

COOL AND CLEAN BUILDINGS

FLAGSHIP CLIMATE ACTION PROGRAM

90%

OCCUPANTS STAY
90% OF THEIR TIME
INDOORS AND
55% TO 65% AT HOME

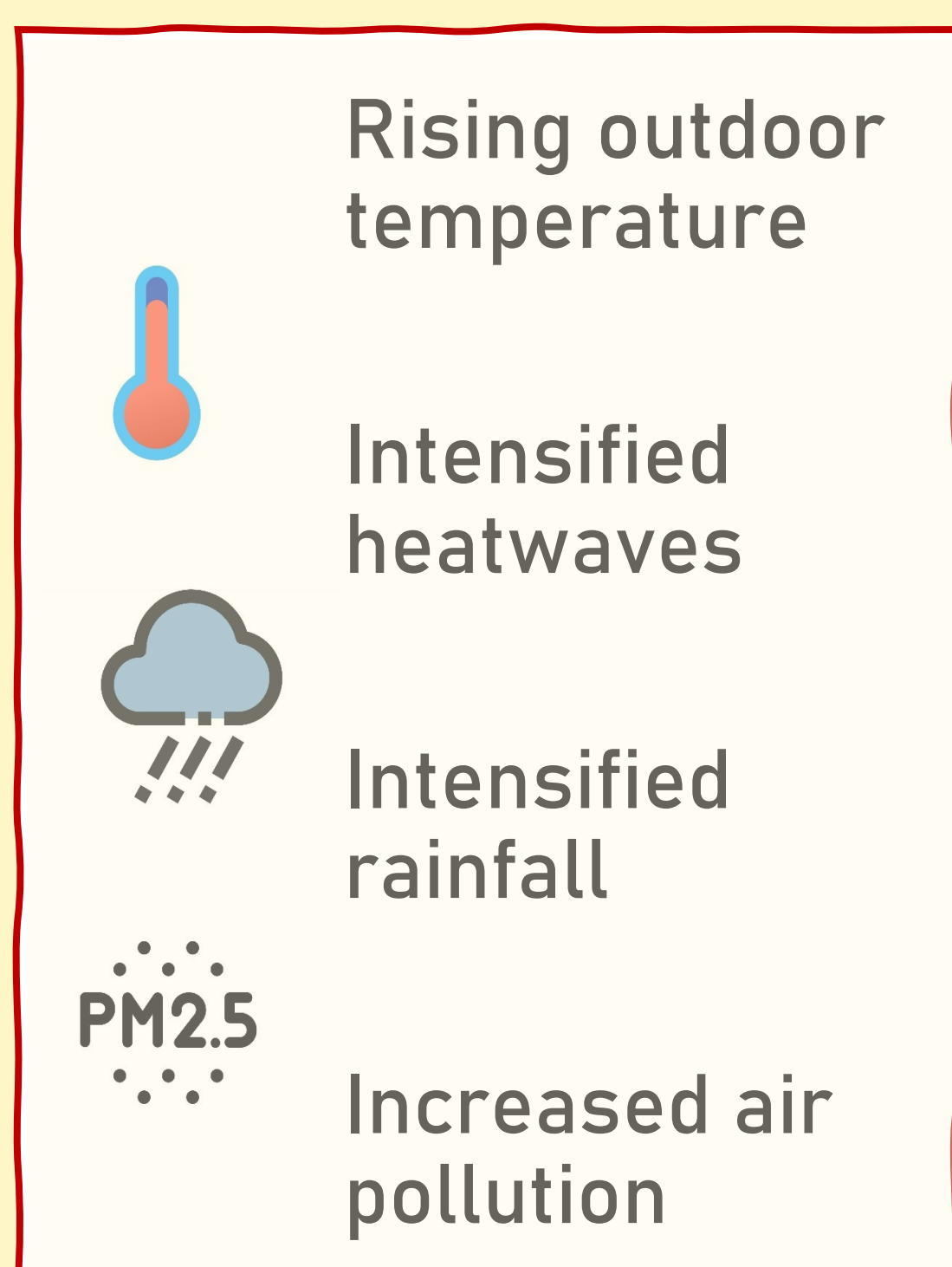


Problem: It is expected that occupants will be exposed to even higher outdoor temperatures, more intensive heatwaves, and increasing heavy rainfalls because of climate change (IPCC, 2023). Increasing outdoor air pollution, due to changes in temperature, drought, wind patterns, and wildfires, is also predicted. These changing outdoor conditions increase the risk of overheating and accumulation of air pollution in homes. Previous studies showed that increased indoor temperatures and air pollution affect occupants' health, resulting in cardiovascular diseases, respiratory, eyes and skin complaints and mortality. Moreover, measures to reduce energy consumption in homes, in order to lower greenhouse gas emissions, can affect the occupants' health negatively.

