

PRP

Designing for Health & Wellbeing

Facts, Science & Impacts

Kartikeya Rajput



HEALTH

What does it mean?

“HEALTH IS A STATE OF COMPLETE PHYSICAL, MENTAL AND SOCIAL WELLBEING, AND NOT MERELY THE ABSENCE OF DISEASE.”

- The World Health Organization (WHO)

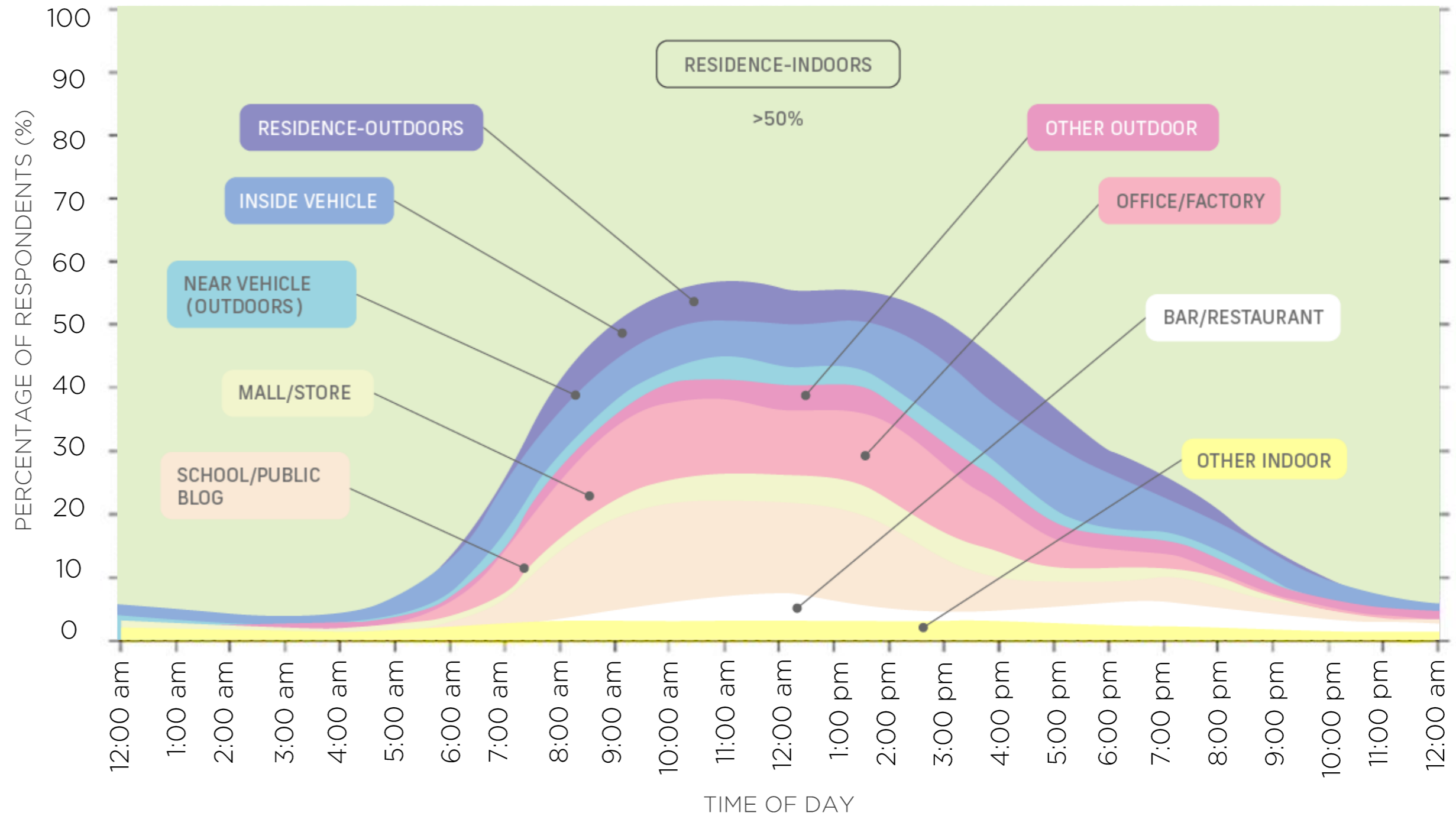


HEALTHY ENVIRONMENTS

Can health be linked to where we live?

WE'RE SPENDING MORE TIME INDOORS...

