & Stigsdotter, 2010).

Since 2002, SLU Alnarp (Sweden) has conducted nature-supported rehabilitation in its own rehab garden, designed with a focus on the eight characteristics for nature-based rehabilitation, with a multimodal team, of licensed staff (Occupational therapist, physiotherapist, psychotherapist) as well as gardening professionals (Landscape architect and landscape engineer. Patients with fatigue syndrome showed a relatively quick return to work ability. The effectiveness of garden therapy at Alnarp was also tested for other patent groups. Findings: The garden therapy in Alnarp Rehabilitation Garden shows high efficiency in comparison to common KBT treatment measured as remaining healthcare costs one year after the end of the treatment (Wahrborg, Petersson, & Grahn, 2014).

3. AIMS OF THIS PAPER

Theories of Ulrich, Kaplan and Grahn have influenced researchers a lot, but less so property developers, planners and politicians. Now when most people live in cities and mental illness is growing due to stress and diminishing nature in people's immediate surroundings land use conflicts occurs frequently. Therefore, important issues today are to learn about how we react to different environmental exposure, how the environment supports us in various needs and how we can agree with stakeholders on appropriate improvements. A prerequisite is that property owners and politicians can learn how soft values benefit their economy. It must be a win-win for all owners as well as for leaders, staff, the municipalities and all society. We believe that considering all nature`s qualities in workplaces and species-rich neighbourhoods is a resource for better climate and for expectancy of long healthy life.

Therefore, our aim in this paper is to describe how soft values and qualities for wellbeing and health can stimulate incentives to improve living environments and at the same time improve economic values and fulfil several sustainability goals.

Research question generally: How can qualities and materials of nature that support our mental needs of wellbeing, creativity, activity and profitability be improved in our working environments, and how can such improvements also support several sustainability goals? How vary possible findings, due to varied data collection methods, respondents and evaluators knowledge and to participation?

The 8 characteristics have been analysed in different contexts due to scale, data collection and forms of evaluation and participation, e.g. participation vs. expert assessment. We describe different ways to study exposure of environmental qualities, outcome for people´s reactions and findings related to different data collection and participation. One aim is to validate data relevance and another to test in practice their usability in planning and design.

Totally the paper shows a progress of 14 cases. In different cases we describe the use of data, nature exposure, outcome, findings and concerned peoples´ participation.

The paper proceeds stepwise in three phases: 1) validation of characteristics in large epidemiologic analysis (Case 1-5, period 2002-2014); phase 2) science and proven experience (Case 6-12, period 2013-2019) and phase 3) practical implications of the scientific – a new tool for evaluation (Case 13-17, period 2020-2025).

Three specific research questions:

Q1: How do peoples´ perception of qualities in their neighbourhood associate with their wellbeing?

Q2: What differences can be found between objectively and subjectively measured exposure of nature qualities on people?

Q3: How can workplace improvements also support several sustainability goals?

4. PREVIOUS RESEARCH FINDINGS

Phase 1. validation of characteristics in large epidemiologic analyses (2002-2014).

Findings in research of nature exposure and outcome analysed from large public health surveys mainly from the Region Skåne. Respondents from age eighteen, geocoded answered questions about their wellbeing and in some cases how they perceive natural characteristics five to ten minutes from their home.

Case 1: Recreational values of the natural environment in relation to neighbourhood satisfaction, physical activity, obesity and wellbeing (Björk et al., 2008).

Exposure: Existing GIS data of land cover, inventories and formal land use regulations from County administrative Board of Skåne were used to elaborate five characteristics Culture, Lush, Serene, Spacious and Wild) (Skärbäck, Wadbro, & Grahn, 2009) later in case 3 referred to as (Skärbäck et al. (2009).

Input from a large public health survey of southern Sweden as a mailed questionnaire to 50,000 respondents each fourth year.

Outcome: Geocoded respondents in suburban and rural areas were analysed (N=24,819), 59% participation answered questions about their self-rated health, however, no respondent questions about perceived characteristics.

Participation: In this study of 2004 the respondents had no questions about characteristics to answer. The Exposure from characteristics were elaborated and GEO-coded by experts.

Findings: The number of recreational values (GEO-coded characteristics) near the respondents` residence were strongly associated with respondents` neighbourhood satisfaction, physical activity and BMI. The effect on satisfaction was especially marked among tenants, and the presence of recreational values was associated with low or normal body mass index.

Case 2: Thesis Nature and Public health, (Annerstedt (2011).

Exposure: The same as in Case 1; Answers from the same questionnaire as in case 1 with a special focus on questions about self-perceived mental health, e.g. "have you, during the past few weeks, felt unhappy and depressed" rated on a four-point scale.

Outcome: Access to the five GEO-coded characteristics (n=7549).

Participation: In this study of 2004 the respondents had no questions about characteristics to answer. The Exposure from characteristics were elaborated and GEO-coded by experts.

Findings: Self-perceived mental health associated with access to wild, lush, serene, spacious and culture when in interaction with physical activity. Interactive effect of physical activity and access to serene or spacious significantly reduced the risk for poor mental health among women.

Case 3: Three measures of exposure compared, 2011 (de Jong et al., 2011).

Exposure: 1) The same as in Case 1 objectively used landscape data and GIS ((Skärbäck et al., 2009) plus 2) cross-sectional data (N = 24,847) from the public health survey conducted in the of Scania, southern Sweden and validates the Scania Green Score (SGS); plus 3) area-aggregated assessments of perceived environmental attributes (The five characteristics) to overcome single-source bias. This at a multilevel model to aggregate individual self-reports of assessments attributes for areas of 1,000 square meters.

Outcome: Demonstration how self-assessments of green neighbourhood environments aggregated to assessments.

Participation: In this study the respondents participated in exposure-measure 2 by self-assessing their perception of characteristics. The exposure-measure 1 was the same as in case 1 and exposure-measure 3 was elaborated by experts.

Findings: Three perceived qualities had autogenic potential: Historical remains (Culture), silence such that sounds of nature can be heard (Serene) and species richness (Lush). Spacious and wild were not appreciated. Perceived qualities within green areas, not merely quantity, are related to aspects of well-being in suburban and rural areas.

Correlations between the index scores based on self-assessments and the corresponding objective assessments were clearly present. The correlation was even more evident for the area-aggregated assessed. All three scores (GIS index score, individual SGS, area-aggregated SGS) were associated with neighbourhood satisfaction, indicating concurrent validity.

Case 4: Moving to Serene Nature May Prevent Poor Mental Health, 2015 (Annerstedt van den Bosch, Östergren, Grahn, Skärbäck, & Währborg, 2015).

Exposure: The same as in Case 1.

Outcome: The same as in case 2. Respondents moved between 1999 and 2005 (n=9,230/1,419).

Participation: In this study of 2004 the respondents had no questions about characteristics to answer. The Exposure from characteristics were elaborated and GEO-coded by experts, SGS.

Finding: Serene was a significant determinant with a significantly decreased risk for impaired mental health among women.

Case 5: Effects of changing exposure to neighbourhood greenness on general and mental health: A longitudinal study 2015 (Weimann et al., 2015).

Exposure: Similar as in case 3 the cohort (n=24,847) was divided into prognostic groups for good self-reported general (n=8891) and mental (n=9444) health. Independent survey data to assess perceived neighbourhood greenness (five characteristics) was used in 1km2 areas.

Outcome: Estimated effects of changing exposure longitudinally were stratified by prognostic group.

Participation as in case 3, participants measure 2).

Findings: "The overall effect on health was small and statistically uncertain. A more beneficial effect of increased greenness was indicated among subjects with lowest prognostic of good general health". Several questions in the cohort are relevant for assessment of executive abilities. From those questions was showed a

certain but week connection between mental health and executive functions such as problem-solving ability, decision-making ability, concentration ability, satisfaction with what you have done, feeling of well-being, happiness on the one hand and increased access to serene outdoor environments, wildness/nature feeling, species richness, sense of space and cultural history.

One reason why the evidence is weak may be that 1 km² is a large unit for evaluation. The distance between a valuable quality and a respondent may be too long.

4.1. Summary of Findings Phase 1

- The number of recreational values Culture, Lush, Serene, Spacious and Wild (GEO-coded characteristics) near the respondents` residence were strongly associated with respondents` neighbourhood satisfaction, physical activity and BMI. The effect on satisfaction was especially marked among tenants (Case 1).
- The presence of recreational values was associated with low or normal body mass index, and with physical activity more often and little longer each time (Case 1).
- Self-perceived mental health associated with access to wild, lush, serene, spacious and culture when interaction with physical activity. Interactive effect of physical activity and access to serene or spacious significantly reduced the risk for poor mental health among women (Case 2).
- Three perceived qualities had autogenic potential: Historical remains (Culture), silence such that sounds of nature can be heard (Serene) and species richness (Lush). Spacious and wild were not appreciated. Perceived qualities within green areas, not merely quantity, are related to aspects of well-being in suburban and rural areas (Case 3).
- Correlations between the index scores based on self-assessments and the corresponding objective assessments were clearly present. The correlation was even more evident for the area-aggregated scores. All three scores (GIS index score, individual SGS, area-aggregated SGS) were associated with neighbourhood satisfaction, indicating concurrent validity (Case 3).
- Serene was a significant determinant, showed a significantly decreased risk for impaired mental health among women when moving to a more serene environment (Case 4).
- When moving and changing exposure to neighbourhood greenness (Case 5) the overall effect on health was small and statistically uncertain. A more beneficial effect of increased greenness was indicated among subjects with lowest prognostic of good general health.
- One result is that several questions in the cohort relevant for assessment of executive abilities showed a certain but week connection between mental health and executive functions. So, there is an indication of improved ability for problem-solving, decision-making, concentration, satisfaction, well-being and happiness with increased access to Culture, Lush, Serene, Spacious and Wild (Case 5).

