International Conference on Integrated Problem-Solving Approaches to Ensure Schoolchildren's Health
Budapest, Hungary, 23-24 May 2019

How can we create a healthy school environment?

NIJZ National Institute of Public Health

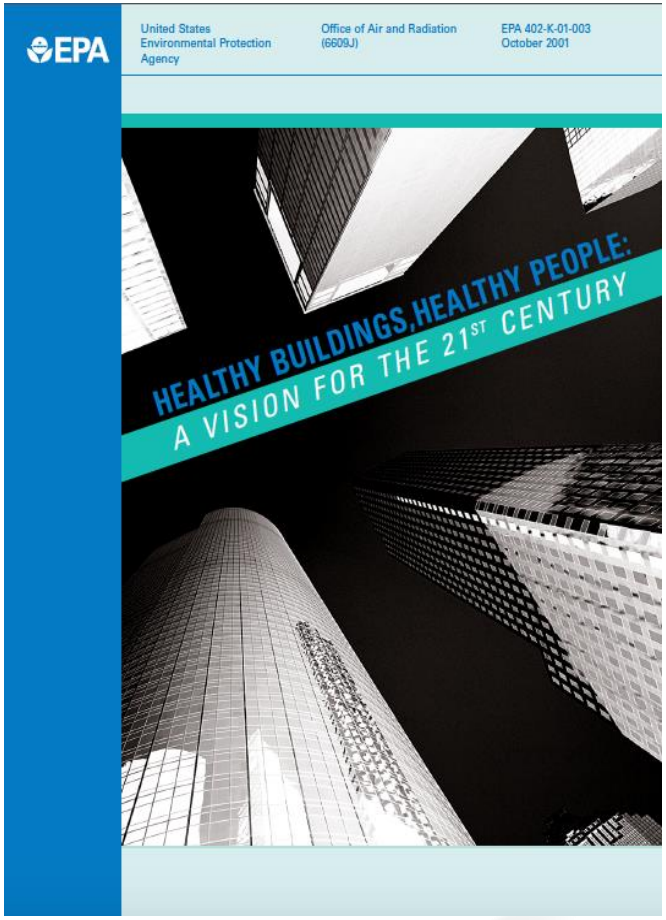
Dr. Anja Jutraž & Dr. Andreja Kukec – National Institute for Public Health, Slovenia


M. SCOTT PECK
RAKKAUDEN
PSYKOLOGIA

INDEX

HEALTHY BUILDINGS, HEALTHY PEOPLE

- On average, we spend about 90 percent of our time indoors, where pollutant levels are often higher than those outside.
- Indoor pollution is estimated to cause thousands of cancer deaths and hundreds of thousands of respiratory health problems each year.
- Kids spend in school in average around 5-8 hours per day.
- The built environment significantly affects the public's health.
- The physical environment must be safe, welcoming and support learning.
- Many urban environments lack adequate safe playgrounds and safe green, open spaces that encourage exercise and easily accessible nutritious food



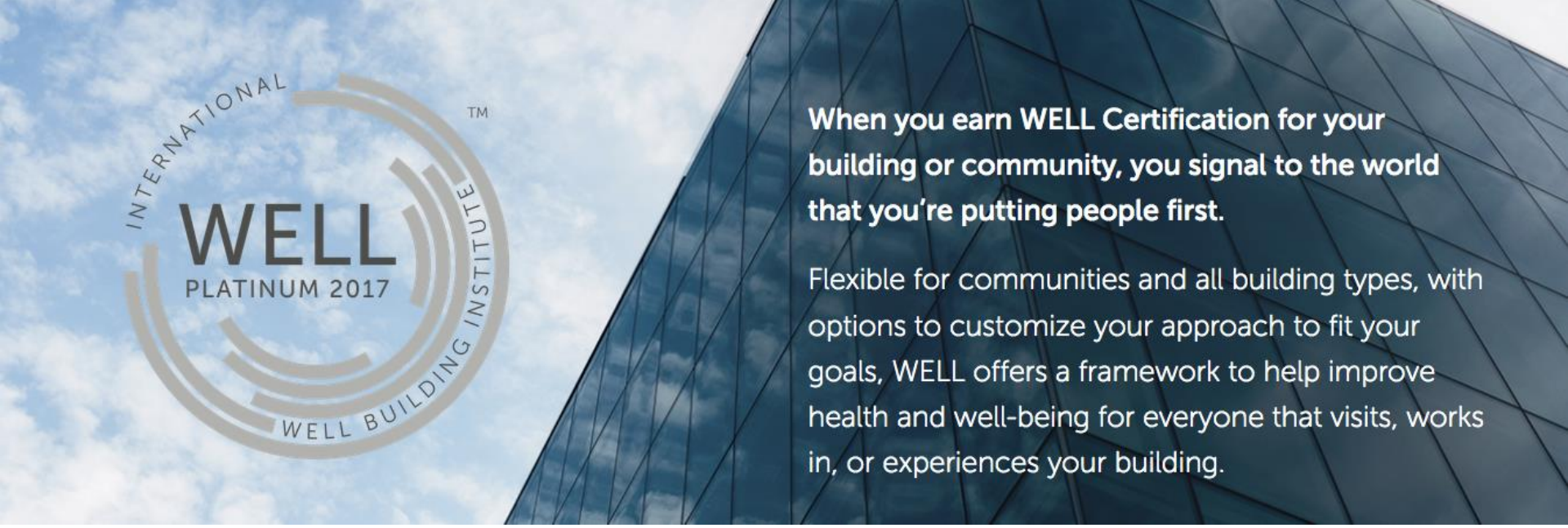
DESIGN AND LEARNING GO HAND IN HAND

PROBLEMS:
LACK OF NATURAL LIGHTENING, FURNISHING, BAD ACOUSTICS

PROBLEMS:
LIGHTENING, ACOUSTICS (A LOT OF NOISE)

PROBLEMS:
DISTRIBUTION OF SPACES,
NON APPROPRIATE LIGHTENING

DIMENSIONS OF HEALTH & WELL-BEING



When you earn WELL Certification for your building or community, you signal to the world that you're putting people first.

Flexible for communities and all building types, with options to customize your approach to fit your goals, WELL offers a framework to help improve health and well-being for everyone that visits, works in, or experiences your building.

- AIR
- LIGHT
- FITNESS
- INNOVATION
- MIND
- WATER
- NOURISHMENT
- COMFORT

INDEX

Part 1

Part 2
HEALTHY BUILDINGS

Part 3

Part 4

Part 5

A HEALTHY, HIGH PERFORMING SCHOOL BUILDING IS:

- AN EDUCATIONAL FACILITY DESIGNED TO PROVIDE A PRODUCTIVE LEARNING ENVIRONMENT FOR STUDENTS AND STAFF
- PROMOTE A HEALTHY LIFESTYLE
- SAVE OPERATING COSTS / SAVE MONEY
- HELP SUSTAIN THE ENVIRONMENT

WHY HEALTHY BUILDINGS?

- **Improve the Learning Environment** = natural daylighting, acoustical comfort and superior indoor air quality
- **Reduce Operating Costs** = efficient systems work together to save energy and water
- **Support Health and Safety** = supports the environmental, nutritional and physical well-being of students and staff
- **Protect our Environment** = environmentally responsive site planning, reducing water and energy use and promoting renewable energy




DIFFERENT DIMENSIONS

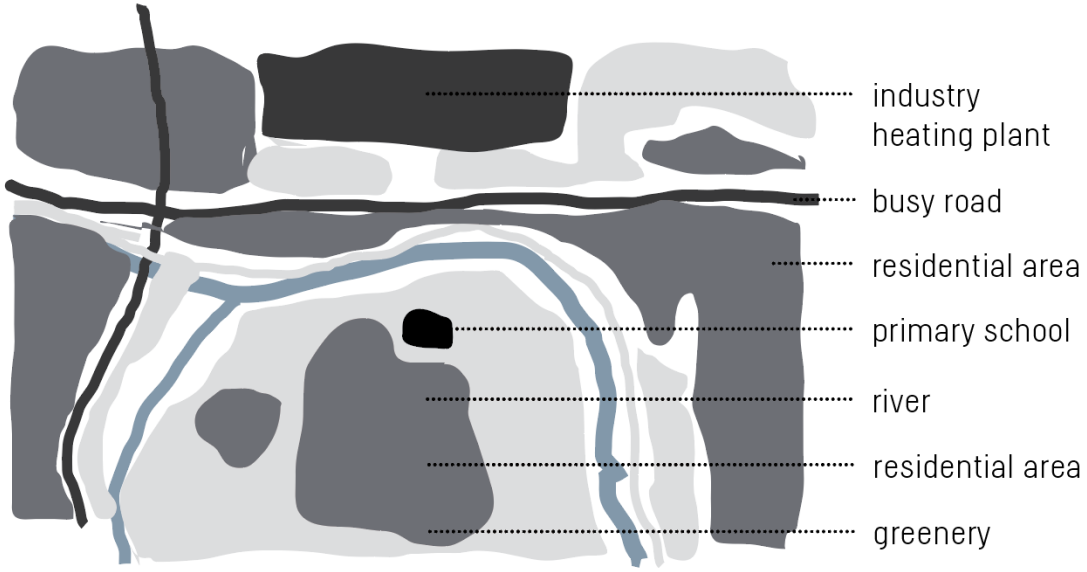
- **URBAN PLANNING**
- **ARCHITECTURE**
- **INTERIOR**