We spend 90% of our time indoors and >50% in homes



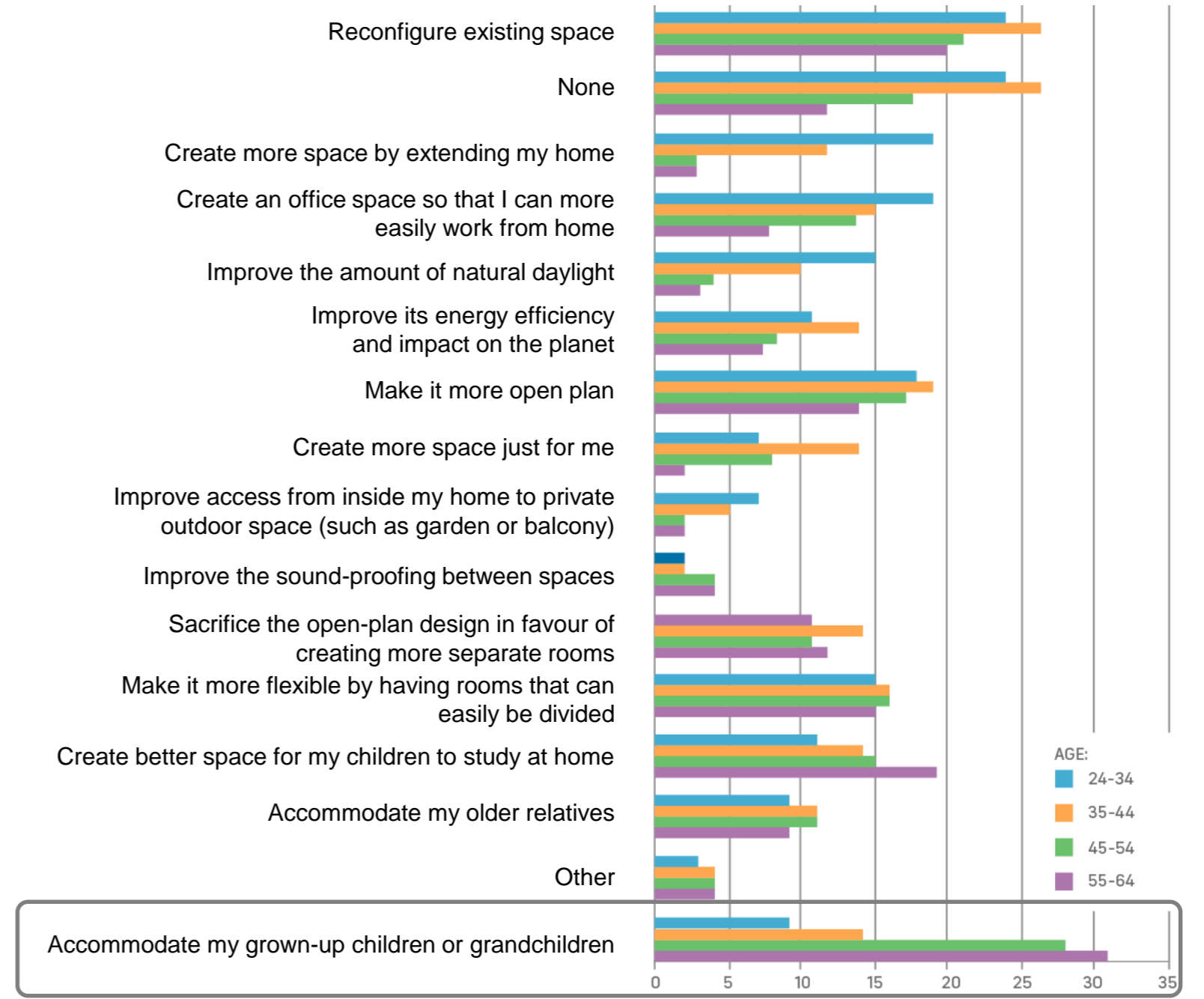
LIVING INDOORS

Can our homes be an agent of health?

SURVEYS SUGGEST THAT BETTER DESIGN OF HOMES COULD;



WHAT SPECIFIC THINGS WOULD YOU CHANGE IN THE DESIGN OF YOUR HOME?



SOCIAL WELLBEING

HEALTHY BUILDINGS HUMAN-CENTRED APPROACH

Architects as a wellbeing designer

COMMUNITY
PARTICIPATION



Wembley Park, E05

OUTDOOR FEATURE
MULTI-PURPOSE
FLEXIBLE



Wembley Park, E05

INTERESTING FEATURES
NATURAL ELEMENTS
MATERIALS



Wembley Park, E03, Canada Gardens

GARDENS
WILDLIFE
FOOD



Wembley Park, E05

SUNLIGHT
ACOUSTIC
MAINTENANCE



Wembley Park, E05

ACCESSIBLE
WALKABLE



Wembley Park, E05

A HOLISTIC APPROACH

Elements of well-being

ENVIRONMENT



AIR



LIGHT



SOUND



THERMAL
COMFORT



MATERIALS

PERSONAL



WATER



NOURISHMENT



MOVEMENT



MIND



COMMUNITY

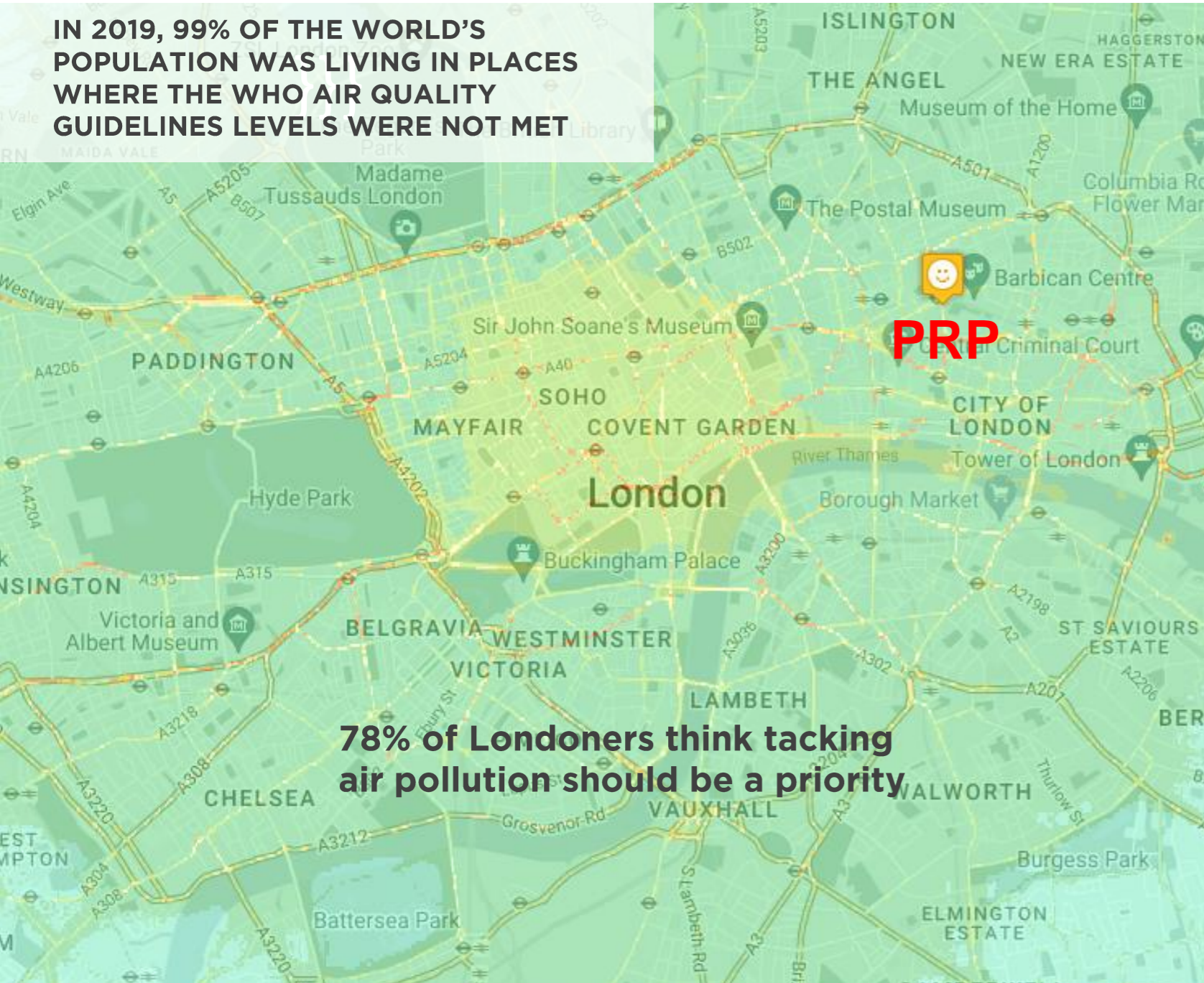
FACTS - SCIENCE - IMPACTS

AIR

Inside & Outside



IN 2019, 99% OF THE WORLD'S POPULATION WAS LIVING IN PLACES WHERE THE WHO AIR QUALITY GUIDELINES LEVELS WERE NOT MET



78% of Londoners think tackling air pollution should be a priority

CONCENTRATIONS OF SOME POLLUTION INDICATORS CAN BE 2-5 TIMES HIGHER INDOORS COMPARED TO OUTDOORS



“Air pollution is the biggest environmental risk to health, carrying responsibility for about one in every nine deaths annually.”