4.2. Conclusion of Phase 1

The large epidemiologic analyses validate in general that the five studied environmental characteristics improve good health and wellbeing, the more of the characteristics the better. Especially the Serene is the most valuable characteristic for the outcome effect, and the more characteristics in neighbourhood the more the respondents activate (Q1).

Since index scores based on self-assessments and the corresponding objective assessments by the expert were clearly correlated (Case 3) one conclusion is that the choice of method for exposure is more a question of available

objective data and educated experts. No big differences were found between objectively and subjectively measured exposure of nature qualities (Q2).

Using over hundred questions in a large public health survey makes it impossible to use long descriptions of each characteristic. Only one or two adjectives may be used in each question. The understanding of a characteristic can be too limited. 2004 and 2008 respondents may have had limited knowledge about how well-being is affected by physical environmental qualities. However, the pandemic from 2018 caused many people to increase their time outdoors and increased their awareness about how and where you can feel better. Today the questions could have been understood better.

To plan certain outdoor environments, survey studies does not provide sufficient guidance, as specific knowledge is required how certain qualities support certain needs in the specific spatial context, unless respondent data is displayed in map form as in Phase 2.

In the next phase we leave the regional scale and go deeper to municipalities and large workplaces such as university campuses. By going deeper in scale, it is possible to also elaborate the three more detailed characteristics: The Common, the Pleasure-garden and the Centre/fest. In Figure 2 we show how the eight characteristics relate to concepts of Ulrich (1984) to the left in the figure and to Stephen Kaplan (1995) the right in the figure.

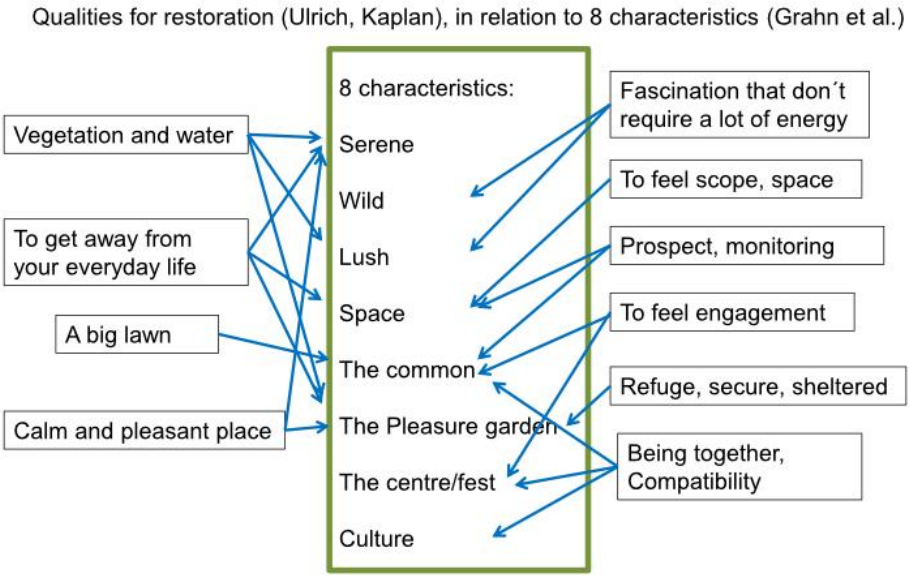

Figure 2. The eight characteristics of Grahn, Stigsdotter, and Berggren-Bärring (2005); Grahn and Stigsdotter (2010) - related to concepts to the left Wilson et al. (1984) and Kaplan and Talbot (1983), Ulrich (1984) and Kaplan, Wilson, Dewey, and Crawford (1998) to the right.

Phase 2. Science and proven experience for spatial planning (Case 6-12, period 2013-2019).

This phase shows studies more detailed in scale from a whole municipality down to full campus scale of universities. In local scales it is possible to elaborate the three characteristics the Common, the Pleasure Garden and the Centre/fest that in previous phase 1 were too detailed for the regional scale surveys and not asked for. A special focus in this phase 2 is the form and level of participation in evaluation of characteristic qualities. All the 8 characteristics have been analysed here with different ways of participation, e.g. laymen participation vs. expert assessment.

Case 6: Green perception a tool for social integration - Malmö Study (2012).

Exposure: from the large public health survey of southern Sweden Skåne (2008) (SGS, see case 3) comes from Malmö 2,946 respondents geocoded. They valued their perception of the five characteristics Serene, Wild, Specious rich (Lush), Space and Culture within 5-10 minutes´ walk from home. In Figure 3 is the Serene (Blue Left up)

analysed from these data (Stoltz, Grahn, Brundell-Freij, Björk, & Skärbäck, 2012). The maps to the right are elaborated from 39 distinct data at Malmö planning office: traffic noise (Black right up), and a regression analysed of overlapping characteristics (Yellow-orange right under) was made with the corresponding characteristics (Rydell-Andersson & Skärbäck, 2010). The map left under comes from a socio-economic investigation of household income presented in the local paper Sydsvenskan two weeks after our presented blue map.

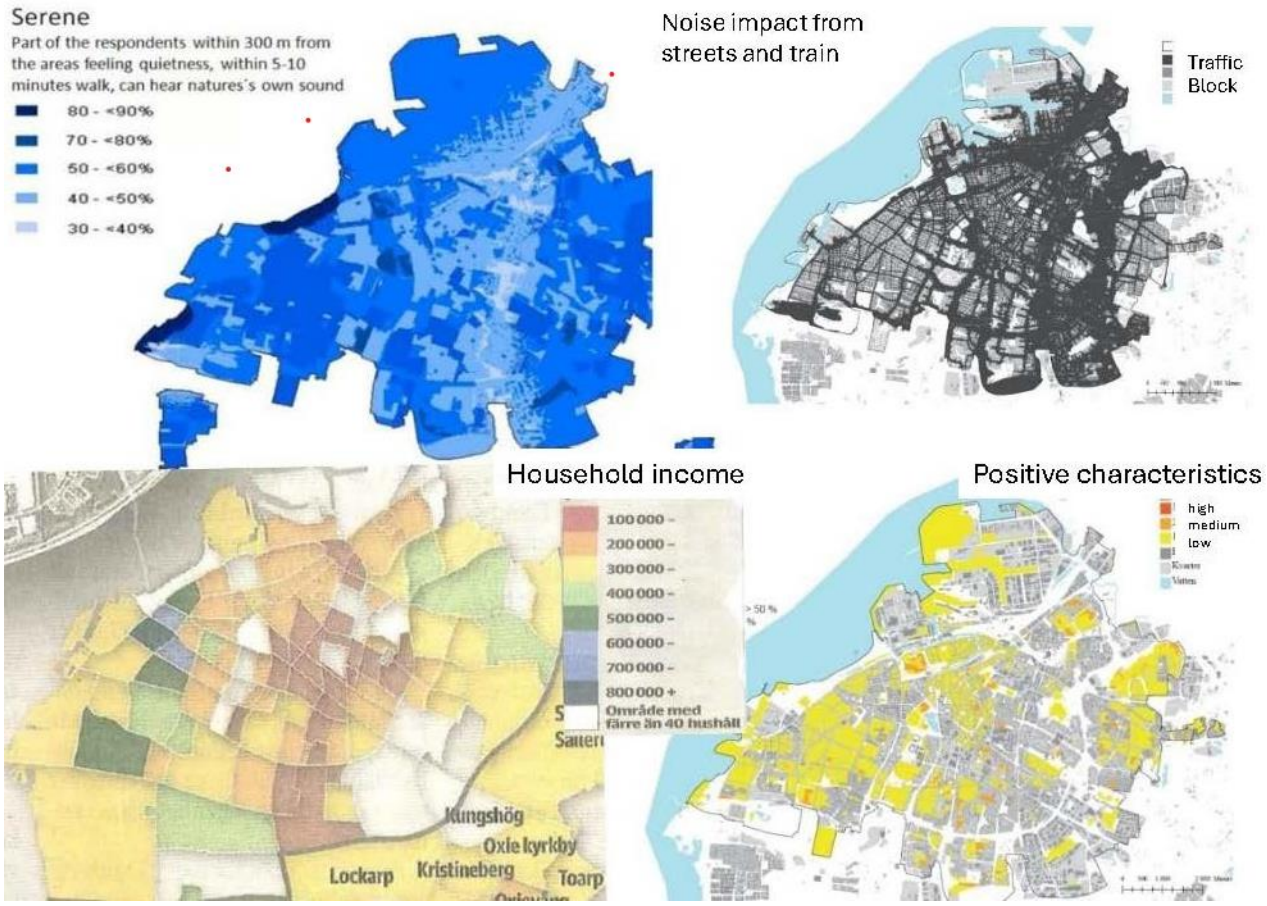

Figure 3. Serene (Up left) and household income (Down left) coincide much. 39 qualities from Malmö plans (Down right) coincide with low noise (Up right), or in other words, lack of green qualities noted in Malmö plans coincide with the most disturbing noise.

Participation Exposure of the five characteristics (Here only the serene) are from the public health survey respondents 2008 (SGS). The respondents (Laymen) participated by self-assessing their perception of the characteristics. The maps to the right are from experts` elaboration of the 39 distinct data from Malmö planning offices, and the household income was elaborated of experts in statistics from Malmö.

Findings: The study of the city Malmö show that less than half of the apartment-dwelling respondents in the Malmö urban area are satisfied with their neighbourhood if less than half of the eight characteristics are available within 300 m. Other findings was a strong visual connection between accessibility to serene areas and household income – Figure 3 left, and a strong visual connection between lack of green qualities and the most disturbing noise – Figure 3 right. These finding suggests that creating additional serene green space in low-income areas, and reduce their noise, may be prioritized tools for the municipality to reduce segregation (Skärbäck, Björk, Stoltz, Rydell-Andersson, & Grahn, 2014).

