VENTILATIVE AND RESILIENT COOLING
IEA EBC ANNEXES 62 AND 80

PER HEISELBERG, DENMARK
PETER HOLZER, AUSTRIA

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IEA EBC ANNEX 62

VENTILATIVE COOLING

Per Heiselberg, Professor
Department of Civil Engineering

AALBORG UNIVERSITY
DENMARK

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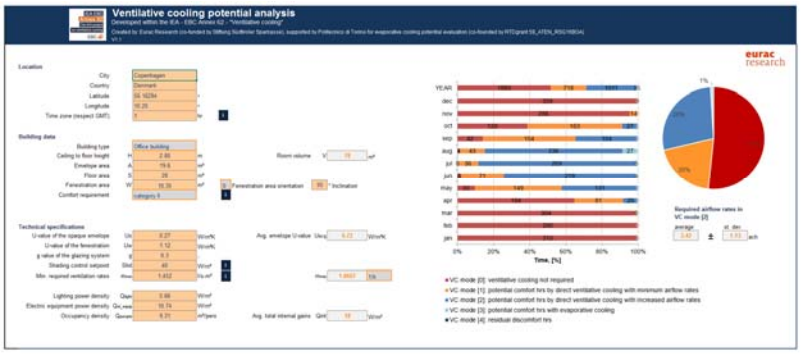
VENTILATIVE COOLING POTENTIAL

CHARACTERISTICS

- Can estimate climate potential
- Take into account building characteristics and loads
- Suggest potential relevant strategies
- Estimate necessary air flow rates



- VC mode [0]: ventilative cooling not required
- VC mode [1]: potential comfort hrs by direct ventilative cooling with minimum airflow rates
- VC mode [2]: potential comfort hrs by direct ventilative cooling with increased airflow rates
- VC mode [3]: potential comfort hrs with evaporative cooling
- VC mode [4]: residual discomfort hrs

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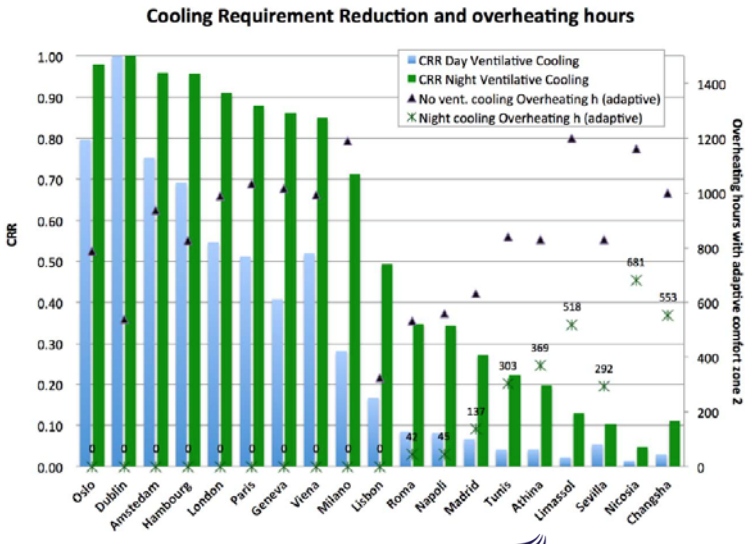
COOLING REQUIREMENTS REDUCTION (CRR)