PM 2.5 ($\mu\text{g}/\text{m}^3$) londonair.org.uk <https://www.londoncouncils.gov.uk/>

The World Health Organization (WHO)

AIR QUALITY

'Pollutants' – Not pollutant



POLLUTANTS

1. Particulate Matter (PM2.5)
2. Particulate Matter (PM10)
3. Nitrogen dioxide (NO₂)
4. Ozone (O₃)
5. Sulfur dioxide (SO₂)
6. Carbon monoxide (CO)
7. Volatile Organic Compounds (VOCs)

HEALTH IMPACTS

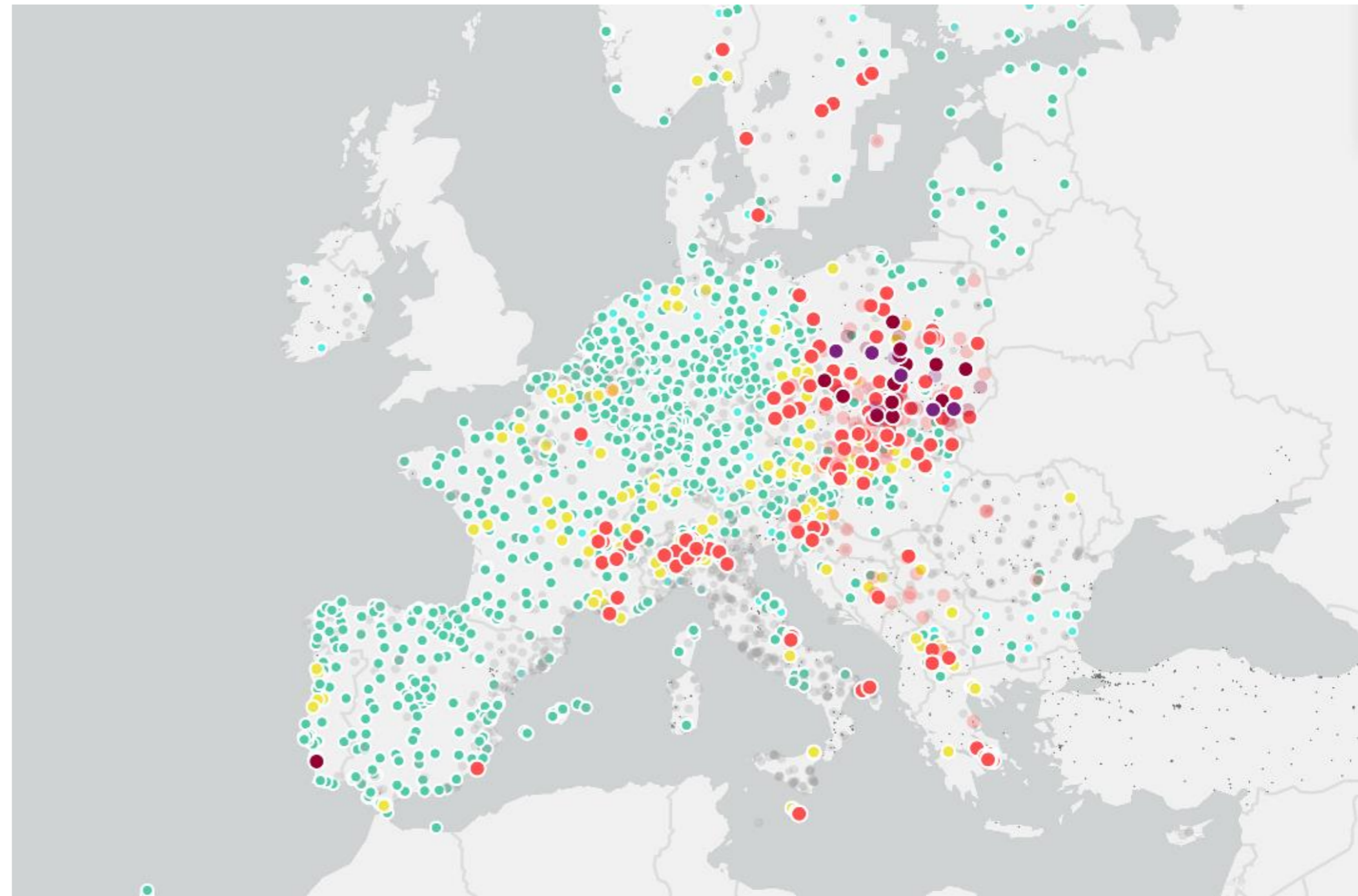
- Asthma
- Heart & Lung diseases
- Reduced lung function
- Damage to the liver, kidney
- Impacts central nervous system

URBAN AIR QUALITY (EAQI)

01.03.23 (6 pm)

	Good	Fair	Moderate	Poor	Very Poor	Extremely Poor
1.	0-10	10-20	20-25	25-50	50-75	75-800
2.	0-20	20-35	35-50	50-100	100-150	150-1200
3.	0-40	40-100	100-200	200-400	230-340	340-1000
4.	0-80	80-120	120-180	180-240	240-380	380-800
5.	0-100	100-200	200-350	350-500	500-750	750-1250

based on pollutant concentration in $\mu\text{g}/\text{m}^3$



AIR QUALITY

How can we improve air quality in homes?



STRATEGIES



GOOD VENTILATION



FILTRATION MICROBE FREE



CHEMICAL FREE PRODUCTS



SMOKING-FREE

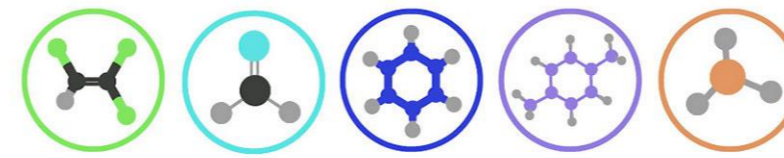


MAINTENANCE AND OPERATIONS



PREVENT CONDENSATION MOULD CONTROL

PLANTS ARE FRIENDS



TRICHLOROETHYLENE FORMALDEHYDE BENZENE XYLENE AMMONIA

Found in printing inks, paints, lacquers, varnishes, adhesives and paint remover/stripper.

Found in paper bags, waxed papers, facial tissues, paper towels, table napkins, particle board, plywood panelling, and synthetic fabrics.

Used to make plastics, resins, synthetic fibres, rubber lubricants, dyes, detergents, drugs and pesticides. Can also be found in tobacco smoke, vehicle exhausts, glue, paint and furniture wax.

Found in printing, rubber, leather and paint industries, tobacco smoke and vehicle exhausts.

Found in window cleaners, floor waxes, smelling salts and fertilizers.