Case 7: Kristianstad local group evaluations (Stoltz, Björk, Grahn, Mattisson, & Skärbäck, 2013). The outdoor environment of the city and neighbour village Vä was divided in physical homogenous subunits. And evaluation groups were organized among staff people from Kristianstad municipality.

Exposures: 1) The evaluation groups classified each of the eight characteristics of the city outdoor environment in four classes for each subunit, from very high quality to no existing quality - Figure 4.

2) As in the Malmö study (Case 6) was used respondents from the large public health survey of Skåne SGS 2008. The geocoded respondents from Kristianstad are n=1605.

3) A try to elaborate characteristics from 18 distinct data at Kristianstad planning office failed.

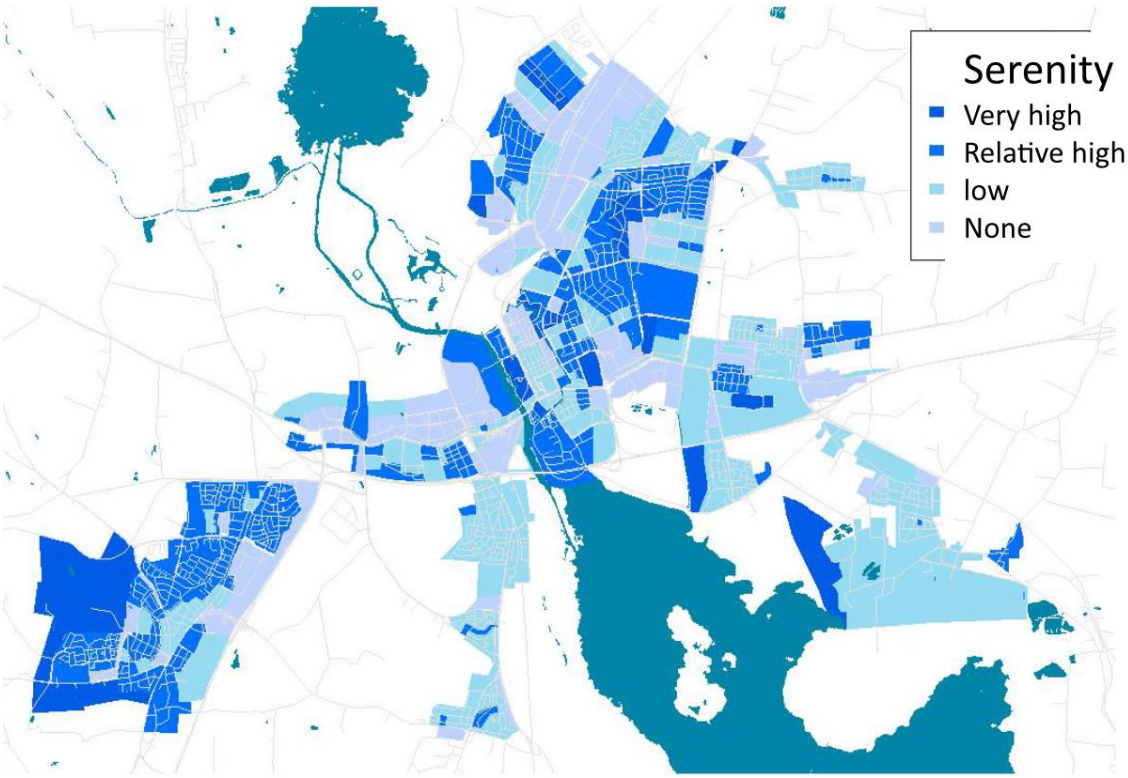

Figure 4. Serenity classified by focus groups from Kristianstad staff.

Outcome: The focus group assessments were analysed together with respondent classifications from SGS public health questionnaire (Only the five characteristics – see case 2).

Participation The focus group assessments of the 8 characteristics` exposure and estimated outcome were to some extent expert analytical due to their local background knowledge of the city and their participation in a series of workshops to learn about the relevant environmental perception research. The respondents participated by self-assessing their perception of five of the characteristics. The green cover assessment is an expert analysis with GIS. Green cover was measured from IR-areal-photo as percentage of non-hardened ground.

Findings: Lush, culture and serene were significantly associated with the focus group assessments. However, not the wild and space. Those two characteristics are difficult to describe in only a short sentence of the characteristics in the extensive public health questionnaire with over 114 questions, as also was found by de Jong et al. (2011).

High green cover was highly significant (p=0.001) with serene neighbourhood perceived by the 1605 respondents at the large public health survey of Skåne, SGS 2008.

Case 8: KI campus Solna, expert analysed of 8 characteristics - AH 2012.

The Akademiska hus ordered an expert analysis of KI (the Karolinska Institute´s campus. KI is the highest ranked university in Sweden and is hosting the prestigious Nobel Prize Foundation. The question was how to improve the eight characteristics on their campus. http://restorativeworkplace.com/wp-content/uploads/2015/10/KI-2012.pdf

Exposure: The campus area was divided into 21 subareas (Landscape rooms between buildings). Each sub area was analysed due to existing qualities and suggestions for improvement measures for each of 8 characteristics. The characteristics of Grahn et al. are related to Ulrich and Kaplan – se Figure 2.

Outcome: Expert advises to improvement measures.

Participation: An expert ES. All the eight characteristics was classified in three classes good medium insufficient – se Figure 5 showing Social (Centrum/fest) to the left, Culture in the middle, and Need of improvement measures to the right.

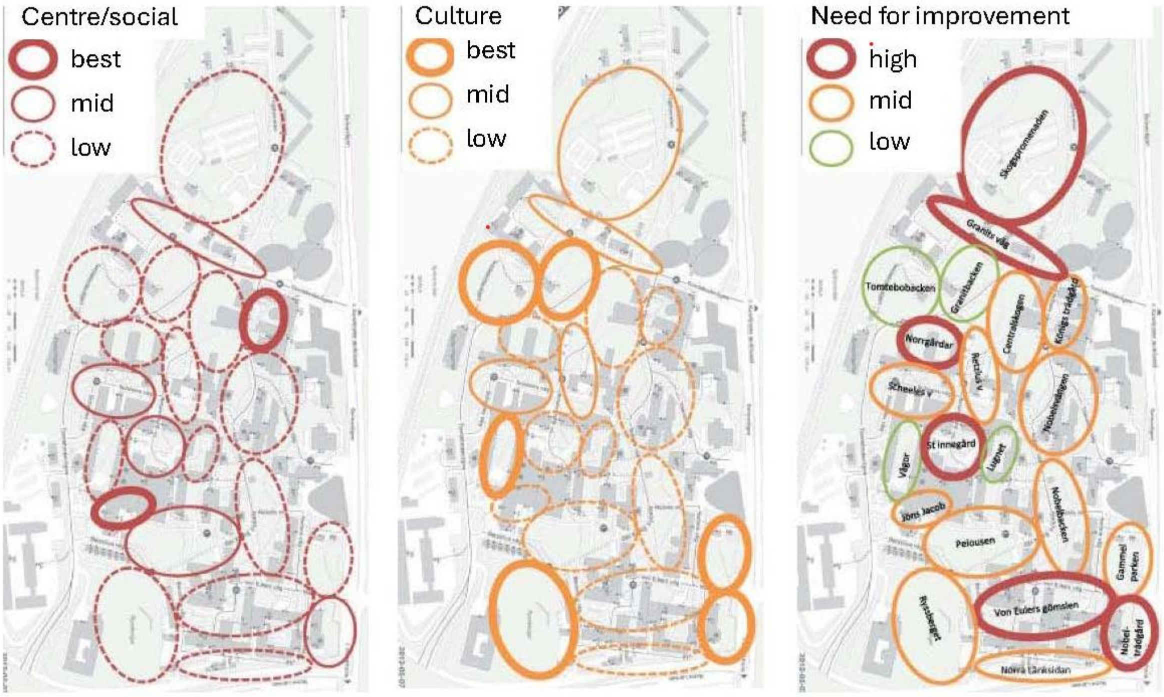

Figure 5. Social to the left, Culture in the middle, Need of Improvements right KI campus Solna, expert analyze of 8 characteristics - AH 2012.

Source: Skärbäck, Van den Bosch, and Gahna (2015).

Findings: Akademiska hus started discussions to prioritize and implement improvement measures together with the tenant KI.

Case 9: KI Solna a questionnaire survey to the staff (n=895) (Skärbäck, Van den Bosch, et al., 2015). Issues to study differences in evaluation between staffs at workplace compared with experts from outside (Case 8), and analysing respondents` perception of wellbeing and stress related to sleeping quality, age, sex, commuting and leisure green exposure, and analyse the respondent`s perception of eight characteristics in their outdoor defined of totally 21 outdoor rooms – Figure 6.