$$CRR = \frac{Q_{t,c}^{ref} - Q_{t,c}^{scen}}{Q_{t,c}^{ref}}$$

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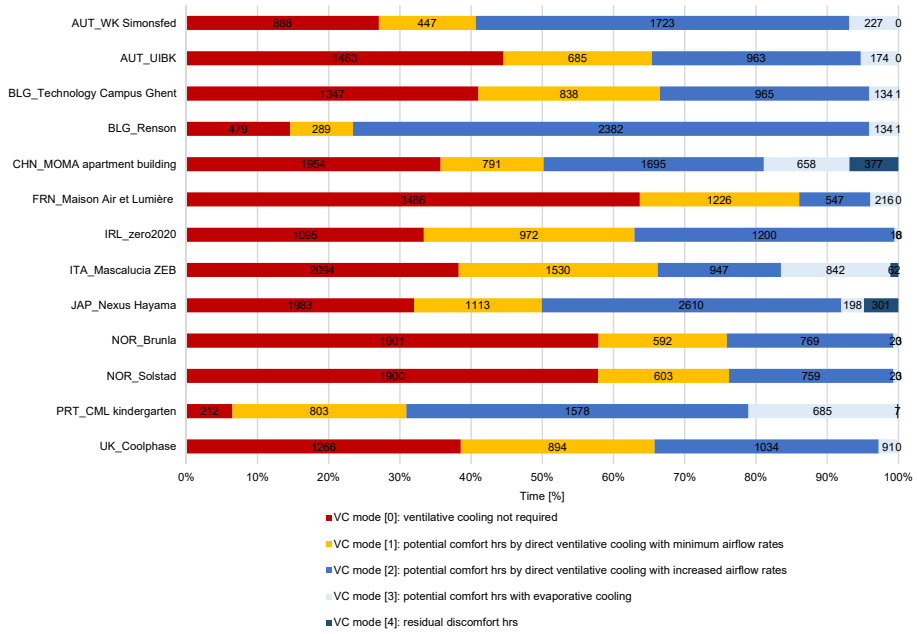
VENTILATIVE COOLING STRATEGIES



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LIMITATIONS

- Climate
  - Peak summer conditions and periods with high humidity reduce the applicability
  - Temperature increase due to climate change might reduce potential
- Urban location
  - Might reduce the cooling potential (heat island)
  - Reduced driving forces for natural systems (higher temperature and lower wind speed).
  - Elevated noise and pollutions levels might also be present
- Other
  - High energy use for air transport limit the potential for use of mechanical systems
  - Building design, fire regulations, security are issues that might decrease the potential use of natural systems

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AALBORG UNIVERSITY

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DESIGN INFLUENCES

Country		Building	Surroundings	Lower Initial costs	Lower Maintenance Costs	Lower Energy Costs	Reducing Solar Loads	Reducing Internal Loads	Reducing External Noise	High Internal noise	Elevated Air Pollution	Avoiding Rain Ingress	Insect Prevention	Burglary Prevention	Reduced Privacy
01	IE	Zero2020	R	H	M	H	H	L	L	L	L	M	L	H	M
02	NO.1	Brunla School	R	H	H	H	L	M	L	L	H	M	L	L	L
03	NO.2	Solstad Kindergarten	R	L	L	H	L	L	L	M	H	L	L	L	L
04	CN	Wanguo MOMA*	U	H	M	H	H	L	L	L	L	M	L	M	L
05	AT.1	UNI Innsbruck	U	H	H	H	M	L	M	L	L	M	L	L	L
06	AT.2	wkSimonsfeld	R	H	H	H	M	L	L	L	L	L	L	L	L
07	BE.1	Renson	R	L	L	M	H	H	H	H	M	H	H	L	L
08	BE.2	KU Leuven, Ghent	U	H	L	H	H	H	L	L	L	M	L	L	L
09	FR	Maison Air et Lumiere*	U	M	M	L	H	M	L	L	H	L	L	M	L
10	IT	Mascalucia ZEB*	R	H	M	H	H	L	L	L	L	L	L	M	L
11	JP.1	Nexus Hayama	R	M	M	H	H	L	L	L	L	M	H	H	M
12	PT	CML Kindergarten	U	H	L	L	M	M	L	L	L	M	M	M	M
13	JP.2	GFO	U	H	M	L	L	L	L	L	L	L	L	L	L
14	UK	Bristol University	R	H	H	H	L	H	L	M	L	M	M	H	L
15	NO.3	Living Lab*	U	L	L	H	H	M	L	M	L	H	L	L	L

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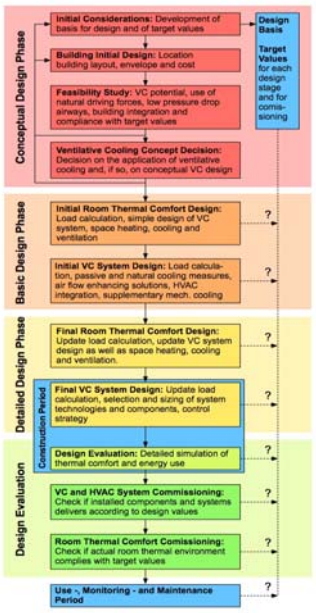
DESIGN CONSIDERATIONS