 DWARF DATE PALM <i>Phoenix robelinii</i>	 BOSTON FERN <i>Nephrolepis exaltata</i>	 KIMBERLEY QUEEN FERN <i>Nephrolepis obliterata</i>	 SPIDER PLANT <i>Chlorophytum comosum</i>	 CHINESE EVERGREEN <i>Aglaonema modestum</i>
 BAMBOO PALM <i>Chamaedorea seifrizii</i>	 WEEPING FIG <i>Ficus benjamina</i>	 DEVIL'S IVY <i>Epipremnum aureum</i>	 FLAMINGO LILY <i>Anthurium andraeanum</i>	 LILYTURF <i>Liriope spicata</i>
 BROADLEAF LADY PALM <i>Rhapis excelsa</i>	 BARBERTON DAISY <i>Gerbera jamesonii</i>	 CORNSTALK DRACAENA <i>Dracaena fragrans 'Massangeana'</i>	 ENGLISH IVY <i>Hedera helix</i>	 VARIGATED SNAKE PLANT <i>Sansevieria trifasciata 'Laurentii'</i>

LIGHT

Circadian rhythms



DEEPEST SLEEP



LOWEST BODY TEMPERATURE



SHARPEST BLOOD PRESSURE RISE



BOWEL MOVEMENTS



HIGHEST ALERTNESS



BEST COORDINATION



FASTEST REACTION TIME



BEST MUSCLE STRENGTH/
CARDIOVASCULAR EFFICIENCY



HIGHEST BLOOD PRESSURE



HIGHEST BODY TEMPERATURE



BOWEL MOVEMENTS SUPPRESSED



MELATONIN SECRETION STOPS



HIGHEST TESTOSTERONE SECRETION



MELATONIN SECRETION STARTS

Circadian rhythms are physical, mental, and behavioural changes that follow a 24-hour cycle. Most of the vital functions of the human being obey this rhythm. The main factors that affect this cycle are light and dark.

LIGHT

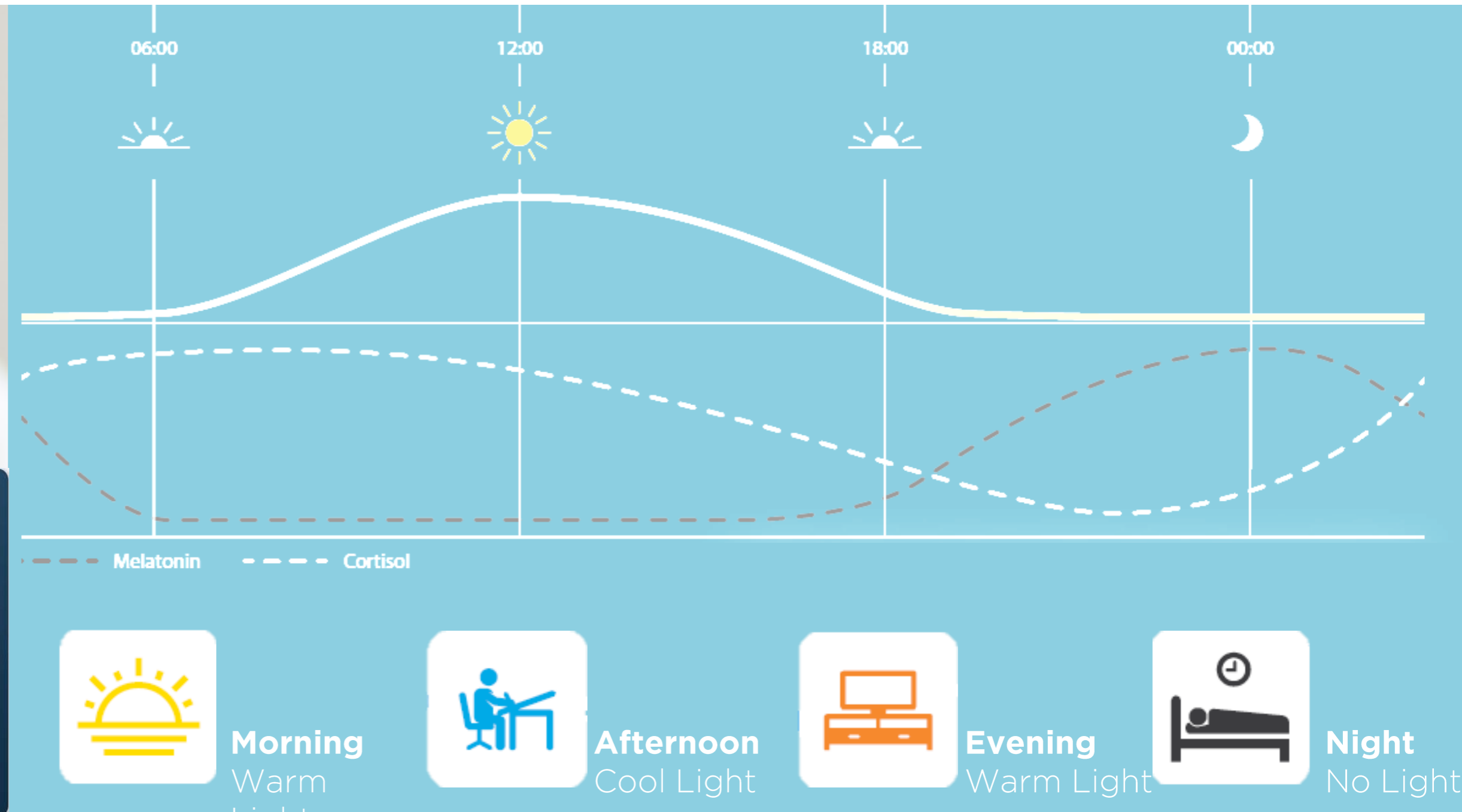
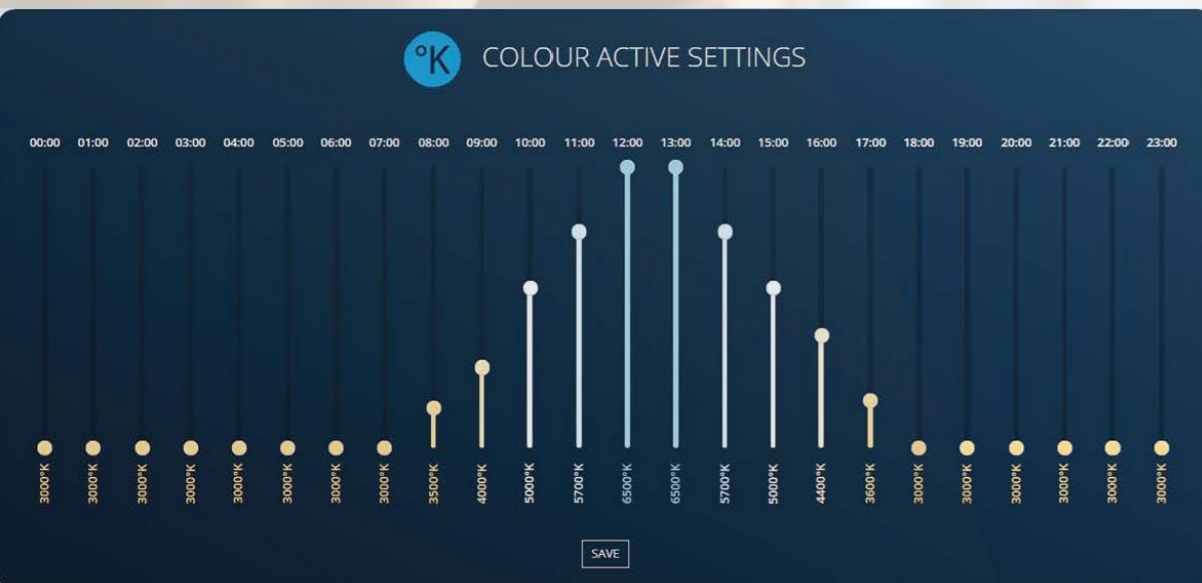
Impact of light on wellbeing