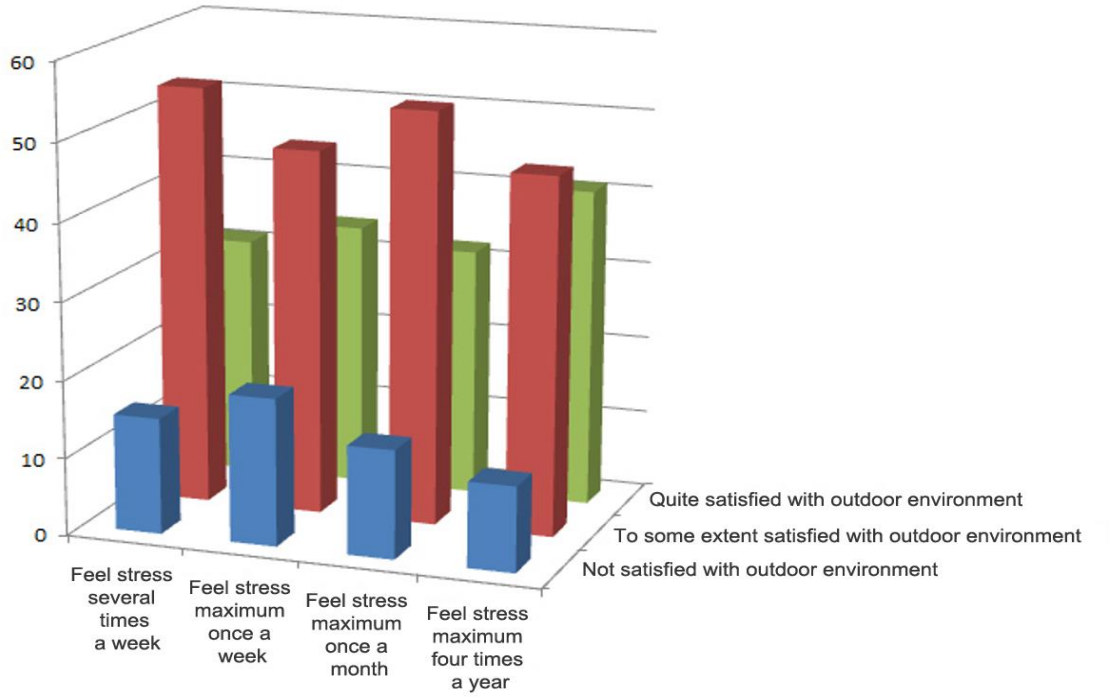

Figure 6. Respondents with low stress perceived the outdoor environments with higher satisfaction.

They were also older. Younger people were more stressed and less satisfied with the out-door.

Exposure questions: How do each respondent perceive the outdoor characteristics in relation to her workplace building classified in high, medium or low perception – Figure 7 left.

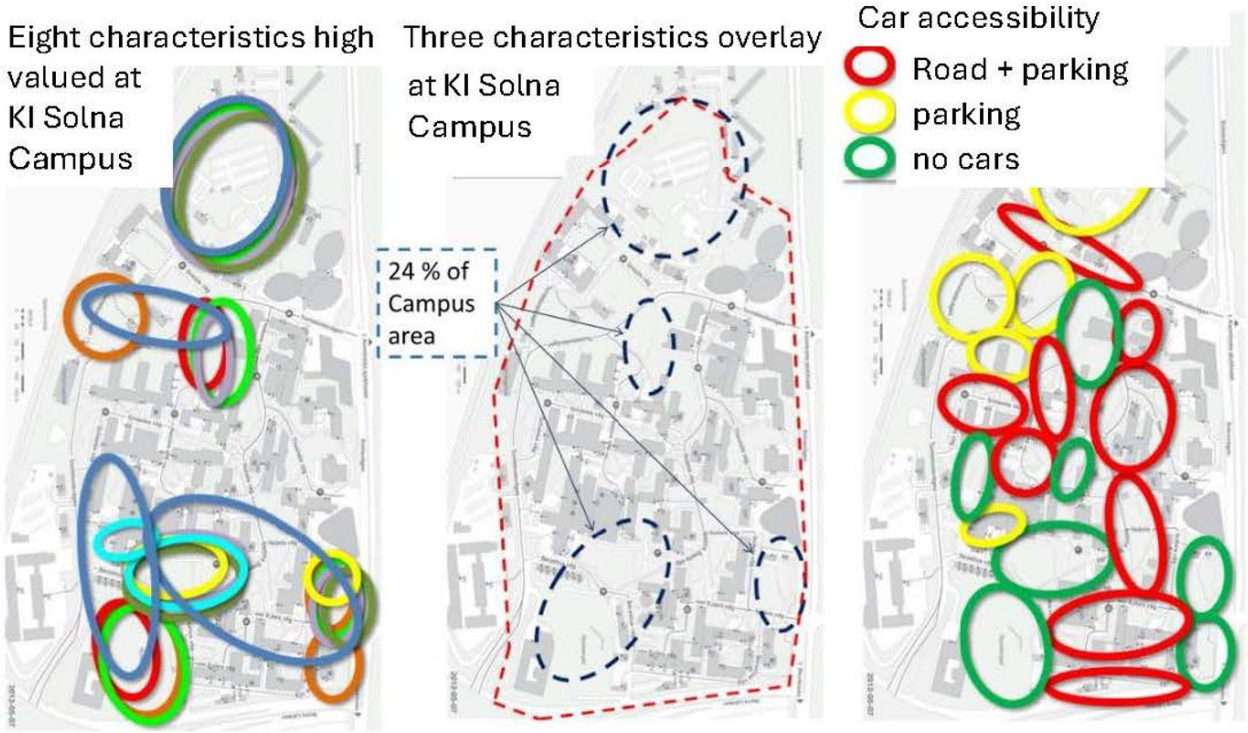

Figure 7. Staffs` high values (Left) 3 or more overlaying (Middle) Disturbing car traffic (Right).

Outcome: Holistic summary: The staff valued higher than the expert for Serene, somewhat equal for Wild, Pleasure Garden and Space, but lower for Lush, Common, Culture and Centre/fest. A tendency was that staff valued a little less than the expert maybe because of expectations and wishes for improvements.

Participation: The staff and students at KI Solna have high general knowledge of health and wellbeing and mostly a lot of experience of their own workplace.

Finding: There are no big differences between staffs` and experts` valuation. However, the internal variation among respondents was unexpectedly high. The stress varied among the respondents age and sex, and the perception of characteristics. Perhaps stress counteracts the ability to experience the outdoor environment qualities? Also, the young spent less time on promenades during the day and were less satisfied with their green exposure leisure time. An interesting finding was that those commuting on bicycles had better sleep quality.

Later analysed (Skärbäck, Grahn, & Stoltz, 2016) how car traffic in campus affected the respondent`s perception of the eight characteristics in relation to outdoor rooms showed high significance for better perception the less car traffic and parking. Best was rooms without any cars.

Case 10: International validity - a comparison Kina/Russia.

Two equivalent studies, questionnaires of preferences for the eight characteristics, were distributed by master students from SLU Alnarp to Huanggang (Wen, 2012) n=148) and St. Petersburg (Aleksandrova, 2013), n=161).

Exposure: Later an assessment of existing qualities (supply) and wishes for the future (demand) to elaborate what may be underbalanced (Skärbäck, Wen, Aleksandrova, & Grahn, 2015) – Figure 8.

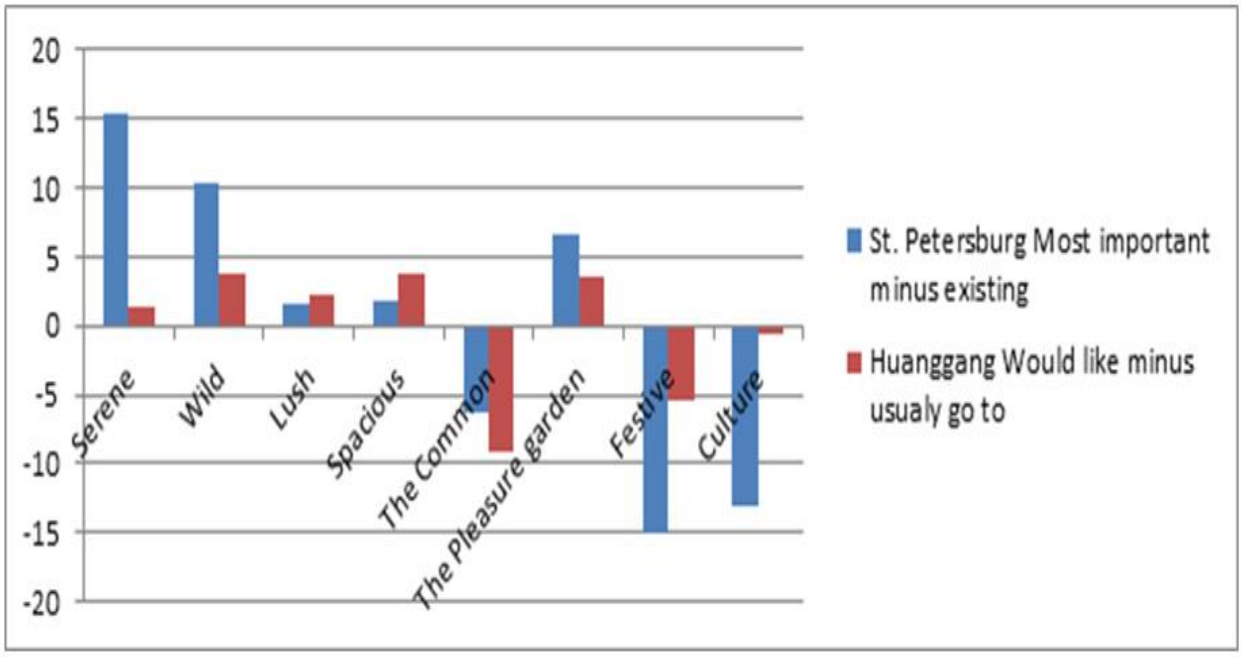

Figure 8. Bare going up means underbalance, need of more. Bare down means enough/sufficient.

Participation: Respondent were mostly (80%) 17-35y, answering about their one local neighbourhood.

Findings: Both student surveys, independent from each other, show that the restorative characteristics serene, wild, pleasure garden, spacious and lush in this order are the most desired, and that they have enough of the common, festive and culture. Despite the differences in landscape and culture between the two cities, the results of which of the Eight PSDs are most preferred and desired are remarkably similar. The conclusion is that respondents

seem to interpret the PSDs in a similar way regardless of cultural background and context, and it also underline that nature qualities supporting basic mental needs is something we inherit from our earliest ancestors.

Case 11: Expert analyses of top university campuses 2012-15.

Over several years, members of the faculty Alnarp visited and analysed international high-ranking universities (Skärbäck, Nyblom, Stoltz, & Grahn, 2014). Earley studies indicate that some few very good characteristics of an area tend to give very positive perception of the area, better than medium of all eight.