Look for when searching for solutions

- ✓ Possibility to use outdoor air without filtering
- ✓ Possibility to use direct airflow from/to outside without a noise problem, a control problem, a burglary, insect and/or rain problem
- ✓ Use exposed thermal mass in the building structure
- ✓ Use heat recovery in cold climates and in buildings with relatively low heat loads
- ✓ Use a large height difference between ventilation intake and exhaust to maximize stack effect and vertical temperature differences
- ✓ Use overflow between rooms either for supply- or extract side of ventilation
- ✓ Minimize need for ducting of ventilation air
- ✓ Minimize airflow rate by air distribution design that can provide low supply air temperatures with risk of draught

Avoid when searching for solutions

- Direct solar exposure of occupants
- Solar heating of intake air
- Negative effects from wind on buoyancy driven air flow
- Building design with little thermal mass exposed in intake air flow paths and in rooms
- Noise transfer from outside and from other rooms of building
- Inefficient room air distribution
- Air flow paths which do not allow easy inspection and cleaning

Ventilative cooling System: Need for supplementary cooling?						
Outdoor environment		**N**		**M**		**Y**
Cold (> 10°C from comfort zone)						
Temperate (2-10°C from comfort zone)						
Hot and dry (-2°C …. +2°C from comfort zone)						
Hot and humid						
Dense urban area with low wind speeds (low natural driving force)						
Dense urban area with high night temperatures (heat island)						
High pollution level in the area						
Noisy surroundings						
Building heat load level:		**N**		**M**		**Y**
Low heat loads < 20 W/m² during occupation	Cold (> 10°C from comfort zone) (heat recovery needed)					
	Temperate (2-10°C from comfort zone)					
	Hot and dry (-2°C …. +2°C from comfort zone)					
	Hot and humid					
Medium heat loads 20 -30 W/m² during occupation	Cold (> 10°C from comfort zone) (heat recovery needed)					
	Temperate (2-10°C from comfort zone)					
	Hot and dry (-2°C …. +2°C from comfort zone)					
	Hot and humid					
High heat loads > 30 W/m² during occuation	Cold (> 10°C from comfort zone) (heat recovery needed)					
	Temperate (2-10°C from comfort zone)					
	Hot and dry (-2°C …. +2°C from comfort zone)					
	Hot and humid					
Thermal comfort:		**N**		**M**		**Y**
High requirements for 95% of occupancy hours						
Normal requirements for 95% of occupancy hours						
Normal requirements for 80% of occupancy hours						
Requirements adaptive to outdoor conditions						
Building and system:		**N**		**M**		**Y**
Low level of exposed building thermal mass						
Moderate level of exposed building thermal mass						
High level of exposed building thermal mass						
High space- and use-flexibility						

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venticool
the international platform for ventilative cooling
IEA EBC
Annex 62
The IEA project
INFORMATION ON VENTICOOL
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Dear visitor,
Recent updates
AIVC 2019 Conference: Call for Abstracts & Topical Sessions
IEA EBC Annex 62 releases its final report on ventilative cooling
SAVE THE DATE for the 40th AIVC & 6th venticool conference 15-16 October 2019, Ghent, Belgium
AIVC 2018 Conference Programme available!
Energy Efficiency and Indoor Climate in Buildings is out! Edition of September 2018
venticool publishes new report on ventilative cooling!
Register now for the AIVC 2018 conference – Programme Overview now available
www.venticool.eu