Disruption of the body's circadian rhythm is associated with diseases like:

- Obesity
- Diabetes
- Depression

The biological effects of light on humans can be measured in Equivalent Melanopic Lux (EML), instead of the traditional lux.



LIGHT

Designing spaces for day & night



Wembley Park, E03, Canada Gardens



Bollo Lane, Barnet

LIGHTING DESIGN

What type and where?



<https://www.alconlighting.com/blog/lighting-news/color-tunable-lighting/>

Colour temperature - Kelvin (K)

Range : 1000 - 10000

2700K

WARM
WHITE

friendly
personal
intimate

HOMES
LIBRARIES
RESTAURANTS

3000K

SOFT WHITE
GLOW

soft
warm
pleasing

HOMES
HOTEL ROOMS
LOBBIES
RETAIL STORES

3500K

NEUTRAL
GLOW

sociable
inviting
non-threatening

EXECUTIVE OFFICES
RECEPTION AREAS
SUPERMARKETS

4000K

DAYLIGHT
GLOW

neat
clean
efficient

OFFICES
CLASSROOMS
MASS MERCHANDISERS
SHOWROOMS

5000K

CRYSTAL WHITE
GLOW

bright
cool
alert

GRAPHICS INDUSTRY
HOSPITALS
GALLERIES
BEAUTY SALONS

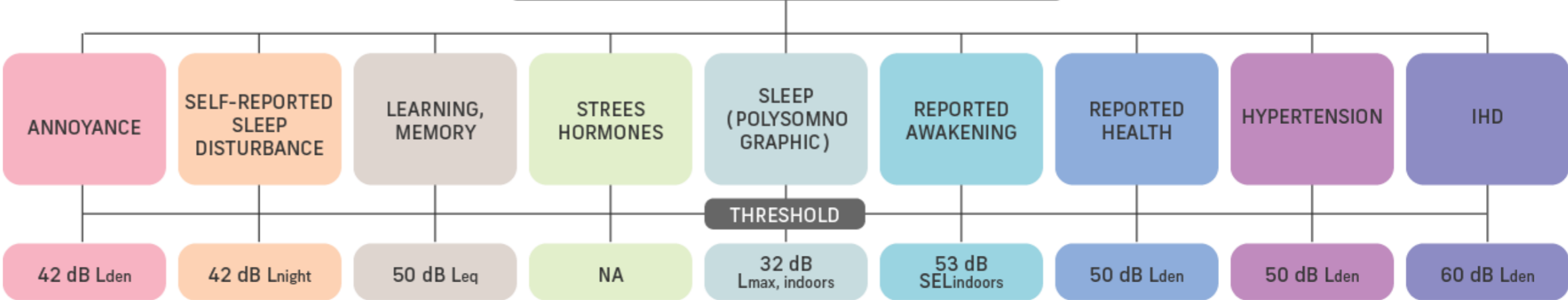
SOUND



“NOISE IS THE SECOND LEADING CAUSE OF ILL HEALTH AFTER AIR POLLUTION.”