Questions: how can different number of overlaying characteristics in % of the total campus area work as a criterion to measure an overall impression of quality? What can be the best number of overlapping characteristics per area to get a spread which agrees with perceived quality of the whole?

Exposure: Campus distribution of eight characteristics. Analysed in situ, field studies. Also, studies of local reports, Google Earth and some local interviewees – Figure 9.

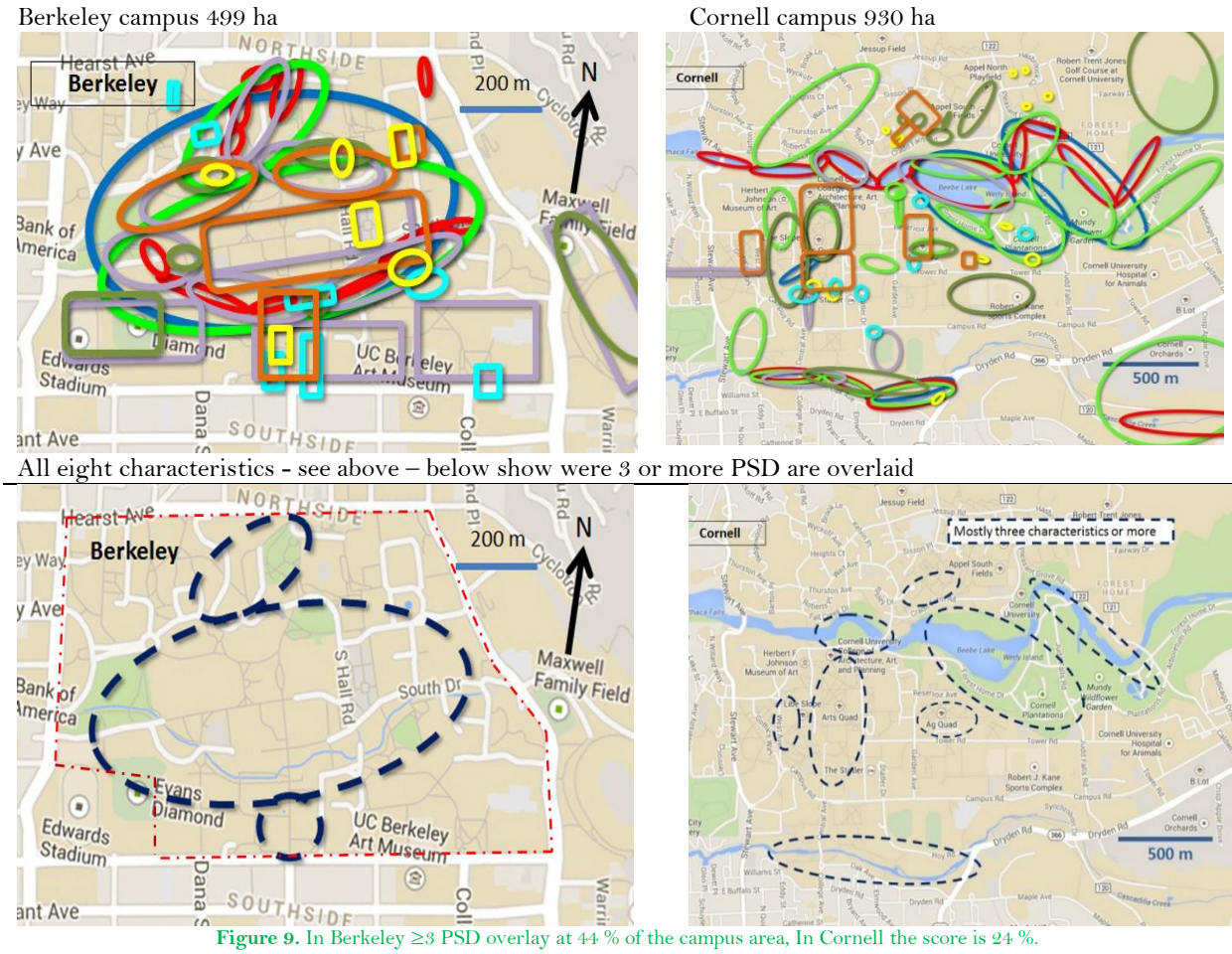

Figure 9. In Berkeley ≥3 PSD overlay at 44 % of the campus area, In Cornell the score is 24 %.

More campus studies in Skärbäck et al. (2014) https://restorativeworkplace.com/studies-of-some-university-campus/.

Outcome: Elaborating different combinations of overlaying characteristics.

Participation: Experts from Restorative Workplace Innovation group.

Finding: The highest ranked universities in different ranking systems also tend to get high ranking as Restorative Workplace if three or more overlaying characteristics in % of the total campus area are used as the

criteria to measure a grade as Restorative Workplace. Three overlaps provide better spread between universities than two or four (Skärbäck, 2013).

The measure three or more overlaps is not statistically analysed with other university ranking systems (Skärbäck et al., 2016). To search for such associations requires further research.

Case 12: Pilot study Sweden campus planning compared with "Campus matters" (Hajrasouliha, 2017) a study of distinct objective variables at 103 US Research universities.

Input: Data from 180 Student programs reported to Swedish government.

Exposure 1: Objective physical distinct qualities of five Swedish universities campus similarly measured as in Hajrasoulihas´ study for USA.

Exposure 2: Eight characteristics experts evaluated and measured for 3 or more characteristics overlapping in % of the campus, e.g. Lund U was one of the universities in the pilot study - Figure 10.

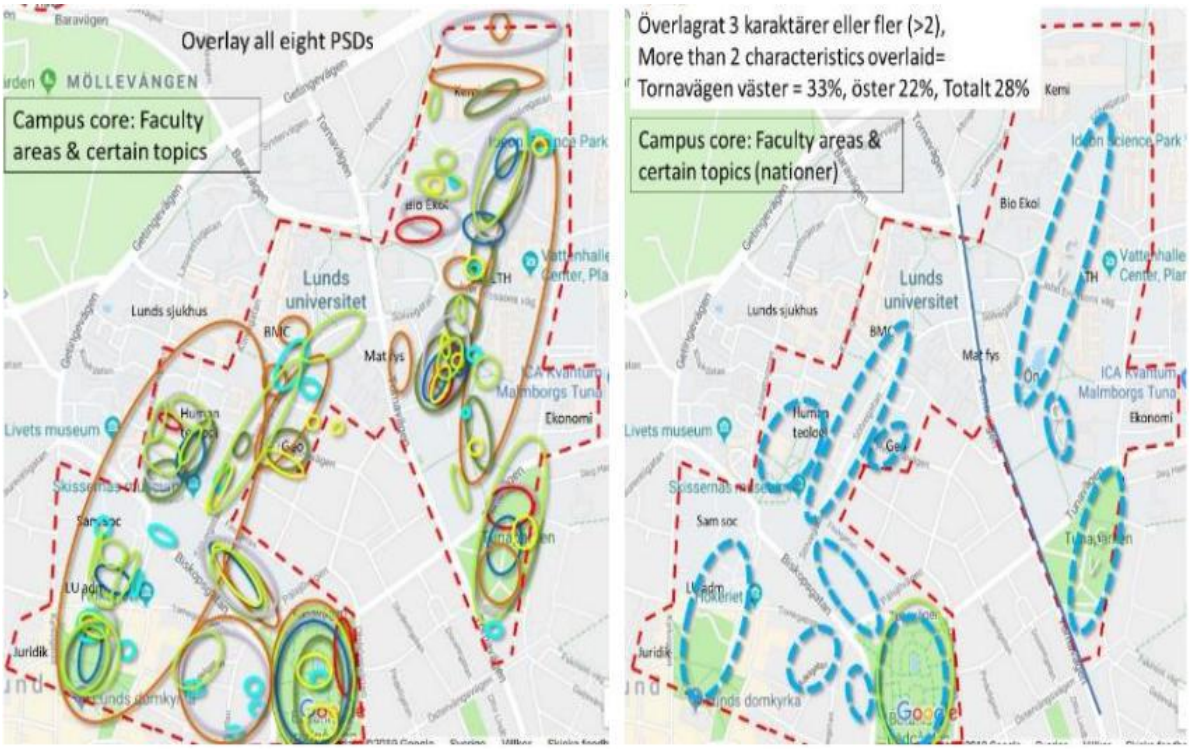

Figure 10. Lund Universities valued eight Characteristics (left), Three or more overlapping (Right). The other universities in the pilot study were Uppsala U, Stockholm U, KTH and SLU.

Outcome: Student performance (Retention data) at the participated universities programs compared with distinct objective factors (1) and compared with overlays of 3 characteristics or more as a percentage of the campus area (2).

Participation: experts from Restorative Workplace Innovation group assessed the characteristic quality values distributed on the campuses.

Finding 1: Tree cover % in the close outdoor (50m) was significant with the student performance.

Finding 2: Overlap of 3 characteristics or more as a percentage of the campus area was significant associated with the student performance HEI 0.142(0.009) * (Jan Amcoff, Fjellborg, Sang, Skarback, & Kleberg, 2025).