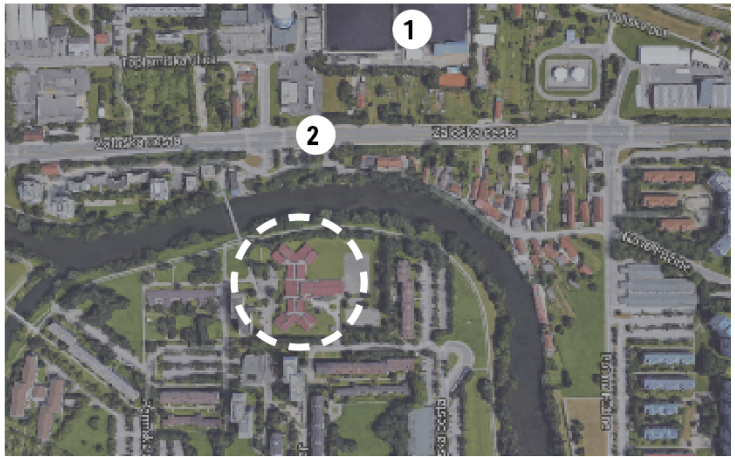

URBAN PLANNING

LOCATION OF SCHOOL BUILDING

BIG SCALE



SMALLER SCALE



1 heating plant 2 busy road

3 car park

AVOID potential sources of indoor air pollution: OUTDOOR SOURCES

A GOOD LOCATION AND SAFE BUILDINGS:

- FIND A GOOD SCHOOL LOCATION
- DESIGN A SAFE SCHOOL STRUCTURE

A HEALTHY OUTDOOR ENVIRONMENT:

- SEEK HIGH QUALITY OUTDOOR AIR
- MAKE PLAY AREAS SUPPORTIVE OF PHYSICAL DEVELOPMENT AND SAFE TO USE
- PROTECT CHILDREN FROM ULTRAVIOLET RADIATION
- DISPOSE OF WASTE QUICKLY AND PROPERLY
- CAREFULLY MANAGE THE USE OF CHEMICALS PRACTICE
- SAFE USE OF PESTICIDES

PROTECTION FROM EXCESSIVE NOISE

CONNECTIVITY:

- **TRAFFIC FAR AWAY FROM SCHOOL**
- **DROP OFF/ PICK UP AREA**

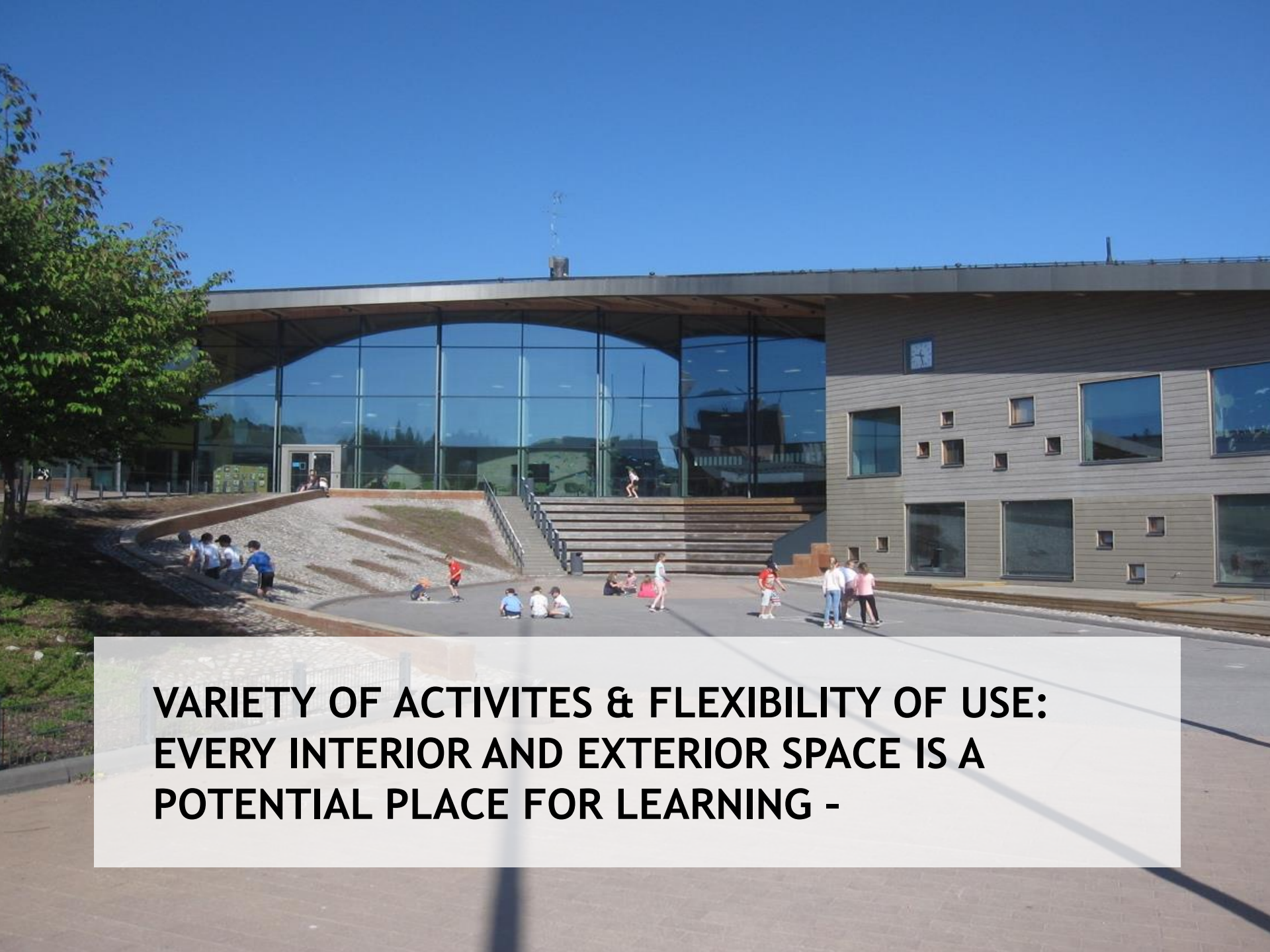
USER FRIENDLY

- **PEDESTRIAN PATHS**
- **CYCLING ROUTES**
- **PUBLIC SPACE**

NATURAL ELEMENTS (GREENERY, TREES, PARKS, WATER ELEMENTS, ETC.) HAVE INFLUENCE ON AMBIENT AIR QUALITY

ACCESSIBILITY

MATERIALS SHOULD BE CHOSEN BASED ON THEIR CHARACTERISTICS IN ORDER TO AVOID ACCIDENTS AND SLIPS



VARIETY OF ACTIVITES & FLEXIBILITY OF USE: EVERY INTERIOR AND EXTERIOR SPACE IS A POTENTIAL PLACE FOR LEARNING –

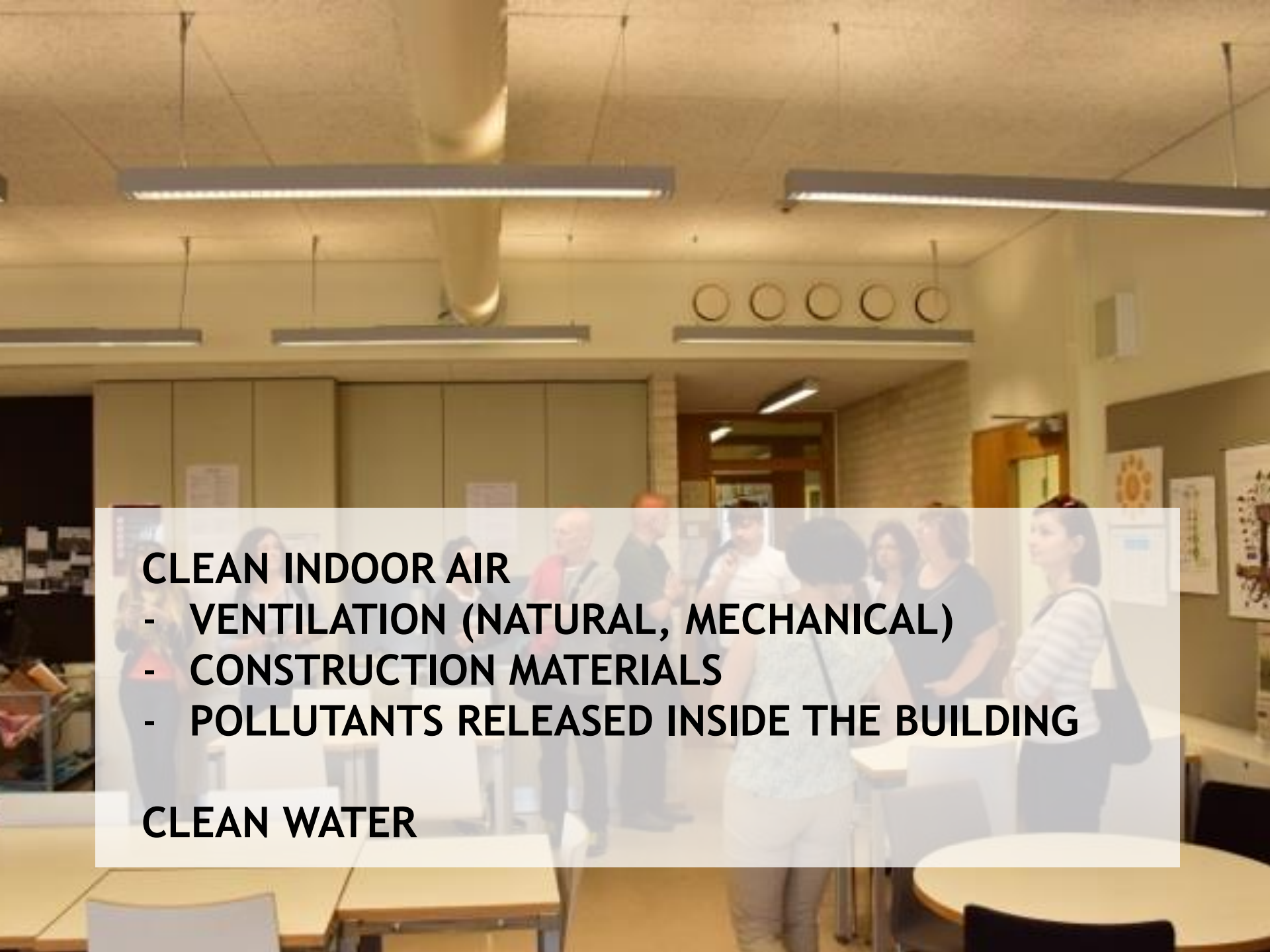
PLAYGROUNDS

ARCHITECTURE

NATURAL LIGHT

CONNECTION WITH OUTDOOR SPACE

OUTDOOR LEARNING SPACE



CLEAN INDOOR AIR

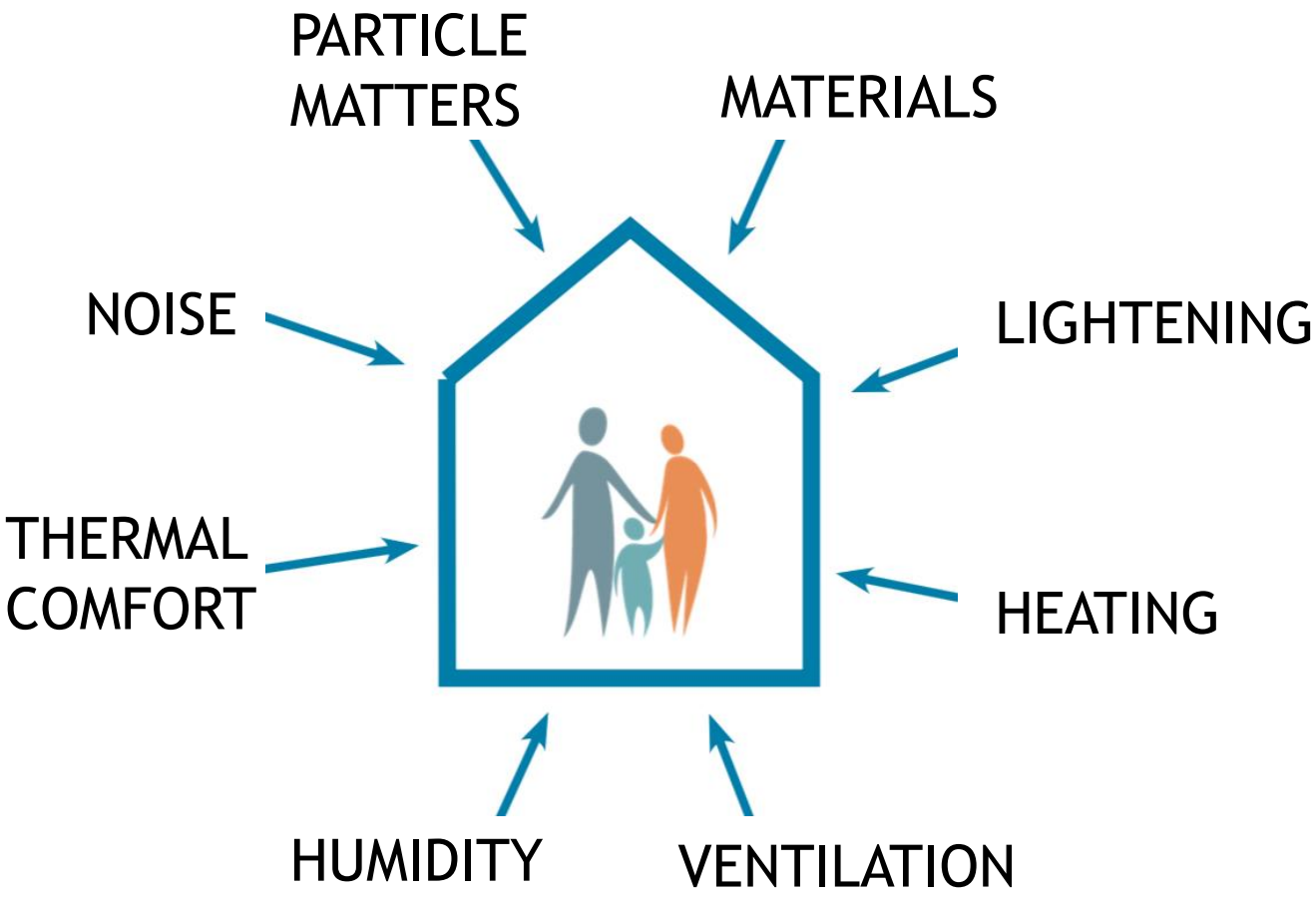
- **VENTILATION (NATURAL, MECHANICAL)**
- **CONSTRUCTION MATERIALS**
- **POLLUTANTS RELEASED INSIDE THE BUILDING**