EFFECT OF NOISE ON HEALTH AND WELL-BEING



1 IN 5 FEEL DISTURBED BY TRAFFIC NOISE (GLOBALLY)



1 IN 3 FEEL DISTURBED BY DAYTIME NOISE (GLOBALLY)

THERMAL COMFORT

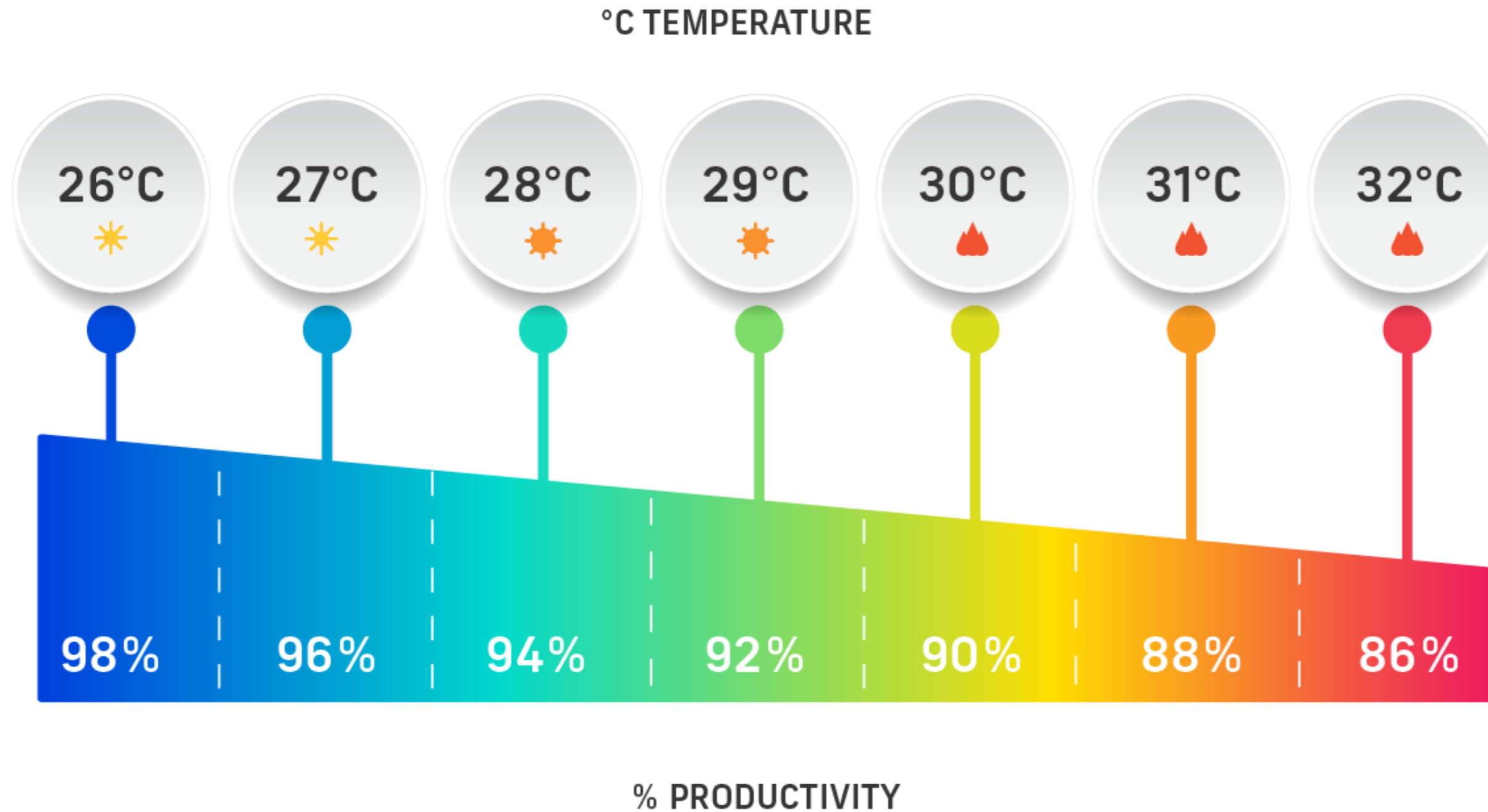
Environmental and personal factors



Pilgrim Gardens, Evington

THERMAL COMFORT AND PRODUCTIVITY

An increase in temperature after 25°C indicates lower productivity



Productivity declines by 2% for each degree above 25°C
and by 4.7% for each degree below 21°C

MATERIALS



“95% OF CHEMICALS USED IN CONSTRUCTION LACK SUFFICIENT DATA ON HEALTH IMPACTS.”

COMMON SOURCES OF TOXINS IN BUILDING MATERIALS:

Insulation Materials
Paints
Coatings
Adhesives
Furniture & Fabrics
Composite Wood Products
Flooring Materials
Combustion Sources
Cleaning Products

Asbestos, VOCs
Lead, VOCs
VOCs, Phthalates
VOCs
HFRs, VOCs
Chromate Copper
Arsenate, VOCs
VOCs
Lead, Particulates
Phthalates

HEALTHY MATERIALS

USE NATURAL, BIO-BASED MATERIALS SUCH AS MYCELIUM OR CLAY, OR RECYCLED MATERIALS. THE KEY IS TO BE NON-TOXIC AND CHEMICAL-FREE.



MATERIALS



IMPERIAL PAINTS, LLC

ECOS MATTE PAINT

ECOS Interior matte wall paint is a self-priming, no sheen, protective finish that dries to a hard, durable film. Ideal for walls and ceilings, its low light reflectance lets it mask some flaws or imperfections on many substrates. Not recommended for high moisture areas like kitchens or bathrooms, where ECOS eggshell wall paint is preferred.

DECLARE ID IPA-0004

LICENSE EXPIRATION 01 JAN 2024

LIVING BUILDING CHALLENGE COMPLIANCE: COMPLIANT

I-13 RED LIST (DECLARATION STATUS): LBC RED LIST FREE

I-14 RESPONSIBLE SOURCING: NOT APPLICABLE

I-10 HEALTHY INTERIOR PERFORMANCE: CDPH STANDARD METHOD V1.1-2010

LIVING PRODUCT CHALLENGE (LPC) CERTIFIED NO

VOC CONTENT IN g/L 0 G/L

FINAL ASSEMBLY LOCATION

SPARTANBURG, SOUTH CAROLINA, USA

LIFE EXPECTANCY 10 YEAR(S)

END OF LIFE OPTIONS SALVAGEABLE/REUSABLE IN ITS ENTIRETY

INGREDIENT LIST

COMPONENT	INGREDIENT NAME	CAS#	%
Binder	Methyl Methacrylate Polymer	9011-14-7	22.24%
	Oleic Acid, Sulfonated, Potassium Salt	67968-63-2	6.8%
	Polyoxyethanediyl	109909-39-9	2.16%
Vehicle	Water	7732-18-5	23.9%
Extender Pigment	titanium dioxide	1317-70-0	21.3%
Thickener	Limestone; Calcium Carbonate	1317-65-3	8.56%
Extender	Kaolin Clay (Calcined)	66402-68-4	4.28%
Rheology Modifier	Silicone	69011-36-5	0.86%
Dispersant	Ammonium Polyacrylate	9003-03-6	0.27%
Surfactant	Ethoxylated-2,4,7,9-tetramethyl-5-decyne-4,7-diol (Surtynol 440)	9014-85-1	0.2%
Defoamer	Paraffin Oil	8012-95-1	0.08%
	Polyoxyethylene Stearyl Ether	9005-00-9	0.08%
Preservative	1-Hydroxy-2(1H)-Pyridinethione, Sodium Salt	15922-78-8	0.09%
pH Stabilizer	Ammonium Hydroxide	1336-21-6	0.04%

Declare.

ECOS Matte Paint
Imperial Paints, LLC

Final Assembly: Spartanburg, South Carolina, USA
Life Expectancy: 10 Year(s)
End of Life Options: Salvageable/Reusable in its Entirety

Ingredients:

Binder: Methyl Methacrylate Polymer, Oleic Acid, Sulfonated, Potassium Salt, Polyoxyethanediyl, **Vehicle:** Water, **Extender Pigment:** titanium dioxide, **Thickener:** Limestone; Calcium Carbonate, **Extender:** Kaolin Clay (Calcined), **Rheology Modifier:** Silicone, **Dispersant:** Ammonium Polyacrylate, **Surfactant:** Ethoxylated-2,4,7,9-tetramethyl-5-decyne-4,7-diol (Surtynol 440), **Defoamer:** Paraffin Oil, Polyoxyethylene Stearyl Ether, **Preservative:** 1-Hydroxy-2(1H)-Pyridinethione, Sodium Salt, **pH Stabilizer:** Ammonium Hydroxide

Living Building Challenge Criteria: Compliant

I-13 Red List:
 LBC Red List Free
 LBC Red List Approved
 Declared
 % Disclosed: 100% at 100ppm
 VOC Content: 0 g/L

I-10 Interior Performance: CDPH Standard Method v1.1-2010
 I-14 Responsible Sourcing: Not Applicable

IPA-0004
 EXP: 01 JAN 2024
 Original Issue Date: 2015

INTERNATIONAL LIVING FUTURE INSTITUTE™ <https://livingfuture.org/declare>



Living Product LABEL

Lush Collection | Edible Paint Company | Functional Unit: Gallons

IDENTIFICATION

Identifies company name, product name and functional unit (e.g. gallons or square feet—a full listing of functional units to be provided)

ATTRIBUTES

Identifies key product attributes typically of interest to consumers in green building programs including expected product life span, warranty period, material composition and end of life solutions. Do we measure and show Handprinting and progress over time?