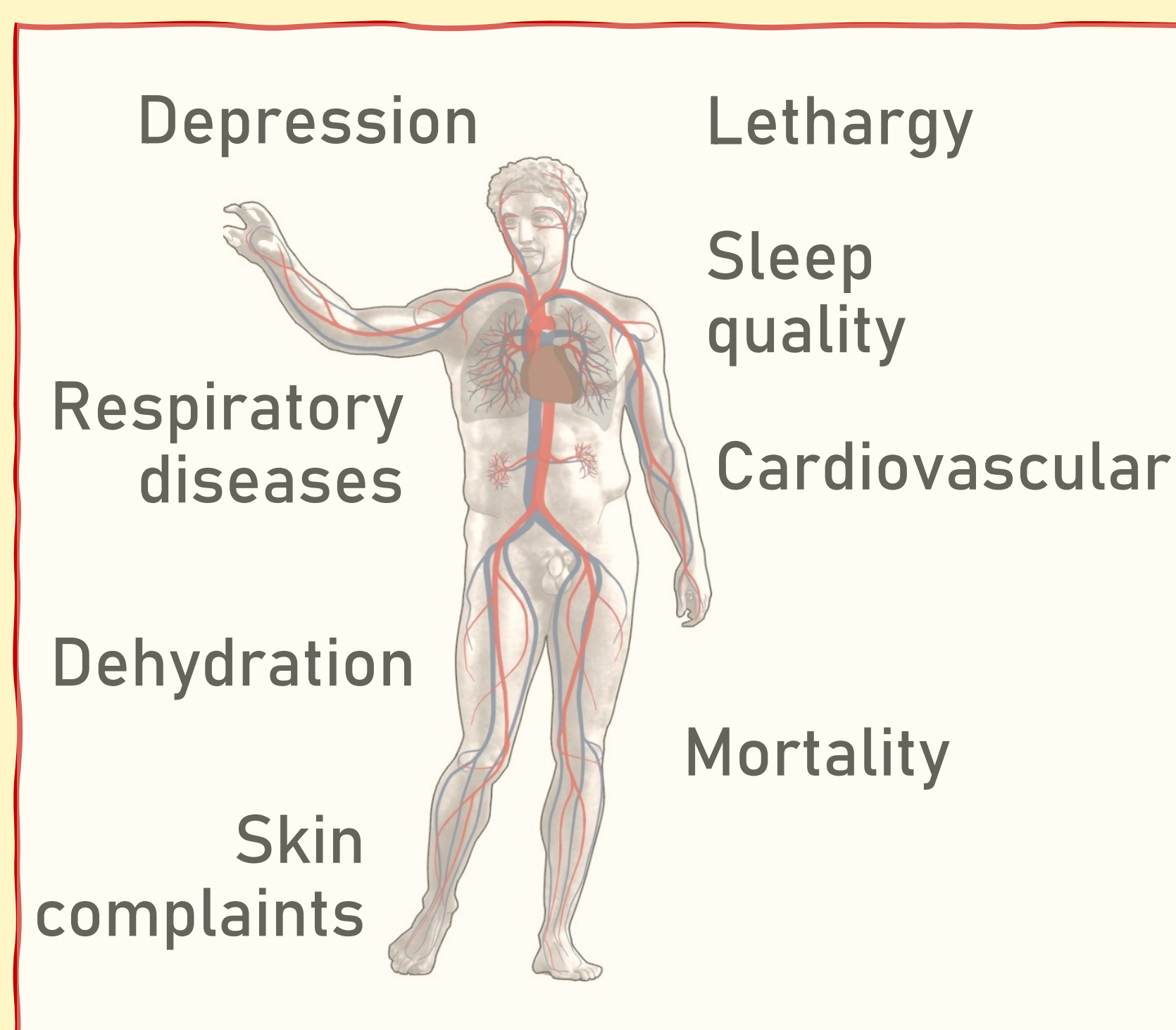
Approach: Uncertainties about the extent of increasing temperatures and air pollution raise the question of how buildings can be designed that accommodate for unpredictability of conditions. Therefore, design strategies for renovations and new buildings are required that effectively enable adaptation to changing conditions on the long term, supporting occupants' health and comfort in future. Furthermore, the increasing occurrence of heatwaves or other extreme events necessitate understanding of the performance of building characteristics that allow for temporary adaptability in relation to health and comfort during these events. Examples of temporary adaptability are behavioural actions, such as adjusting the conditions (control of solar shading, ventilation with openable windows during the night) or retreating to comfortable and healthy places (spatial freedom). Relations between adaptable building characteristics and health can depend on the intensity and the length of exposure to environmental stressors. New adaptive behaviour may evolve from new experiences and knowledge of occupants as well as from new technologies that limit energy use, provide renewable energy, or increase building related health.

Because of behavioural changes and uncertainties in predictions, understanding is needed of how buildings, in conjunction with new technologies, are adaptable to temporary changing conditions as well as changing conditions on the long term..

CHANGING OUTDOOR CONDITIONS



HEALTH RELATED TO OVERHEATING AND INDOOR AIR POLLUTION



ACTION

Study of required adaptability of buildings including integration of new technologies and variant needs of occupants due to changing outdoor conditions



WHAT ARE THE RESEARCH QUESTIONS?

- Which combinations of building characteristics enable long term and temporary adaptation to support comfort and health in relation to outdoor heat and outdoor/indoor air pollution?
- How is health associated with occupants' adaptation strategies to cope with indoor heat and air pollution?
- Which new technologies contribute to energy neutral/positive buildings AND protect occupants against indoor air pollution and heat?