CLEAN WATER

GYM AS PART OF THE SCHOOL

INTERIOR

MICROCLIMATIC PARAMETERS

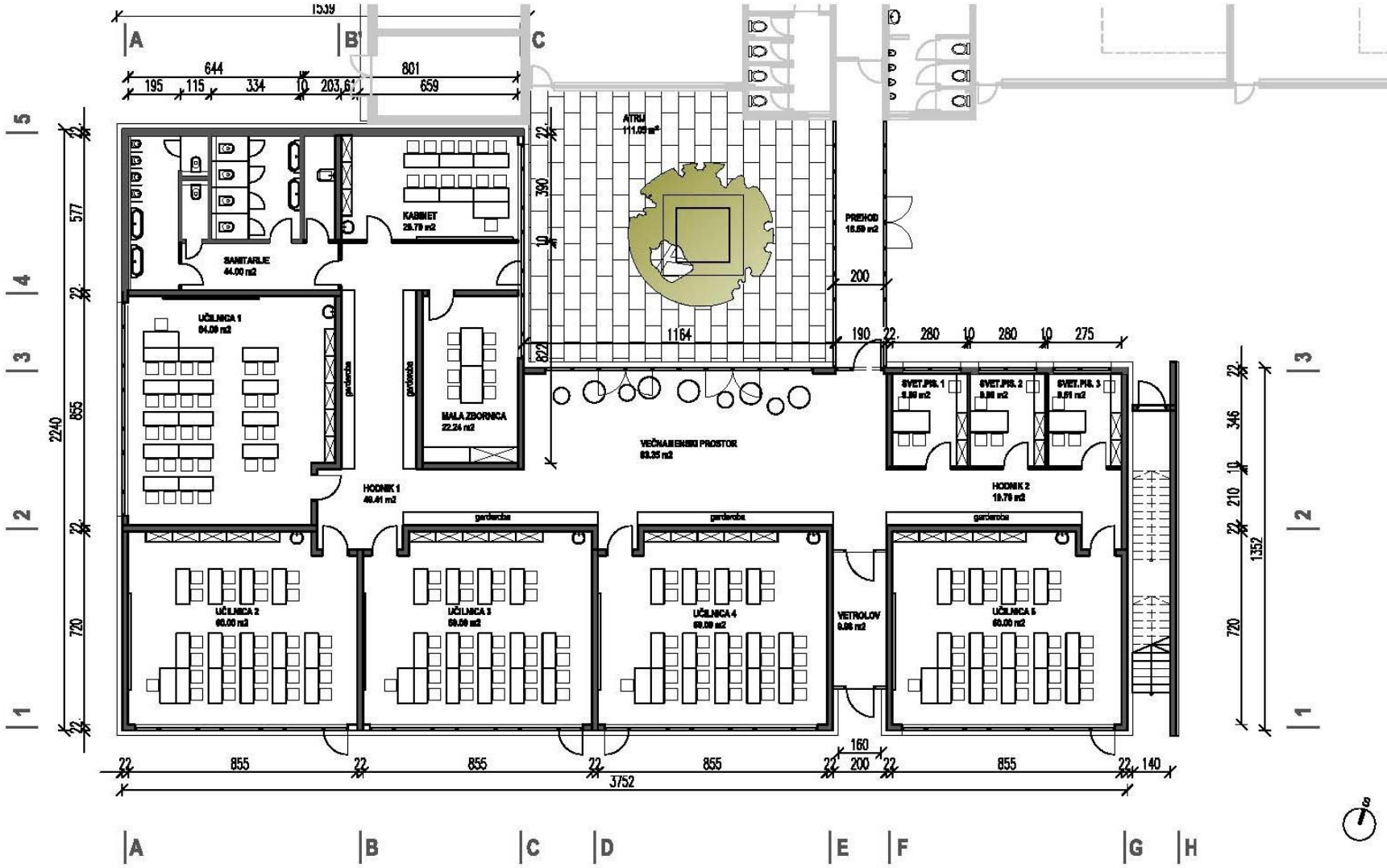


NOISE / ACOUSTIC PANELS

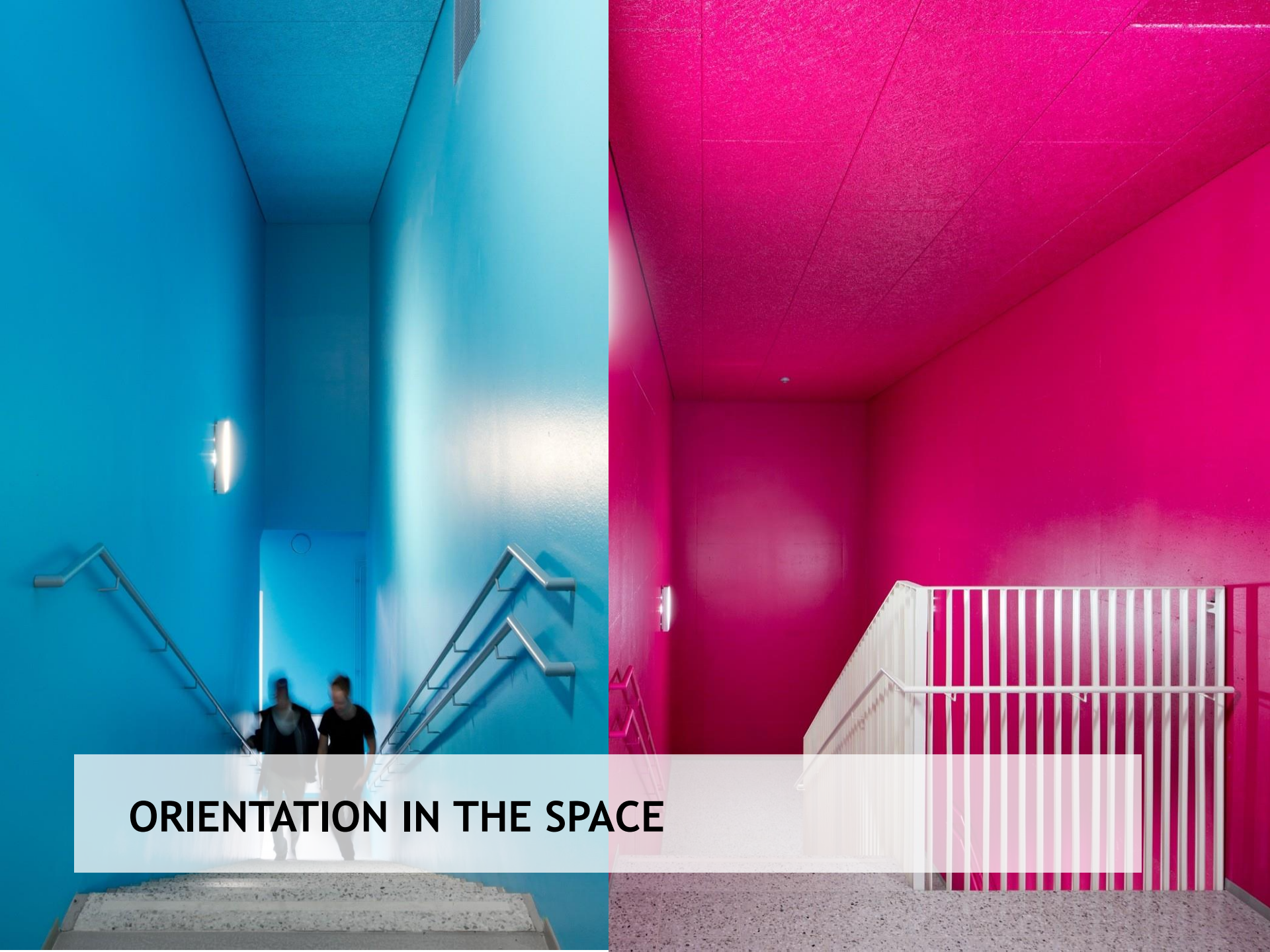
LIGHTING

VIEWS


IN PROCESS... RENOVATION PROJECT
NEW CEILING – ACOUSTIC PANELS
NEW GLASS DOORS – NATURAL LIGHTENING



SPACE DISTRIBUTION



ORIENTATION IN THE SPACE

THERMAL COMFORT:

- **HEAT**
- **HUMIDITY**

AIR QUALITY:
FRESH AIR, AVOID SMELL

AIR QUALITY:

- **VENTILATION – MEP ROOM**

FURNISHING

- ERGONOMIC TABLES/ CHAIRS
- MATERIALS

ORDER
SPACES IN BETWEEN (SOCIAL INTERACTIONS)
COLOURS

FURNISHING:
ELEMENTS THAT PROMOTE ACTIVITY

FURNISHING:
MOVABLE FURNITURE – ENCOURAGING NONTRADITIONAL CLASSROOM SETTINGS, GROUP LEARNING

FLOORING / FINISHING
PROMOTING MOVEMENTS

ALTERNATIVES TO STAIRS: PROMOTING ACTIVITY

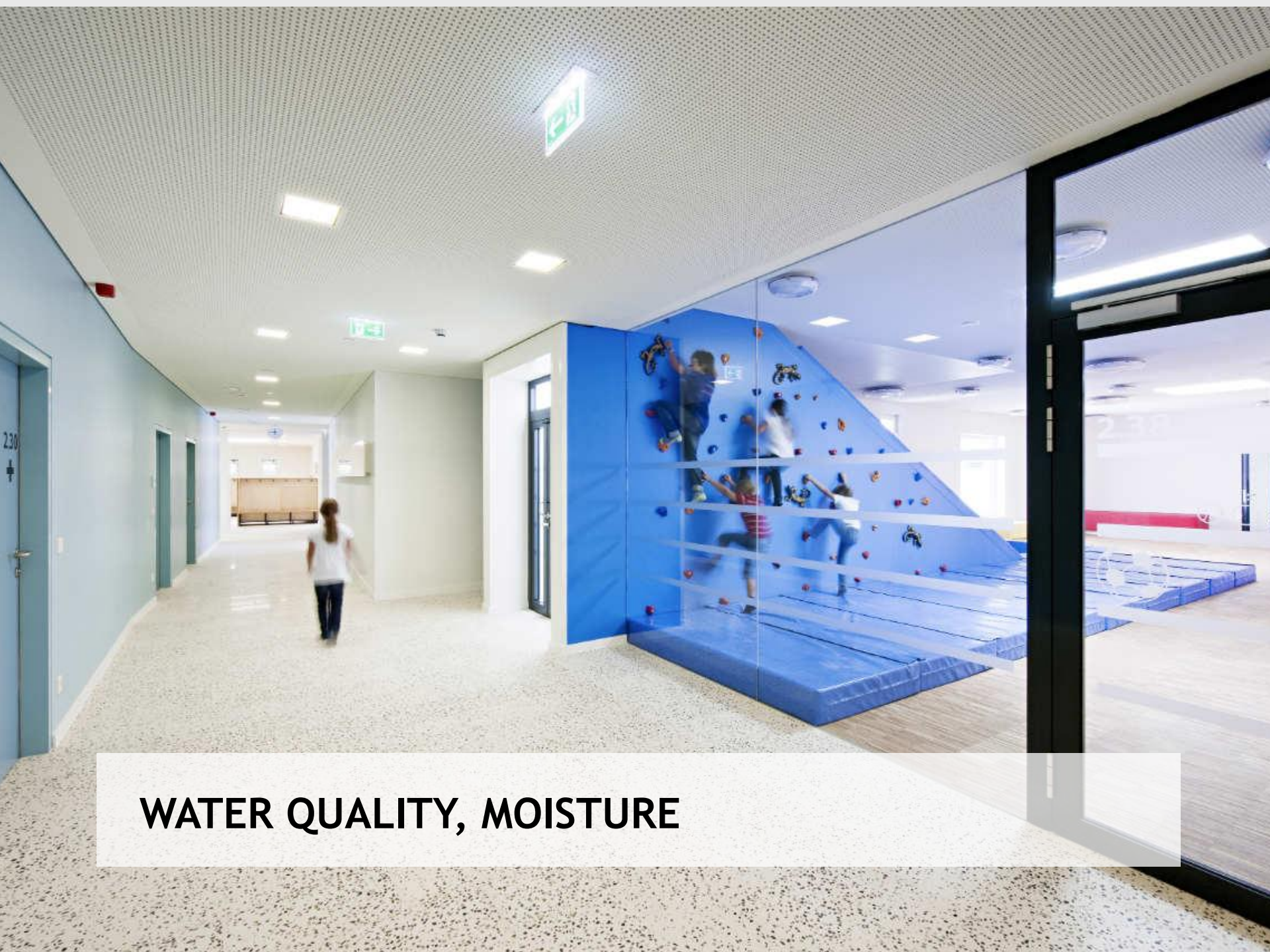
ADDITIONALLY

MULTIFUNCTIONAL SPACES: COMMUNITY CENTER IN THE EVENING

CLEANLINESS: NO DUST
MAINTAINANCE PROTOCOLS

SENSE OF SECURITY, SAFETY: BALCONIES, FENSES

SENSE OF SECURITY, SAFETY: INDOOR ATRIUM



WATER QUALITY, MOISTURE

NICE DESIGN – PSYCHOLOGICAL EFFECTS

INDEX

STAKEHOLDERS

GOVERNMENT	PROFESSION	PUBLIC (=users)
AUTHORITIES: - Ministry for education, science and sport - Ministry of health - Ministry of the Environment and Spatial Planning **NATIONAL INSTITUTIONS:** - National institute of Public Health - Slovenian Environment Agency - Universities (Medical faculty, Faculty of health science, Faculty of Civil and Geodetic Engineering, Faculty of Architecture) **MUNICIPALITIES:** - Municipality of Ljubljana	**EMPLOYEES:** - management - teaching staff - technical/ support staff (janitor, cleaners) **DESIGNERS:** - architects - civil and geodetic engineers - mechanical engineers - urban planners - contractors **HEALTH CARE WORKERS** (part of Healthy school iniciative) **PUBLIC HEALTH PROFESIONALS** - public health experts - pediatrics - environmental health engineers	**PARENTS** (indirect impact) **PUPILS** (direct impact) **COMMUNITY**

Cleaners: they have their rules, all cleaning materials are set; when they clean the classroom, they open the window; they need to attend the trainings about cleaning materials, elements.

Designers: they have a big influence in the planning stage when they can educate investors and future users about the importance of indoor air quality.

Parents: they can donate some equipment or furniture; they are the bond between pupils and teachers; they can raise awareness on indoor air quality among their pupils.

Community: In general, the community is bigger and more involved in the school in smaller towns.

PROCESS

PLANNING

1 BEFORE PLANNING	2 CURRENT SITUATION	3 BEHIND THE SCENES	4 CHOICES & VOTING	5 WINNER/ CHOSEN DESIGN

CONSTRUCTION

6 BRIDGE-MOVING FROM IDEA TO THE PROJECT	7 BIM	8 PROFES-SIONAL DISCUS-SIONS	9 FINAL PLANS	10 BUILDING & CONSTRUCTING

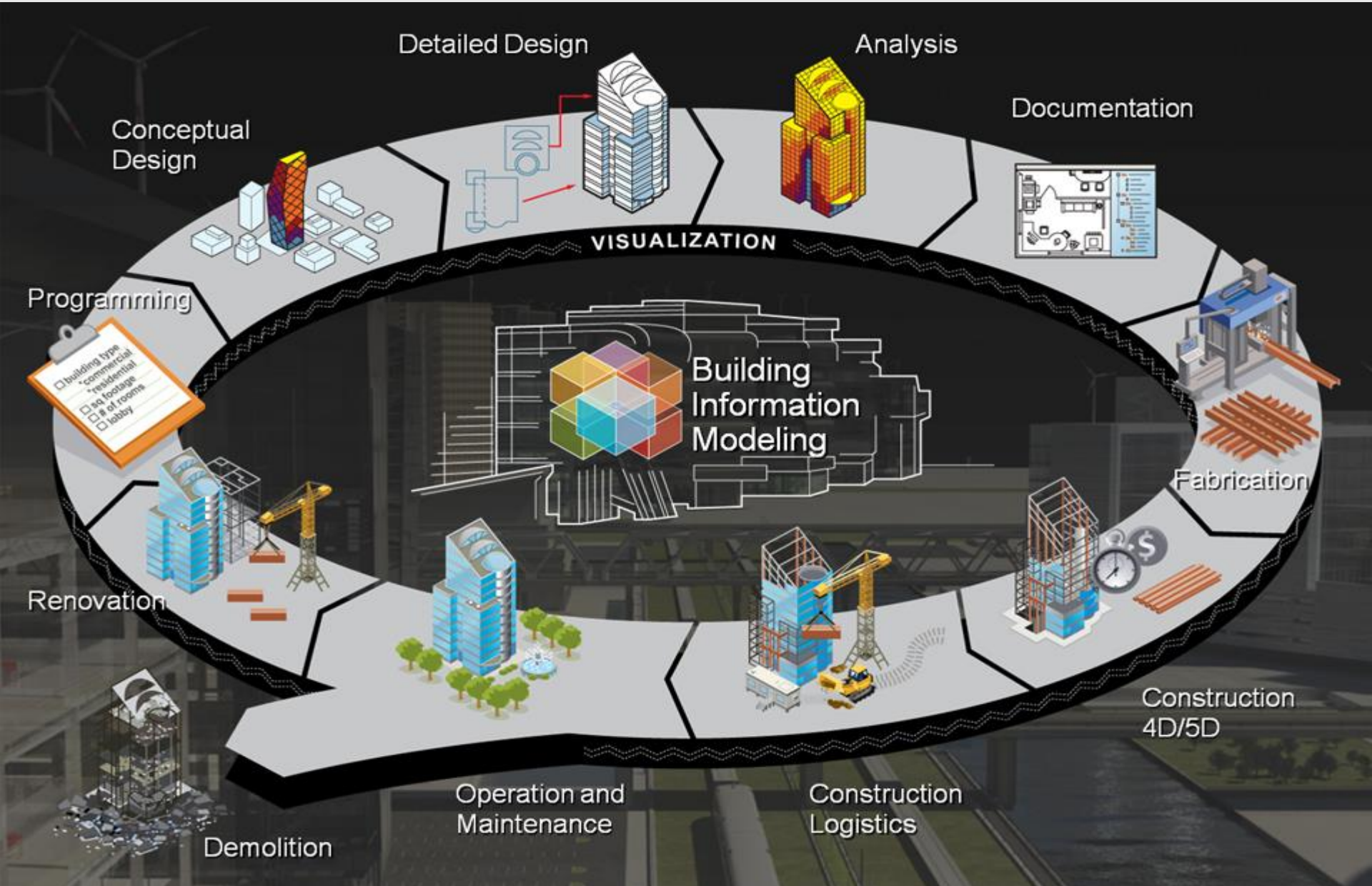
MANAGING

11 USING	12 DISCUSS	13 COMMUNITY BUILDING	14 MAINTAINING

share *discuss* *input* *feedback*

LIFE-CYCLE OF THE BUILDING

BIM MODELLING



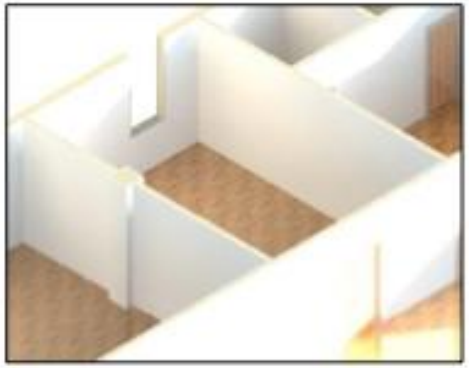
SIMULATIONS

Table 1: *Example of a Performance Analysis with LindQST*

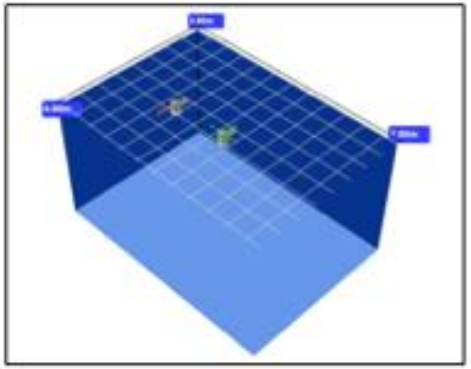
Room Information

Room type:	*Office*	-	*Occupants: **	*2*	*per.*	*Height:*	*3.8*	*m*
Length:	*7.0*	*m*	*Width:*	*4.9*	*m*	*Area:*	*34.3*	*m²*
*Demand 1: ***	*20*	*L/s pr. per.*	*Demand 2: ***	*0.7*	*L/s pr. m²*	*Airflow Rate:*	*64*	*L/s*