4.3. Summary of Findings Phase 2

Exposure:

- The most serene city parts in Malmö also have the highest household income (Case 6).
- The most noise disturbed city parts also lack the most of green qualities (Case 6).
- If less than half of the eight characteristics are available within 300 m less than half of the apartment-dwelling respondents were satisfied with their neighbourhood (Case 3).
- The characteristics Wild and Space are difficult to describe properly with only short sentences in questionnaires (Case 3. & Case 7).
- High green cover was highly significant with serene neighbourhood in Kristianstad (Case 7).
- There are no big differences between respondents and expert valuations at KI. However, the internal variation among respondents was unexpectedly high (Case 8 & Case 9).
- Stress can vary due to respondents age and sex at qualified universities, due the perception of characteristics. Perhaps stress counteracts the ability to experience the outdoor environment qualities? (Case 9).
- Stress may also depend on less time spent on promenades during the workday and/or lower exposure and of leisure green (Case 9).
- Commuting on bicycles was significant with better sleep quality (Case 9).
- Workplace staff perceive their outdoor rooms better the less car traffic and parking with highest significance for all eight characteristics except for festive/centre (Case 9).
- Young people (17-35y in surveys from China and Russia, case 10) perceive the characteristics serene, wild, pleasure garden, spacious and lush in this order, and feel they have enough of the common, festive and culture. This confirm that qualities supporting basic mental needs is something we inherit from our earliest ancestors, regardless of temporary differences in culture and landscape (Case 10).
- High ranked universities in different ranking systems tend to get high ranking also as Restorative Workplace, measured as the proportion of the campus area having 3 or more overlaying characteristics (case 11).
- Greenery, as tree canopies, in the immediate surrounding from students´ workplaces was significant with student performance at 20 localizations of five universities in Sweden. Significant with performance was also the overlap of 3 characteristics or more as percentage of the total campus area. The distribution of eight perceived sensory dimensions and their interplay in and around the campus area, as well as data on indoor environments, is an urgent issue to increase the chances of student retention and success (Case 12).

Participation:

- It seems like respondent evaluations is equally valid as expert evaluation after a relatively short introduction of the method and background research to the participants (all Cases: 6-12).
- Different experts value similarly in the Pilot Study, case 12, classifying different cities. Despite this the correlation between % of campus area having 3 or more overlapping characteristics show significant association with student performance (Case 12).

4.4. Conclusion of Phase 2

To go even closer in scale and evaluate single workplaces there is a need for more detailed assessments of where and how people need different kinds of mental support from the environment. Stress reactions happen several times during a workday in a similar way to how our predecessors did flee or fight in danger. The same is for stress

reduction. Stress subsides quickly when in a safe shelter, well equipped with soft natural qualities like sounds of birds, hummingbirds, pouring water, smells of flowers etc.

So, for more practical implications of the detailed improvements of workplaces there is a need for a more complex evaluation protocol as elaborated in phase 3.

5. NEW TOOL FOR EVALUATION

Phase 3. Practical implications of the scientific (Case 13-18, period 2020-2025).

Previous scientific findings led to the development of an assessment protocol for restorative workplaces. A SLU Innovation-team started 2014 a project, with some sponsoring from The Swedish Innovation Agency, to develop an evaluation protocol for workplaces related to the eight characteristics, now called the eight sensory dimensions (PSD). The idea is a work tool for estate owners and architects, tenant companies and staff having mutual interests to improve their workplace for better stress-reduction productivity and economy. Preferably to evaluate together.

5.1. The Way of Sensory Impressions

Every one experience good mood in contact with nature but does not know very well why. The reason for our limited knowledge of how we react to nature-impressions is that sensory information goes unconsciously directly to our limbic system and influence our mood to feel confident and open for social contacts with others around us. We get more empathetic; however, don`t understand how it happens. Our reactions from nature can be dated back to very early stages. Reptile brain is hundreds of million years old. The limbic system used to be called the birdbrain because it developed about 50 million years ago when reptiles came up on land and started to fly. The human brain used to describe as younger than one million years.

Our conscious system, the human brain called DAS (Directed attention System) is sometimes called aggressive since it claims you to consider while it takes energy. There we sometimes are pressured by negative impacts e.g. personal daily problems, weak hearing and/or by environmental compensation, e.g. disturbing noise, poor lighting, freeze that takes energy from us. All such negative impact causes stress and can reduce the available DAS capacity to a high risk of burnout. Our conscious thought can process only about 10 bits per second, our working memory about 10-50 bits (Zheng & Meister, 2025). While our sensory systems process billions of bits per second, however unconsciously – Figure 11.

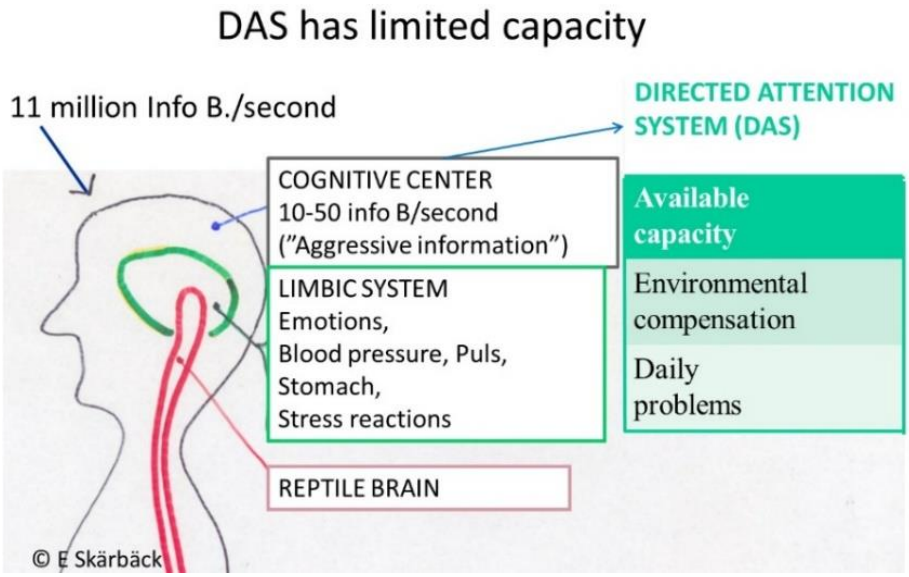

Figure 11. Most information from nature to our brain, the exposure, goes unconsciously direct to our limbic system at the same time as we concentrate on other things.

Source: Skärbäck (2013)

The directed attention system requires mental rest several times during an entire working day. Even a few minutes of exposure to nature can restore a lot. It is critical if the directed attention is persistent, lasts long time, and is very demanding. The World Health Organization (WHO) has identified stress as one of the leading health crises of the 21st century (World Health Organization, 2025).

5.2. Nature Impressions Strengthen Mental Needs (Q1)

Research so far shows that impressions of nature provide well-being, improve short-term memory, ability to concentrate, feel security, reduce stress, and increase creativity. Greenness makes us consider each other better, show more empathy, willingness to cooperate and potentially reduce bullying. This is essential for a good working environment. Good working environments have physical qualities we perceive supporting basic mental needs, and improve production as shown in case 12. The mental needs can relate to the eight characteristics as in Figure 12.

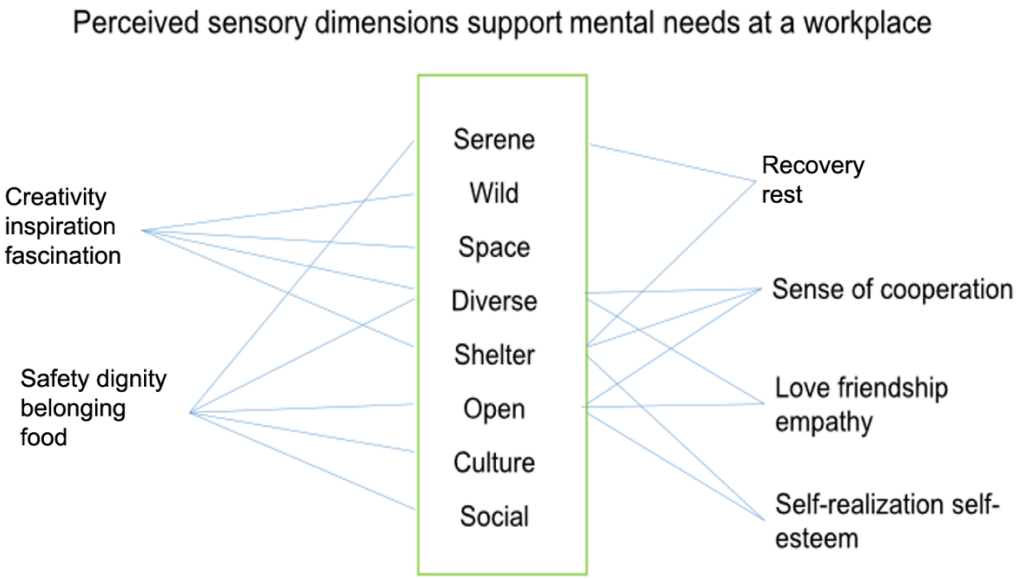

Figure 12. The eight PSDs support basic mental needs if properly planned were and how.

Qualities support both in action and in relaxation, what, where and how depend on situation. Supportive environments also called perceived sensory dimensions, PSD, some of these can have opposite attributes while others are close together (Jonathan Stoltz & Grahn, 2021).

It is particularly critical if a person experiences danger, disturbances in their environment or other difficult-to-manage demands. This applies especially to children who are exposed to insecurity at home or bullying at school. Bullying can also happen to adults in a workplace, poor in empathy and poor in qualities supporting belonging in the workplace.

5.3. Finding Improvements (Q1)

Case 13: Testbed for an evaluation protocol – testbed of a 16-part constellation for 30 workplaces (Vinnova, 2022).

A group of property owners and tenant companies came together in 2018 with an innovative team of environmental experts; psychologists and architects in landscape and interior design or ecology all with documented knowledge in environmental psychology. The parties agreed upon a mutual partnership for a testbed of an evaluation protocol. Their aim is to fulfil social, ecological and economic goals simultaneously by improving workplaces that attract work staffs` togetherness and encourage owners to report performances related to workplace qualities in their annual reports, also due to sustainability reporting directives from EU.

The temporary organization of the 16 owners and tenant companies agreed on the use of the assessment protocol from start, over improvement measures and to complete with final evaluation assessments, ratings, and certificate as restorative workplace for the testbed objects (Now in process).

The evaluation protocol consists of 104 questions about qualities to value in the three zones: Indoor, Immediate outdoor (0-50m) and Neighbourhood (50-400m) for the 8 characteristics, classifying the values both existing for the day and for improvement measures in the future. The two outdoor zones offer different activities. There are big differences in use between the immediate outdoor zone and the neighbourhood zone. In a campus 400 m distance from the building there may be possibilities for a 30-minute running or a fast promenade if the neighbourhood is mostly accessible land and attractive green.

