



Designing pandemic resilient spaces

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What is pandemic resilient buildings?

- Buildings with the capacity to withstand and adapt to the challenges posed by pandemics.
- Equipped with necessary infrastructure e.g.:
 - Advanced ventilation- and building management systems.
 - Touchless technologies.
 - Flexibility to convert spaces.
- Enabling health safe interactions.

Reality

- Design and execution:
 - Legislation: Sufficient indoor air quality, e.g. 800-1200 PPM_{CO₂} or 6-10 l/s.person.
 - Designer: Analytically dimensioning (often) mixing ventilation system according to legislation and guidelines.
 - Contractor: Building according to drawings and design.
 - Result: A building with $\pm 10\%$ deviation.

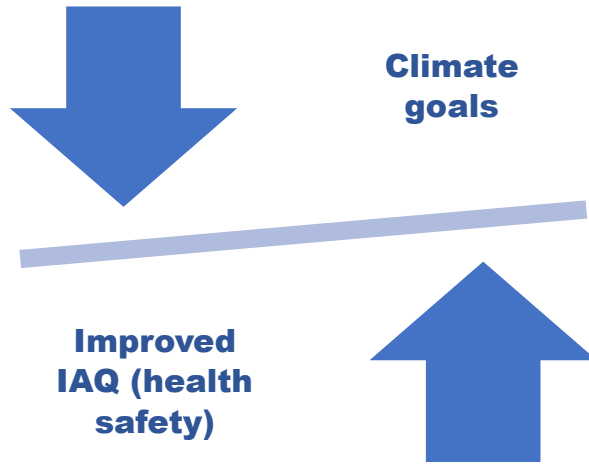
Outbreak of pathogen, e.g. SARS-CoV-2

- First reactions: More outdoor air, more isolation of people i.e. work from home.
- REHVA and ASHRAE: More air changes and more outdoor air. Air cleaners with high CADR. Sufficient filtration etc.
- Research: More air changes and cleaner air. Ensure the air turbulence within the room. Sufficient filtration etc.

Parameters to enhance pandemic resilience

- Space/building design
 - Possibility for sufficient distance between occupants.
 - Encourage outdoor occupation for e.g. lunch break, meetings etc.
 - Biophilic interior design.
 - Logistic of people flow.
- Ventilation design
 - Make a risk assessments.
 - Concept solutions for each room type.
 - Strategy framework for monitoring optimization.
 - Air distribution and optimization.
 - Filtration need.
- Pandemic strategy, for extraordinary situations
 - Possibility to increase air turbulence and air cleaning through air cleaners.
 - Flexibility for change in layout/occupant density in case of violent pathogen outbreak.
 - BMS systems to be a part of monitoring situation.
- Governance and personnel
 - Health and safety representative to be a part of implementation and maintenance.

- More outdoor air means higher energy usage and appears to be in direct conflict with climate goals.



- To reach balance we must, among other things:
 - Prioritize the near surroundings of people i.e., micro-environment.
 - Combine health-safety, energy efficiency and economy based on a life cycle cost point-of-view from early stage.
 - Minimize the environmental impact from a life cycle viewpoint. i.e., LCA.
 - Take steps forward towards more sustainable and energy efficient systems.

Possibility to level up!

Synergies or conflicts?

ESG x IAQ

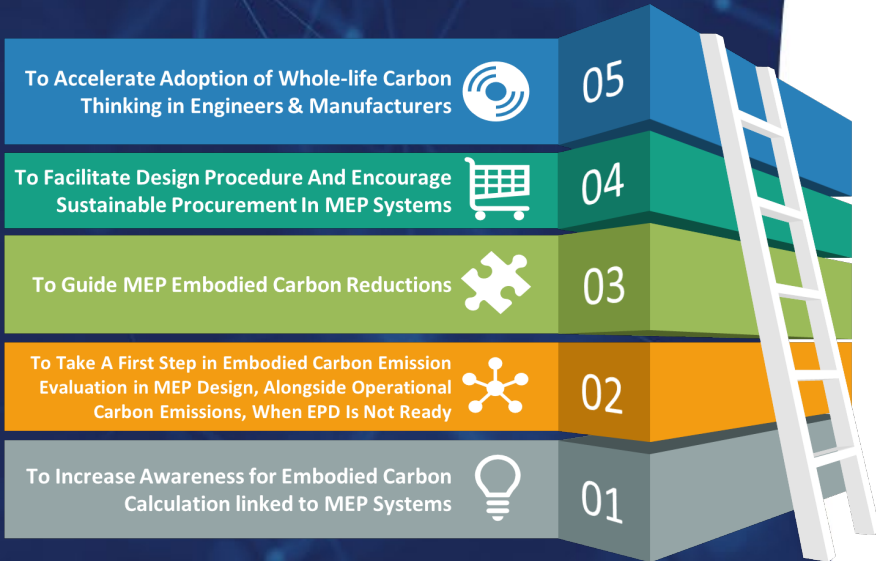
How is indoor air quality (IAQ) linked to ESG?

- From an Environmental standpoint, poor IAQ can contribute to greenhouse gas emissions and energy inefficiency due to the fact, that more energy is required to maintain indoor thermal comfort and sufficient ventilation rate.
- From Social perspective, poor IAQ can have a significant impact on the health and well-being of building occupants. Exposure to pollutants, pathogens etc. can cause a range of health problems and can lead to absenteeism and decreased productivity.
- From a Governance perspective, building owners and managers have a responsibility to provide a safe and healthy indoor environment for occupants. This includes ensuring that IAQ meets (or exceeds) established standards and guidelines.
- Summary:
 - IAQ is an important component of ESG considerations. Companies that prioritize IAQ are more likely to have a positive impact on society and the environment and attract socially responsible investors and other stakeholders.

LCA x IAQ

The main contributions of Life Cycle Assessment (LCA) on pandemic resilient IAQ (i.e. ventilation design) are as follows:

1. Environmental Impact Assessment
2. Comparison of Design Options
3. Identifying Opportunities for Improvement
4. Supporting Decision-Making
5. Promoting Sustainable Practices:



Business benefits

- Correlation between IAQ and cognitive function
- Pin-pointed investments in health-safety (ie. good IAQ) can lead to productivity improvements and result in 10% gain in profits.
- Studies made by MIT suggests that healthy buildings rent at 4-7% more per square foot.



Key takeaways

- Traditional design – very analytical.
An ever changing reality needs dynamic solutions.
- Lack of knowledge in all segments.
Demand solutions that meets your targets, wether it's from business or ESG point-of-view.
- Make risk assesments and take appropriate actions in design and on site.
Follow up on every step and control functionality in aftermarket.
- Research is crystal clear – we have to take health-safety in general and airborne disease transmission in particular, seriously, when designing buildings and building service systems.
- There's business opportunities to be found for property developers and for companies investing in healthy buildings and people.
- Ensure the know-how in all disciplines.
- Legislation changes.
At the end of the day, few actors in the industry goes "the extra mile" without a certain reason.



THANK YOU!



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