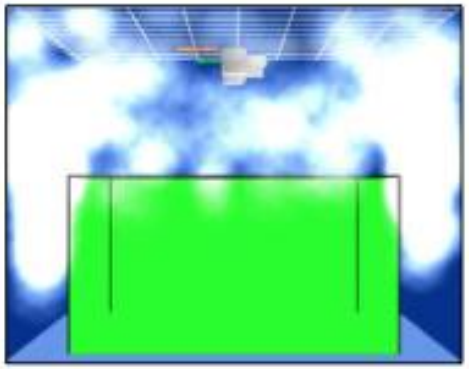
Model in Revit



Model in LindQST



Analysis



Analysis Results

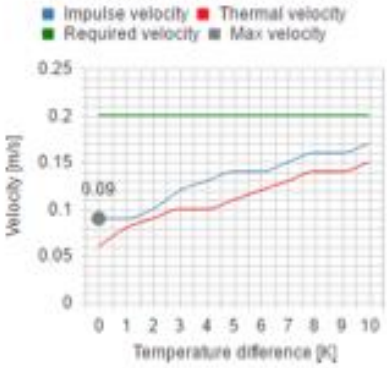
Settings

Suspend ceiling:	*No*
Diffuser(s):	*LCS-160*
Ceiling offset:	*0.3 m*
Conditions:	*Isothermal*

Occupant Zone

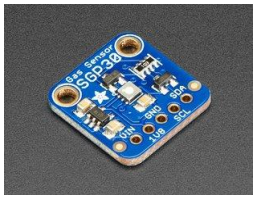
ID	Demand	Result	
Velocity	*0.2 m/s*	*0.1 m/s*	✓
Sound	*35 dB(A)*	*32 dB(A)*	✓