Exposure: Perceived values assessed and classified together in a local focus group of max 7 persons: owner, manager, staff, guided by architect -landscape and/or designer.

Outcome: Grades for each zone present qualities for the day and potential for the future, plus complete restorative workplace certificate with marks.

Initial exposure results from the assessment protocol till 2020 (Pandemic start).

Three zones were assessed separately in the work-tool: Interior, the immediate environment 0-50m and the neighbourhood 50-400m (Bengtsson, 2015). Figure 13 shows result from the starting evaluations.

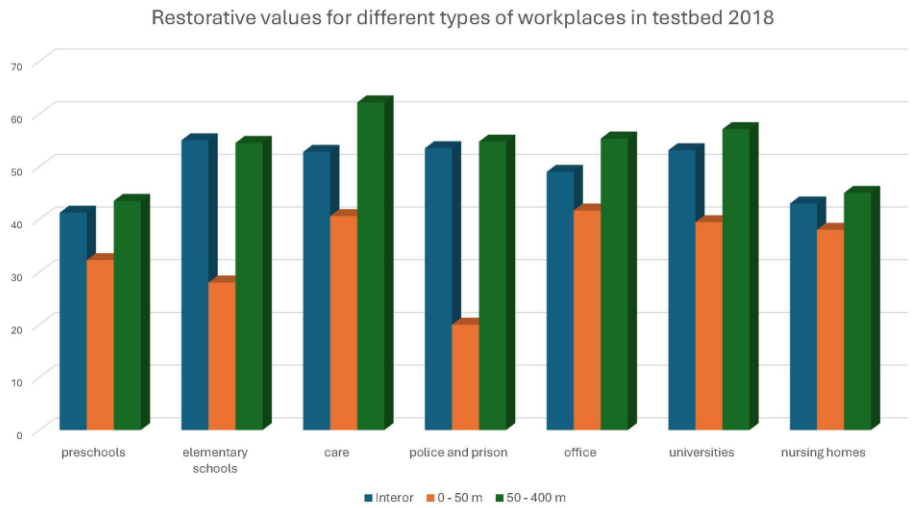

Figure 13. Differences in perceived values for seven types of workplaces 2018. From left preschools, elementary schools, care, police and prison, office, universities, nursing homes.

The results differ between the seven types of workplaces. Offices and universities showed all three zones together better physical work environment than schools, care, and nursing homes. The neighbourhood zones showed all 7 types better qualities than the immediate surroundings, 0-50 m, from the workplaces. Elementary schools showed at average having lower qualities than their neighbourhoods.

The diagram in Figure 13 is a summary of the 30 different properties starting the test bed assessment in stage 2, 2018-2019. It is a little material for general conclusions but raises questions if differences in quality scores also can indicate differences in productivity.

Findings from the initial assessment of the test bed (2018-2020).

- Local participation: The more evaluators participating the more qualities the team recognize. That is why most of the evaluation members ought to come from their own building and workplace.
- Green wash prevention: Evaluating with the local concerned stakeholders prevents also from AI-constructed greenwash elaborations.
- Lokal representatives are most motivated to realize in practice improvement measures suggested during the evaluation process, a kind of local democracy.
- Learning: By evaluating in a group discussion among themselves the participants also learn from each other how and why the environment supports their feelings. Unconscious knowledge reaches a higher consciousness.
- Idea creation: Participants together can better find ideas and agree upon measures to improve their environment. Some improvement measures may land on the property owners, and some land on the tenant company leader. And the staff themselves can also improve things to better their workplace.

5.4. Restart after the Pandemic

In 2021, the Corona pandemic occurred. This did inhibit innovation work however it also supported it. People were not allowed to meet in evaluation groups. On the other hand, they took long outdoor walks and experienced how walking in nature improved their well-being.

Now owners of properties and companies focus on attracting work staff back to office. The stakeholders and the workplace staff have now a greater interest in evaluating the qualities together to better find ideas and agree upon measures to improve their environment.

Seven objects in the testbed were complete certified until spring 25: Incubator & Science Park (Krinova); Properties with law enforcement agencies as tenants, and elementary school in Linköping (Vacse); Forum Medicum, Lund university (Akdemiska hus).

Two of these, one from Linköping one from Lund, are here presented to illustrate the assessment for improving measures, gradings and certification.

Case 14: Vallastaden school, Linköping, Vacse AB. Final evaluation & certification (Vallastaden Skola, 2024).

An evaluation team with representatives from the property owner, Vacse AB, the tenant school organization and an ecologist assisting the certifier. The management and teachers met for 2 hours, walked in and around the school, spoke to teachers and observed schoolchildren in their rest.

Exposure/outcome: After the walk, the team evaluated the questions for each of the eight characteristics and identified possible reachable improvements for the future – Figure 14.

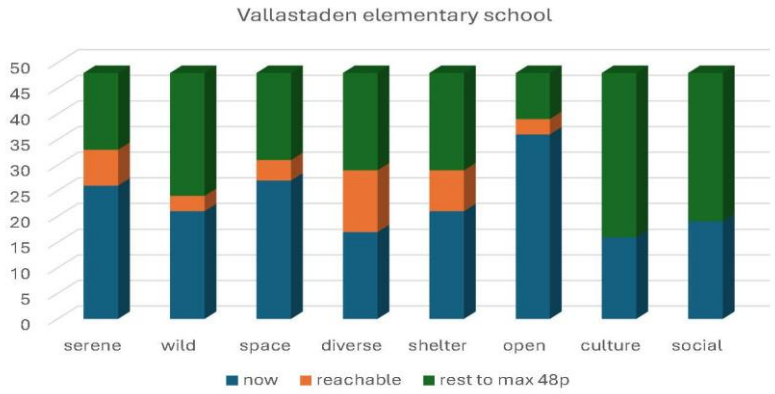

Figure 14. Vallastaden school summary of quality points for the day (Blue), within reach (Orange).

Grades: Next step was to summarize from protocol the ratings for the different zones the day of evaluation and potentially in a near future – Figure 15. To provide a relevant sense of perceived level of quality the grade designations refer to old Swedish school grades: VG is very good, G means approved.

Figure 15. Show the results summarized in the interior zone, immediate environment, and in the neighbourhood today in blue text. ratings reachable in the soon future for the three zones have red text.

Certificate: The certificate signals a reward, as a proud welcome on the workplace door – Figure 16.

Figure 16. The certificate aims to signal a reward, here with several tulips.

Case 15: Forum Medicum, Lund University, Akademiska hus AB. Final evaluation & certification. (Forum Medicum & Akademiska, 2025).

This is an example of a development project from start at the construction planning (Phase 2) to the final phase of completion. The evaluation group met together several times 2018-2019 following the evaluation protocol questions under supervision of Jerker Nyblom landscape architect of Akademiska hus one of Sweden´s largest property companies. Forum Medicum now fully built 2023 host 4000 students, researchers and teachers at the Faculty of Medicine. Architect is Henning Larsen.

The building is an important link between an old southwest part of the university dominated by human sciences and a newer northeast part dominated by technical development in all scales down to the smallest, e.g. Neutron Microscope ESS.

The interest in participating in the final certification of Forum Medicum was great, 14 University lecturers, researchers and students participated at the evaluation for indoor and 5 participants for outdoor. Figure 17 show both the rating and the final certificate with the scoors expressed similar as school grades.

The certificate scoors like school grades.

Figure 17. Ratings for the day and reachable later.

Case 16: Evaluation for improvements

Next step was to follow up how evaluation groups could propose improvement measures for their workplaces reachable to low cost. Evaluation proceeding for the two objects Vallastaden School, and Forum Medicum, Lund University is summarized in Figure 18.

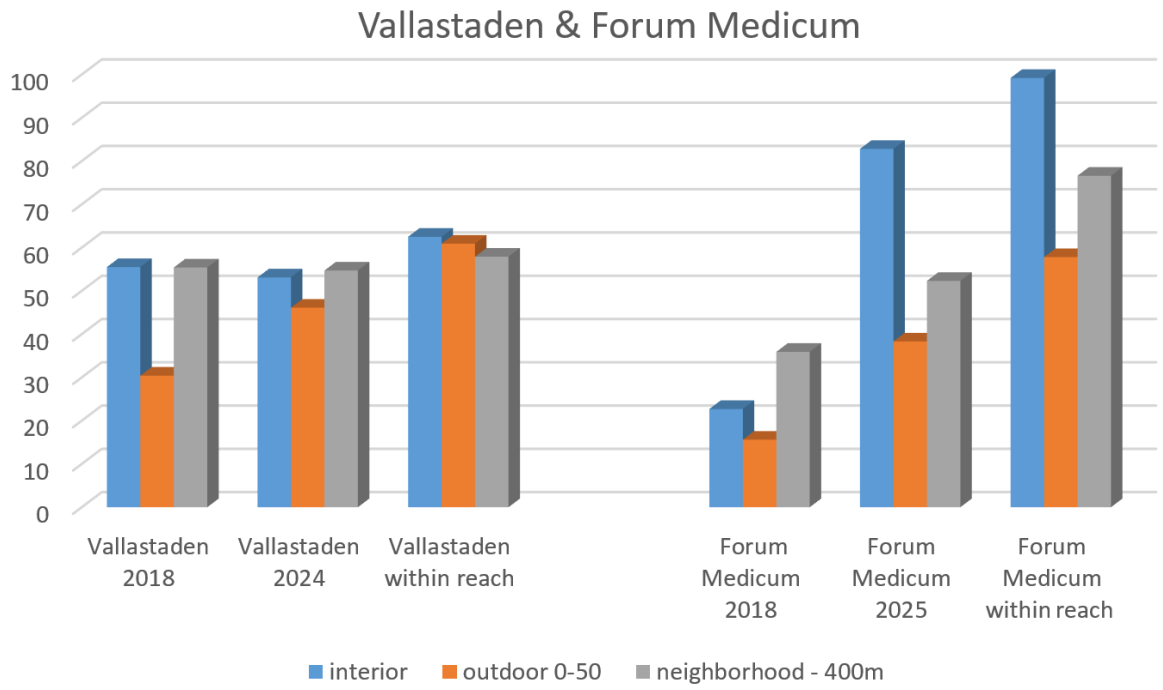

Figure 18. The development from 2018 – 2025 for the two objects Vallastaden School, Linköping and Forum Medicum, Lund University. Bars show % of max possible points.