IMPERATIVES

Identifies which imperatives of the LPC has been successfully completed for the product.

DECLARE

Identifies the ingredients found within the product per Declare guidelines.

Life Expectancy: 000 YEARS
Warranty Period: 000 YEARS
End of Life Options: RECYCLABLE (00%), LANDFILL
Recycled Content: 00%
Bio based material: 00%
Take Back Program: LIST OPTIONS

Material Origins

COUNTRY OF MANUFACTURE: Canada
 MATERIALS: Cement 00%, Water 00%, Resin 00%

Embodied Carbon

1,200 KG CO₂e

Embodied Water
 4,5 L H₂O

Embodied Waste
 35 KG WASTE

Embodied Emissions
 2 KG EMISSIONS

IMPERATIVES MET

Place 2/4
 Water 2/2
 Energy 1/1
 Health 2/3
 Materials 3/4
 Equity 2/3
 Beauty 2/2

15
20

Just. SOCIAL JUSTICE AND EQUITY INDICATORS:

Diversity
 Non-Discrimination
 Gender Diversity
 Ethnic Diversity

Worker Benefit
 Worker Happiness
 Employee Health Care
 Continuing Education

Local Benefit
 Local Control
 Local Sourcing

Equity
 Full Time Employment
 Pay-Scale Equity
 Employee/Union Friendly
 Living Wage
 Gender Pay Equity
 Family Friendly

Stewardship
 Responsible Investing
 Community Volunteering
 Positive Products
 Charitable Giving
 Animal Welfare
 Transparency

Safety
 Occupational Safety
 Hazardous Chemicals

Declare.

INGREDIENTS: Ingredient One (Location, ST), The Second Item (Location, ST), NextIngredient (Location, ST), Living Building Challenge Red List, Different Part of the Product, Another Component, More Stuff, US EPA Chemical of Concern, Yet Another Item, Non-toxic Element, Piece of the whole, Component of Concoction, Third From The End, ECHA REACH Substance of Very High Concern, Last Ingredient

THE LIVING PRODUCT LABEL XXX-001 EXP: xxx/xxx/xxxx
 INTERNATIONAL LIVING FUTURE INSTITUTE™ livingproductchallenge.com

ORIGINS

Identifies where the final point of assembly for the product is geographically as well as the location of major constituent components.

DIALS

Identifies the embodied characteristics of the product for energy, water and waste per functional unit of the product—as well as the type and magnitude of emissions relative to the functional unit.

JUST

Identifies the JUST levels achieved by the manufacturer for the product.

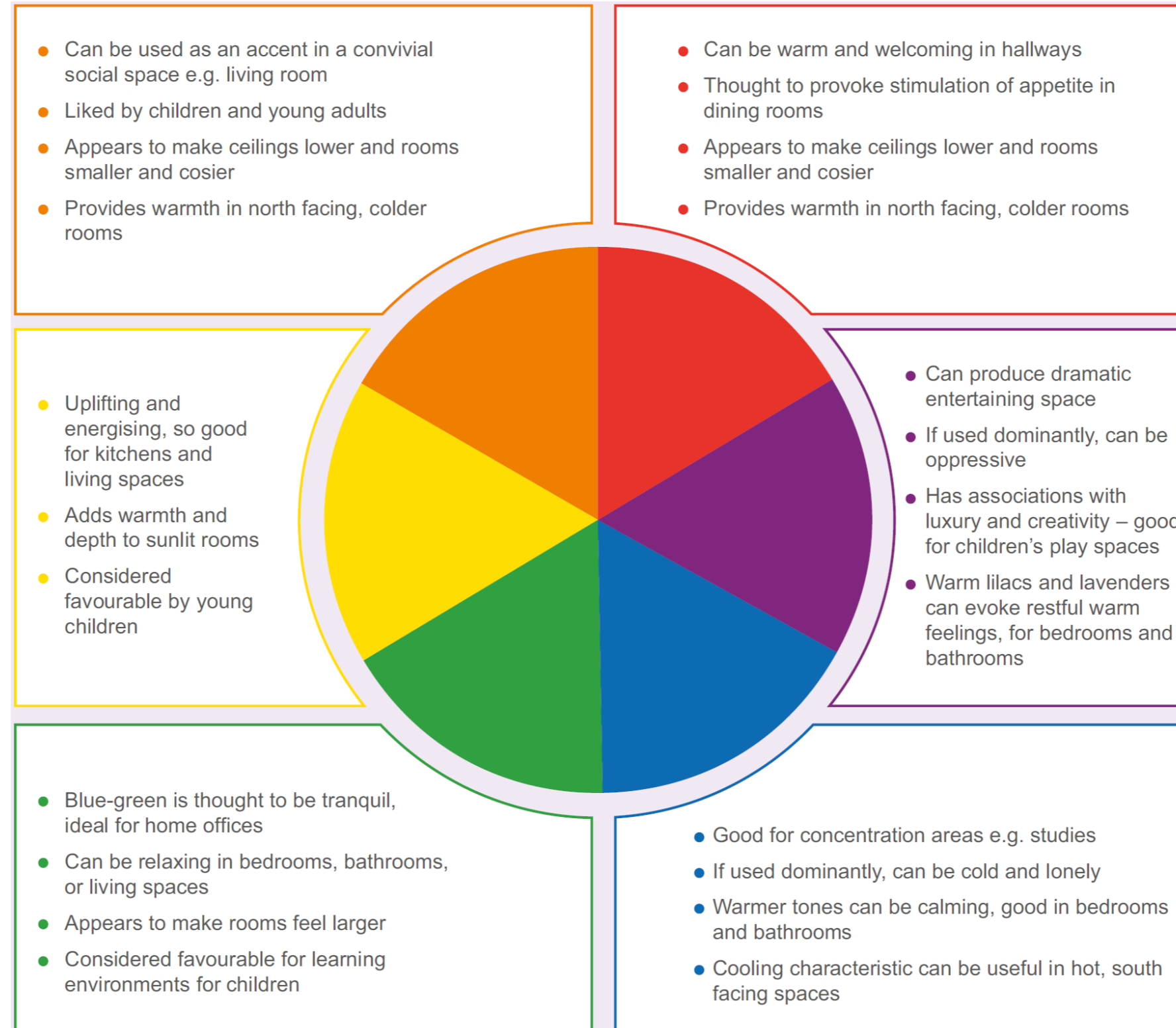
EXPIRY

Identifies the date of expiry for the Label related to product re-certification.

PSYCHOLOGY OF COLOURS



Research experiments have concluded that we are influenced by colour in our interior environments, which evokes both a physiological and psychological response within us.