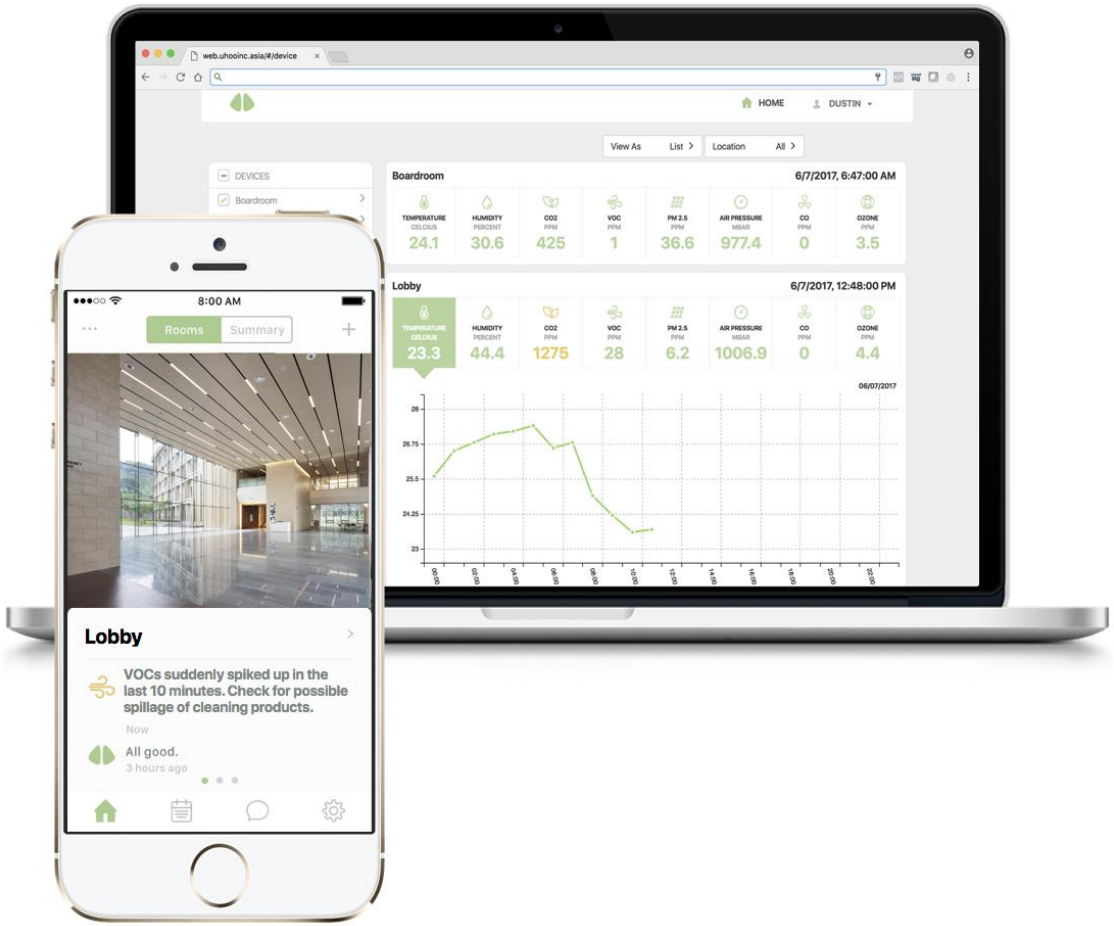
Non-Isothermal Conditions



Imported to Revit

MONITORING / SENSORS





AWARENESS RAISING

INDEX

Part 1

Part 2

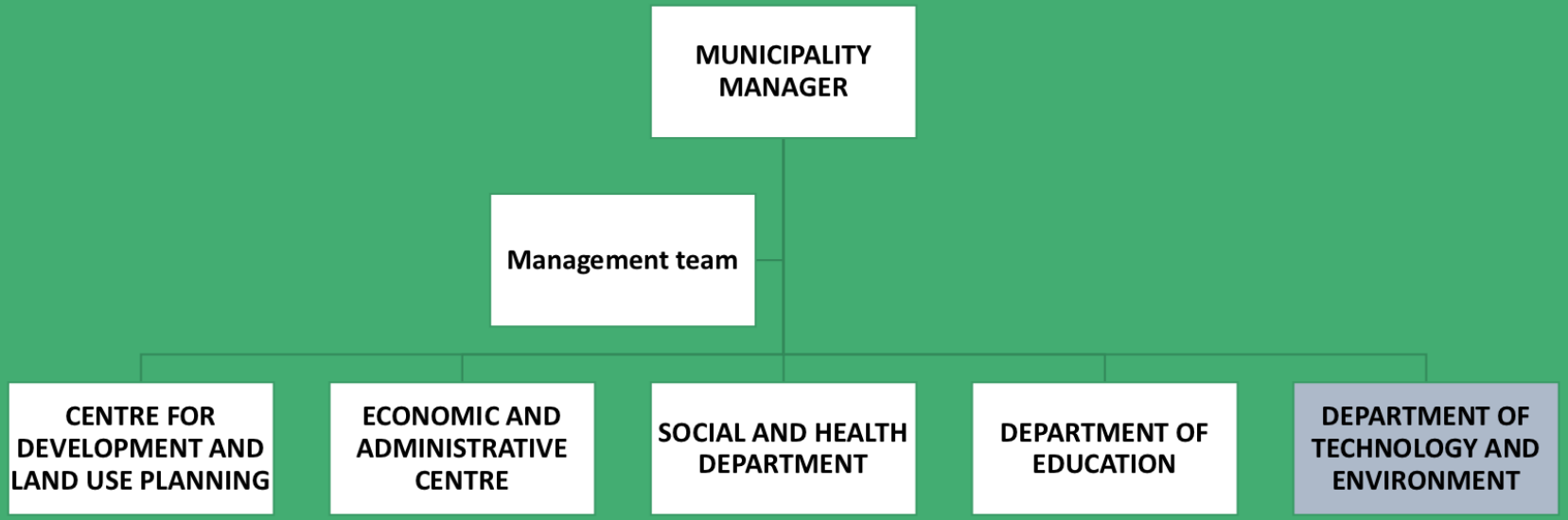
Part 3

Part 4
CASE STUDIES

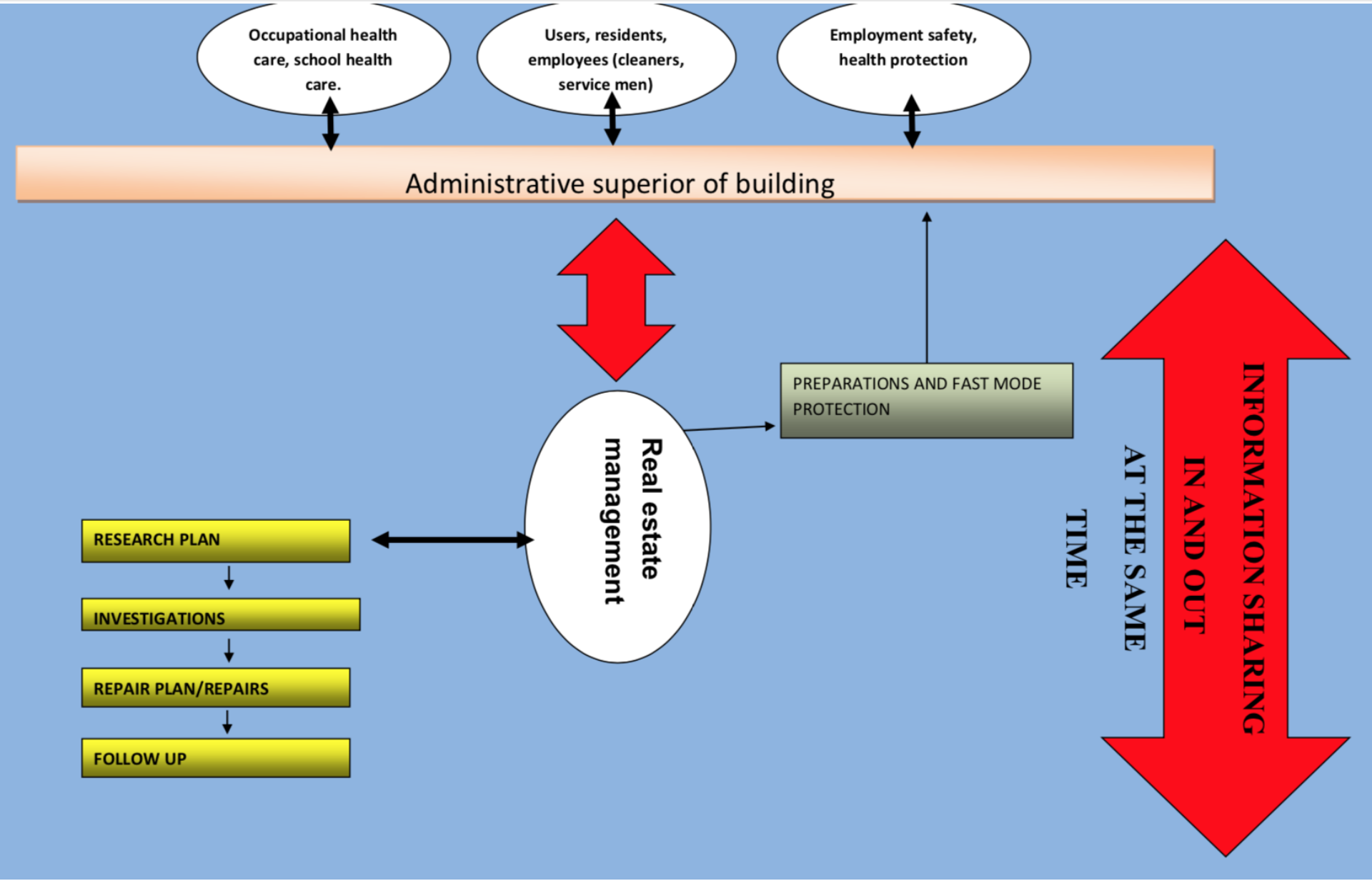
Part 5

Organisation of the municipality

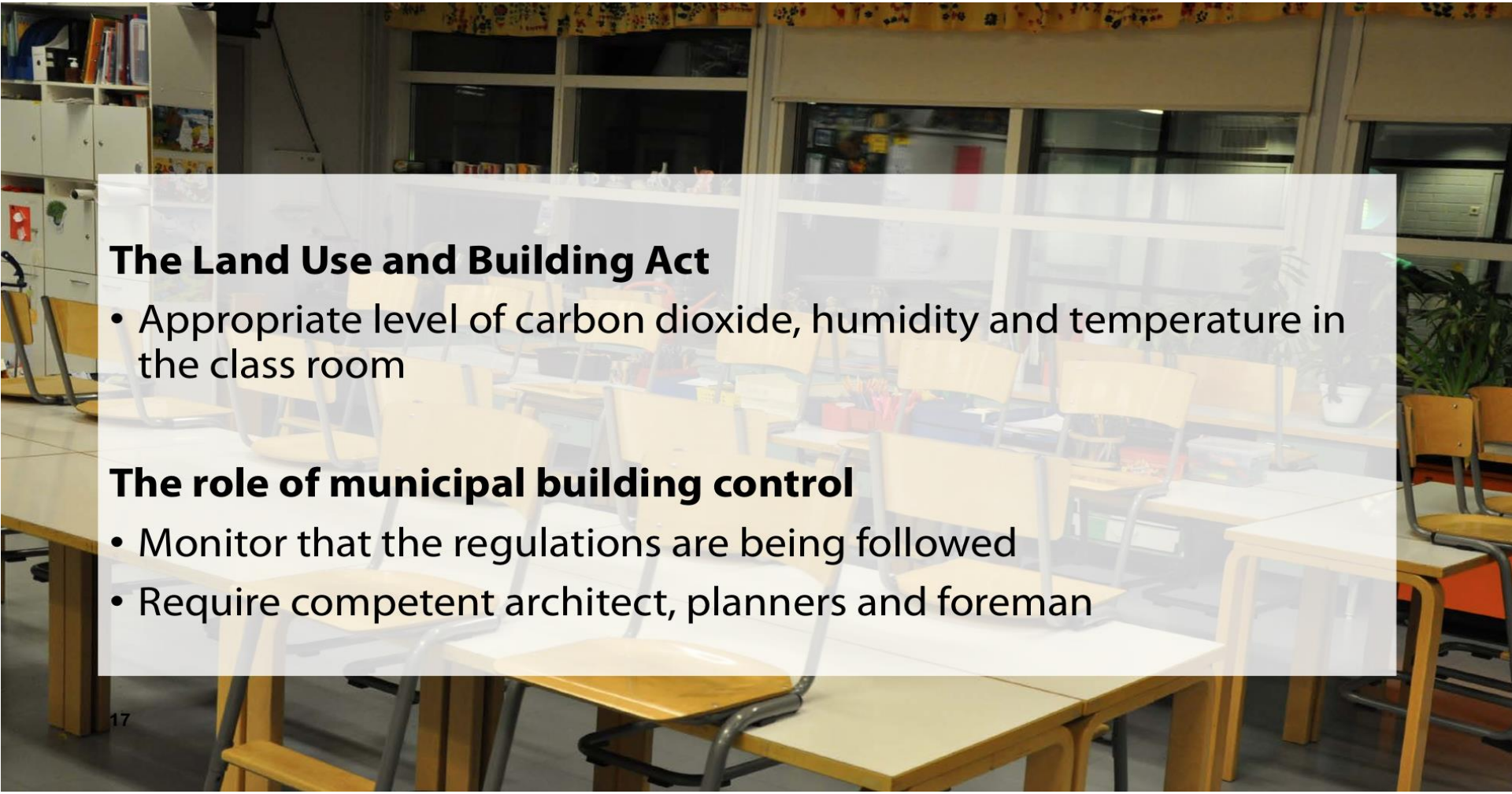
SIPOO SIBBO



SIPOO'S INDOOR AIR QUALITY PROCESS



GOOD INDOOR QUALITY AS A BASIC REQUIREMENT FOR ALL BUILDINGS



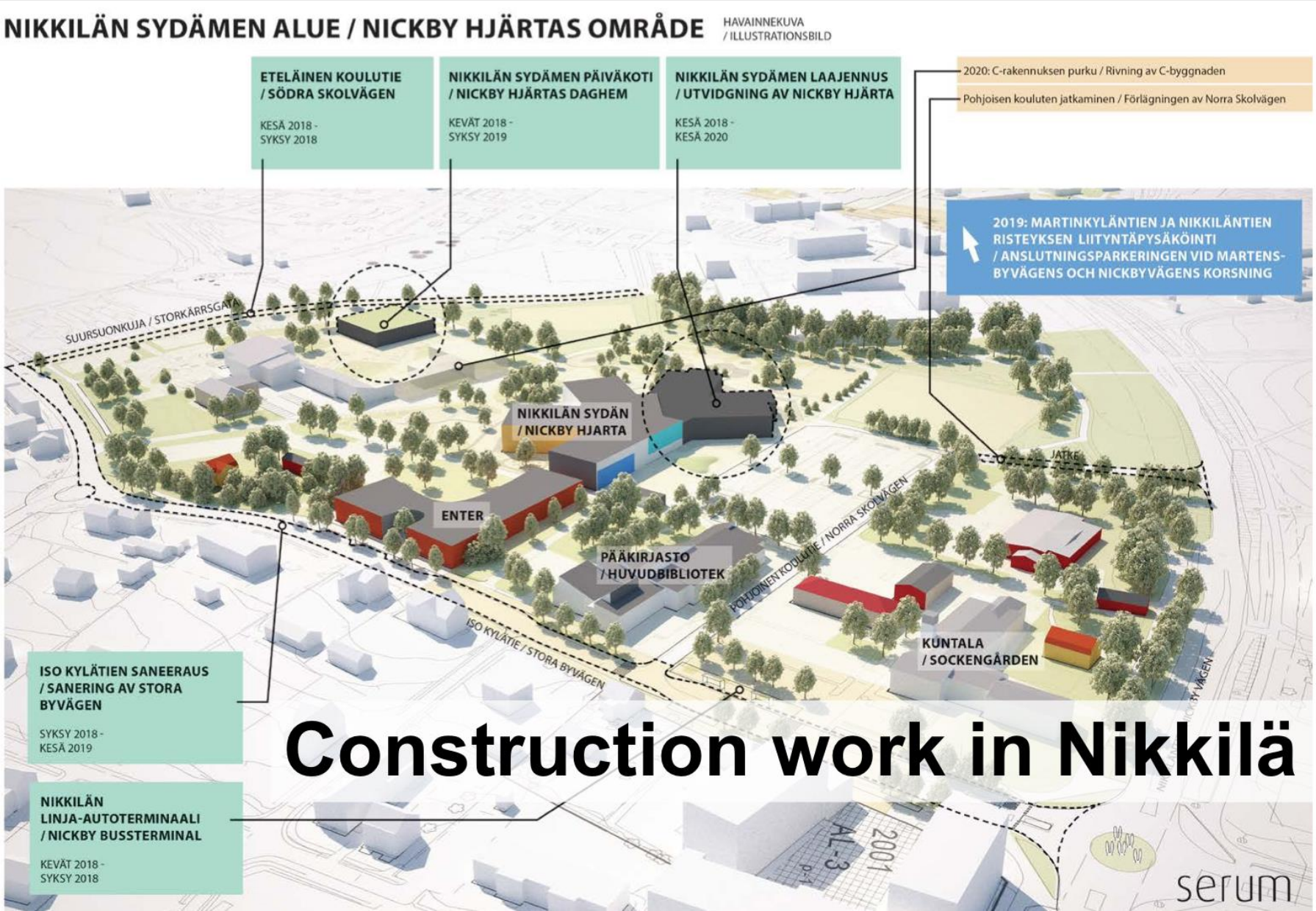
The Land Use and Building Act

- Appropriate level of carbon dioxide, humidity and temperature in the class room