Forum Medicum where still in an early planning phase 2018 that explain the low points evaluated from drawings. The grade results 2025, however, "very good" for the indoor and "extraordinary" (MVG+) for potential to reach may be explained by the large interests from all involved participating, motivated to discuss several further reachable improvements indoors.

At the outdoor environment evaluation, three weeks later, participated five researchers and students. Also, that day several further reachable improvements was listed. Some of which are already being implemented.

General Comments from evaluation groups in testbed so far.

- Workplace with both long-term tenants and temporary guests, as Incubator & Science Park Krinova, appreciated the mutual assessment discussion about different concrete needs for different purposes.
- Staff with very challenging and demanding jobs, such as high security police-houses with prisons, appreciate getting this attention and insight into their workplace.
- The focus group members (Many of them are quite busy staff) experience the protocol is concrete and relevant hands-on tool, which is also shown by the fact that the assessment rounds were normally completed within two hours.
- Owners found it useful for continued improvements in facility management.
- Staff also commented with appreciation that they learned a lot about how their emotions are affected in different places in the workplace.
- They also realized that it is the responsibility of the various stakeholders to improve the workplace environment.

Cases 17: Relocation assessments for several nursing ward departments at NSM, Region Skånes property dept. & Skåne University Hospital (Q2) (Lanbeck, 2008).

When an organization moves from one location or place, premises, the staff and management want to ensure that the new place and rooms fulfil the staff and patient's needs of mental support for production and recovery. The evaluation proceeds in two steps first to evaluate the workplace they leave, second to evaluate the new premises conditions. Currently this is an ongoing process for the hospital reconstruction in Malmö, NSM & SUS. Several architects experienced in the restorative workplace evaluation method participate e.g. assessment of nursing departments Neurology and stomach and intestine ward.

5.5. Supporting Common Goals (Q3)

5.5.1. Potential Improvements for EU Directives

One purpose of the work tool is to support companies to focus on workplace environmental qualities in their annual reports due to the EU Sustainability Reporting Directive, CSRD. The main task for this reporting is to demonstrate concrete opportunities to improve the environment.

Actions to improve urban nature for people's mental health and well-being can also improve several of the other global sustainability goals, particularly climate impacts and urban biodiversity. A key to this is involving workplaces stakeholders, staff and other users locally mutually to work towards their common goals. There is however a major discrepancy between the European policy for biodiversity and for the development of people's mental health in the EUs´ Directive. The EU Biodiversity Strategy for 2030 aims to transform the Union into a modern, resource-efficient and competitive economy with no net greenhouse gas emissions by 2050. It also aims to protect, preserve and enhance the Union's natural capital and protect public health and well-being from environmental risks and impacts. This is however only half-good, since EUs´ definition of health and wellbeing is limited to the protection against risks and negative impacts, not considering peoples´ daily need of nature stimulation for wellbeing and health.

Most people now live in cities. Mental illness is growing due to diminishing nature in people's surroundings. EU recommendations today will land most measures for biodiversity outside the cities, not in the cities. Therefore, EU must consider the need for nature in peoples´ neighbourhood. Therefore, economic growth must consider reusing poorly utilized industrial land and buildings with renovation and rebuilding at the same time as ensuring biotopes and species diversity. Cities must get new restorative biotopes that bind carbon dioxide, feed pollinators and provide security for citizens' health wellbeing and productivity. That is the win-win for all participants.

5.5.2. Potential Improvements for Sweden

Governments ought to lob to EU to supplement the CSRD sustainability directive to improve also the urban landscapes, for better health, climate, biodiversity and economy.

The CSRD recommendations must consider people's need for nature for the health and well-being of their neighbourhoods and for the contribution of cities to the climate.

Another issue is to support efforts to strengthen the nature potential to reduce mental illness and support well-being and productivity, a since too long overlooked topic, e.g. Sweden can reward schools with extra pupil allowance (Elevpeng) for successful improvements of their workplace and reward care with extra allowance (Vårdpeng) for their successful improvements of their workplace, all as a gratitude for well implemented Restorative Workplaces - "Carrots go further than sticks" - probably the same for public as private organizations.

A third issue for the government may be to suggest a mutual initiative from the Nordic countries to cooperate in a coming reconstruction of Ukrainian schools, hospitals and dwelling areas. Researchers and students from Alnarp have expanded to Denmark and Finland the use of eight PSDs in design and planning, Ulrika Stigsdotter as professor in Copenhagen University developing rehabilitation in forest environments (Octavia), and Sara Malve-Ahlroth using 8 PSDs in a school project for Hemsö in Helsinki, and as a researcher in Finnish Institute of occupational Health for the use of 8 PSDs in safety and health at work.

5.5.3. Potential Improvements for the 17 Global Sustainable Goals

Improvements of the Eight characteristics, PSD, do benefit many of the 17 sustainable global goals, primarily the 3) good health and well-being; 8) decent work and economic growth; 11) sustainable cities and communities; 13) climate action (primarily urban); 15) life on land; 16) Peace justice and strong institutions, by training in local democracy; 17) Partnerships for the goals, by cooperation among rich countries to support developing countries efforts for growth.

6. DISCUSSION AND CONCLUSIONS

Incentives for most people to engage in workplace improvements are that better wellbeing leads to better creativity, production and profitability for all involved. Additional incentives for property owners are to reduce vacancies and raise property values. Incentive for tenant companies is to attract young newly educated demanding people joining their workplace too. Incentives for staff are their concern about their own and colleagues´ health at workplace.

As with all the above cases, the findings and knowledge about perception of characteristics increase from study to study, from case to case. The context for the studies varies, but between different ages and sex there are no big differences in perception. Serene seems to be the most preferred characteristic independent from context.

Less perception of characteristics among some young people may be explained by their sometimes very high stress in school and university.

One conclusion from the cases is that even though people's preferences for environmental qualities differ, people's social needs and desires to experience feelings are general, e.g. feeling of safety, security, belonging, inspiration, creativity, rest, and protection.

Although perceptions of what concrete qualities produce these feelings vary, the eight characteristics become applicable and relevant to all environments when judged by the people themselves locally living in the environment.

Consequently, we need to improve the natural facilities overall in our urban environments where people live, also around residential areas. However, how? That is a crucial question. Urban Land is very valuable both for developers to invest and explore, and for inhabitants´ to restore and recreate. A both empathic and economic incentive to engage in this issue is that better wellbeing leads to better creativity, production and profitability.

An issue today in the property market is whether AI will reduce the roll for architects? On the contrary, say the big construction companies. Although AI is streamlining how to meet government requirements the producers need the help for the big questions of why to build and how we want to live, the big challenges around climate, and interpersonal issues such as increased ill health and loneliness (Tema-AI, 2025).

Important benefits are when people discuss the evaluation issues together, they learn more about how certain characteristics support certain needs. That is, they may better understand their emotions related to environments, to better operate.

Raising unconscious knowledge to a higher awareness, by discussing perception together locally, can prevent mental illness. That is especially important for young people who live under stress. Evan schoolchildren's stress increases now.

The work environment for our growing generation must be welcoming and trusting. Children have an inherited desire for learning, belonging and justice. If adult generation meets children with trust and the children get frequent occasions to play and sport, they also manage their learning best, as often proven in research (Ericsson, Grahn, & Skärbäck, 2009).

The conclusion of the long research studies and the practical tries to implement the knowledge to improve workplace environments indicates that and how sustainability criteria for health, well-being and production must focus on both the immediate environments of the workplaces and its neighbourhood. It applies both to protect and provide existing qualities of nature and to create new qualities.

Working life today is intense and stressful. Since evolution has given us stress hormones to quickly escape or fight, and the stress reduction is just as fast when the hunt or danger is over, we can cope with the changes if the work environment has peaceful natural impressions indoors as well as outdoors. That means quiet room for both calm and inspiration, concentration and rest, fascination and feeling of sense of belonging together. That is necessary for all workers, not least schoolchildren to learn. Also, developers of housing now understand that residential are not only for sleeping but also for working.

Sustainability goals for health and well-being must focus much more on city planning on the immediate outdoor (0-50 m), and for the need of short walks, 15-20 minutes, which claims for an accessible neighbourhood with green characters within 50-400 m attracting to walk or run for improving life expectancy and quality. Greening of numerous neighbourhood areas will also improve the carbon dioxide bindings to the fortune for city-climate.

The municipalities have a responsibility towards the companies to cooperate with them on the planning for restorative workplace. That is a challenge, because all urban land is also valuable for construction. However, today the incentives for companies and for the city are stronger, than before the pandemic, to collaborate for more greening.

Not all companies are in cities. Some border farmland. There, "Wilding" can be a success. Wilding is a new movement among landowners to favour the return of a richer flora and fauna with high biodiversity. It supports people's psychological needs, binds carbon in the soil and strengthens soil quality.

A key for successful improvements is to involve all stakeholders, the company staff and customers together with the municipality and other neighbours. They have all their own interests to participate for own sustainability. Nearby nature qualities increase social ecological and economic sustainability.

It strengthens bottom-up democracy, peace, justice and local institutions. In a changing world order when autocracy presses from the top ethic, empathy and democracy among the people is a necessary counterforce from the bottom up.

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