WATER

Dehydration- Did you know?



SIGNATURE CARE HOME

Dehydration is a huge problem within the elderly population; 35% of individuals admitted into a care home are affected by dehydration.

WATER

Dehydration



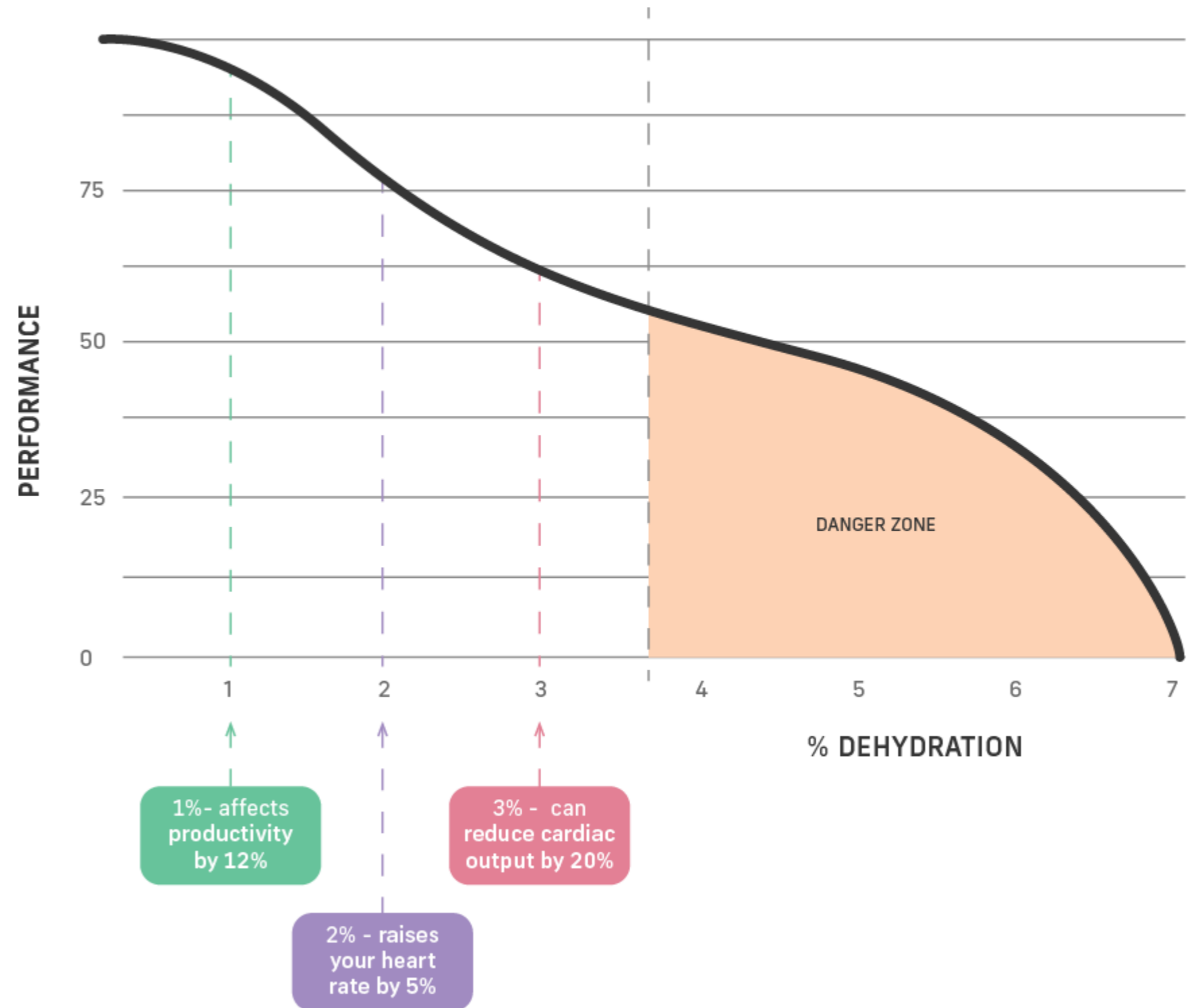
“BEING DEHYDRATED BY JUST 2% CAN IMPAIR PERFORMANCE IN TASKS THAT REQUIRE ATTENTION, PSYCHOMOTOR AND IMMEDIATE MEMORY SKILLS.”

HOW MUCH WATER DO WE NEED?

Women	2.7 Litres
Men	3.7 Litres
Adults (51+)	1.5 – 2.5 Litres

BENEFITS

Protects tissues, joints and spinal cord
Helps in the optimal functioning of the brain



NOURISHMENT



“EATING UNHEALTHY IS LINKED WITH A 66% INCREASED RISK OF PRODUCTIVITY LOSS.”



Myatts Field North, Lambeth

Design should encourage healthy eating and provide opportunities for local food production



MOVEMENT



Physical inactivity has been identified as the 4th leading risk factor for global mortality

People aged 60 and over who do just 15 min of exercise a day reduce their risk of dying early by 22%.

BENEFITS

- Alleviates depression
- Stronger bones & joints
- Increase in lung volume
- Prevents heart diseases
- Lessen back pain

The World Health Organization (WHO)

PROMOTE PHYSICAL HEALTH



St Bedes, Bedford

SECURE AND WALKABLE ROUTES
SOFT SURFACES, EASY ACCESS



Bristol Court, Feltham

CONNECTIONS WITH WIDER
COMMUNITY, WEATHER PROTECTION



New Lodge, York

MIND



“MENTAL HEALTH DISORDERS ACCOUNT FOR 14% OF THE GLOBAL DISEASE, WITH DEPRESSION ALONE RANKING AS THE LEADING CAUSE OF DISABILITY WORLDWIDE.”

POOR MENTAL HEALTH IS LINKED TO:

- Cardiovascular disease
- Obesity
- Diabetes
- Poor health behaviours
- Sleep disorder
- Physical inactivity



BIOPHILIA HYPOTHESIS

The biophilia hypothesis suggests that there is an instinctive bond between human beings and other living systems that have been mapped in our brains for thousands of years



UNTIL MODERN MEDICINE, THE ENVIRONMENT
PLAYED A CENTRAL PART IN CURING ILLNESS
AND RESTORING HEALTH.

Biophilia

BIOPHILIC DESIGN

Elements and attributes



COMMUNITY



“COMMUNITY IS ESSENTIAL TO SHAPING INDIVIDUAL AND COLLECTIVE HEALTH OUTCOMES. SPACES CAN BE DESIGNED IN A WAY THAT ENABLES ALL INDIVIDUALS TO PARTICIPATE AND THRIVE.”

Architecture influences social interaction through:

- Space design
- Provision of communal spaces
- Visual cues signalling social norms

Enable engagement opportunities for all users throughout the year



SUMMER



BOTANICAL PLACE WEST BYFLEET



WINTER