The role of municipal building control

- Monitor that the regulations are being followed
- Require competent architect, planners and foreman

NEW BUILDING INSTEAD OF RENOVATION



Construction work in Nikkilä

LEGISLATIONS

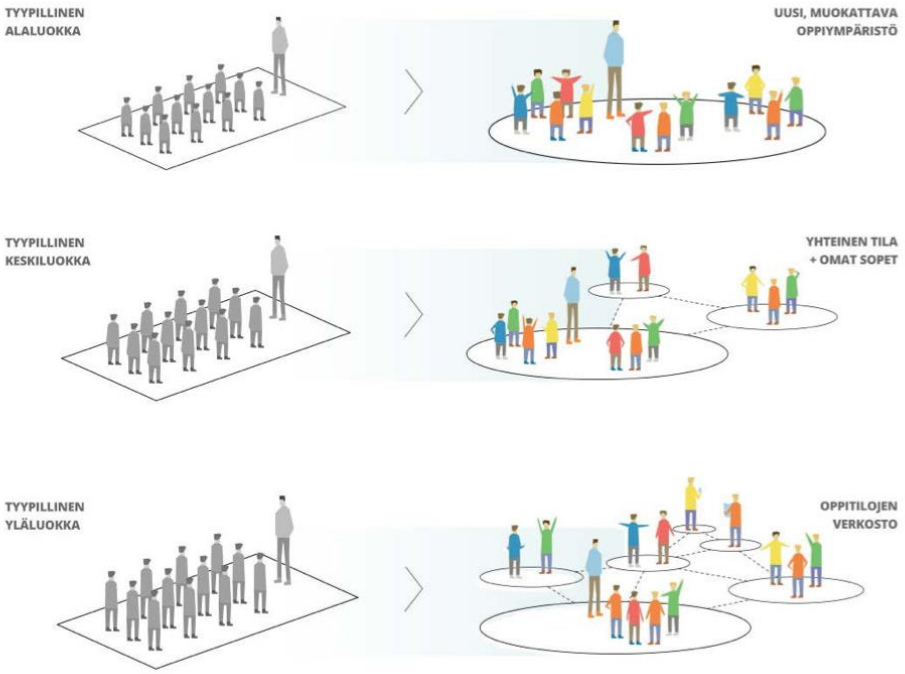
SCHOOL CURRICULUM AND NEW LEARNING ENVIRONMENT

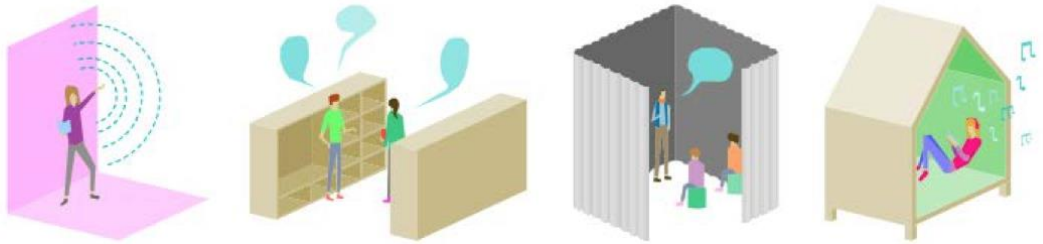
The new curriculum launched in 2016

- The old classroom based teacher-drawn learning → learning by experiencing and phenomenon-based learning
- The learning environments become more versatile

→Living room –like spaces for one or many classes to small quiet spots for one person

→School is no more just a building but it expands into nearby playgrounds, forests and nature





LESSONS LEARNED FROM FINLAND

- Integrated school design
- Healthy building design
- Children well-being

- Legislations in Finland
- New ways of learning

- Indoor air quality
- Programs for IAQ in Sipoo /Finland
- Action plans for IAQ – for new buildings and renovations

INDEX

CONCLUSION

TO CONCLUDE, A **HOLISTIC APPROACH** IS NEEDED IN THE PLANNING PROCESS OF SCHOOL BUILDINGS, WHICH IS BASED ON **INTERDISCIPLINARY COLLABORATION** BETWEEN DIFFERENT STAKEHOLDERS, FROM PLANNERS (ARCHITECTS, ENGINEERS ETC.) TO PUBLIC HEALTH EXPERTS.

DIFFERENT PROFESSIONALS SHOULD BE INVOLVED IN DISCUSSIONS ABOUT THE QUALITY OF INDOOR ENVIRONMENT: **PUBLIC POLICY, HEALTH, BUILDING SCIENCES, PRODUCT MANUFACTURING, ENVIRONMENTAL RESEARCH …**

IT IS IMPORTANT TO DESIGN THE QUALITY-SCHOOL ENVIRONMENT FOR HEALTH OF EMPLOYEES AND USERS AND **DEFINE THE GUIDELINES FOR DESIGNING HEALTHY SCHOOL ENVIRONMENT FROM PUBLIC HEALTH AND ARCHITECTURE VIEW.**

INTEGRATED DESIGN OF THE BUILDING

CURRICULUM
LEGISLATION

HEALTH OF THE USERS
(EMPLOYEES & KIDS)
- Mental health
- Physical health
- Environmental health

INTERDISCIPLINARY
COLLABORATION

DESIGN PHASE

1. TECHNICAL ASPECT
2. DESIGN ASPECT
3. SOCIAL ASPECT

MAINTAINANCE

MONITORING
CLEANING PROCESS

ACTION PLANS

HOLISTIC APPROACH TOWARDS DESIGNING HEALTHY SCHOOL BUILDING

INTERDISCIPLINARY COLLABORATION:
- USERS
- AEC EXPERTS
- PUBLIC HEALTH EXPERTS
- POLITICIANS

MONITORING
MAINTENANCE

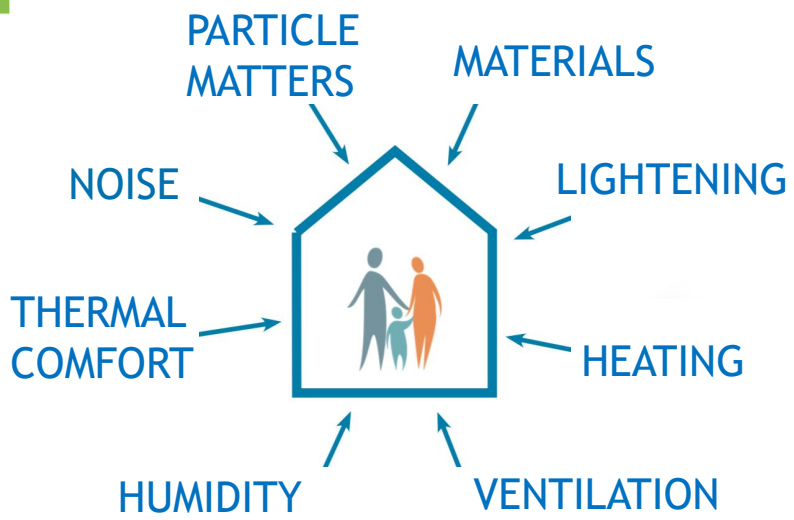
PROCES

STAKEHOLDERS

HEALTHY SCHOOL

BIM MODELS
3D VIRTUAL WORLDS
SIMULATIONS
SENSORS

TOOLS



International Conference on Integrated Problem-Solving Approaches to Ensure Schoolchildren's Health
Budapest, Hungary, 23-24 May 2019

THANK YOU

NIJZ National Institute of Public Health

Dr. Anja Jutraž / anja@jutraz.com – National Institute for Public Health, Slovenia

INFLUENCES ON HUMAN HEALTH

CHEMICAL INFLUENCES:
Environmental pollutants, contaminants in food, pharmaceutical, intoxicant, hazardous substances etc.

PHYSICAL INFLUENCES:
Climate, weather, heat, cold, radiation, current, light, colour, noise etc.

HUMAN

BIOLOGICAL INFLUENCES:
Microorganisms, plants, animals and foods etc.

PSYCHO-SOCIAL INFLUENCES:
Living and working conditions, stress, depression etc.