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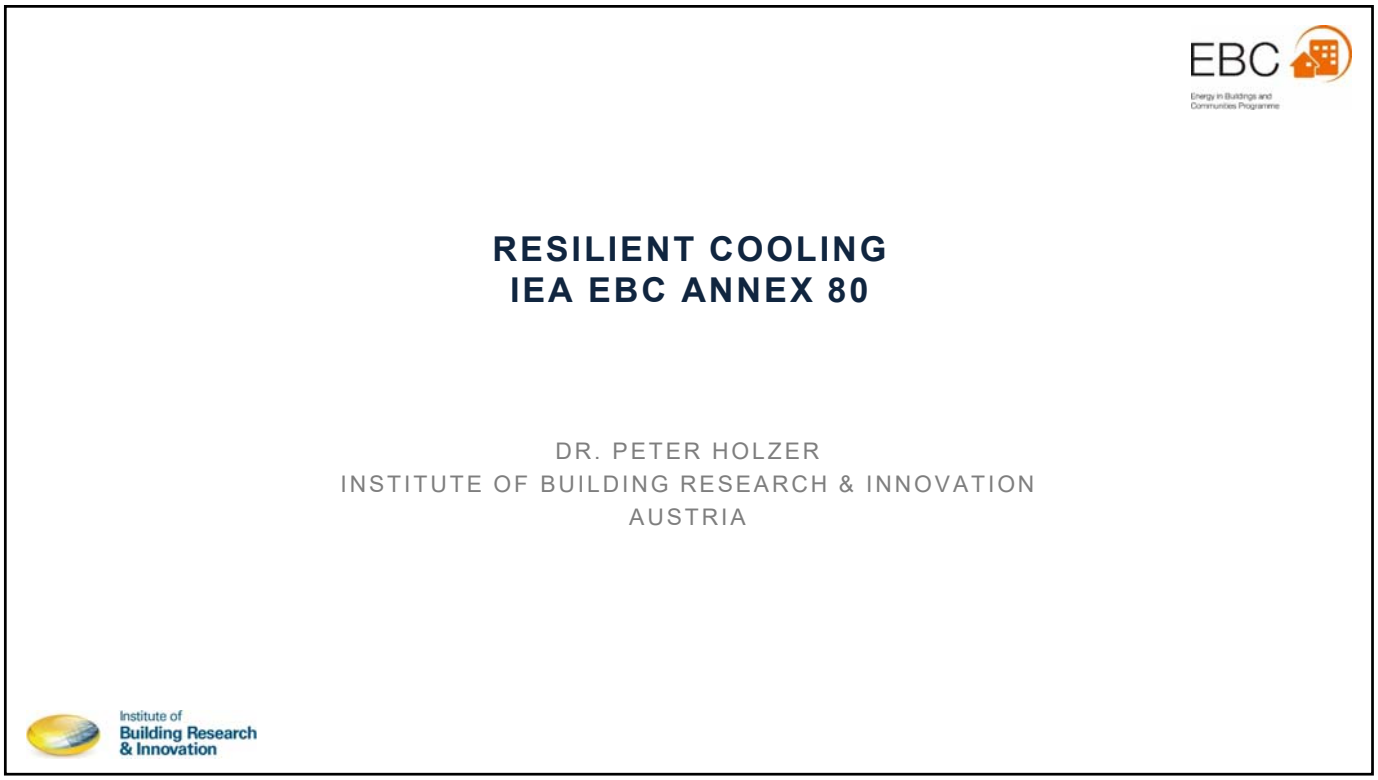
RESILIENT COOLING
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DR. PETER HOLZER
INSTITUTE OF BUILDING RESEARCH & INNOVATION
AUSTRIA
Institute of
Building Research
& Innovation

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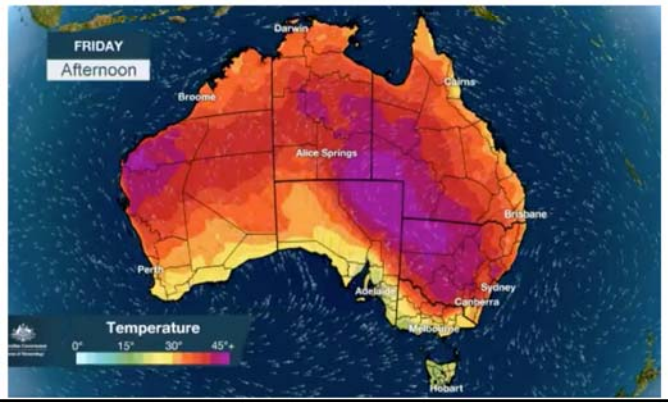
Australia heatwave: overnight minimum of 35.9C in Noona sets new record

On fifth day of record-breaking extreme weather, temperatures in parts of Victoria, ACT and NSW forecast to soar above 40C, including in Sydney's west

- 25 January - Australia extreme heatwave: Victoria and Tasmania face bushfire threat - live updates
- Extreme heat Melbourne: city expecting 44C as Victoria faces hottest day since Black Saturday



Source: https://www.theguardian.com/australia-news/2019/jan/18/australia-heatwave-sydneys-west-to-hit-45c-after-week-of-extreme-weather, 10.04.2019

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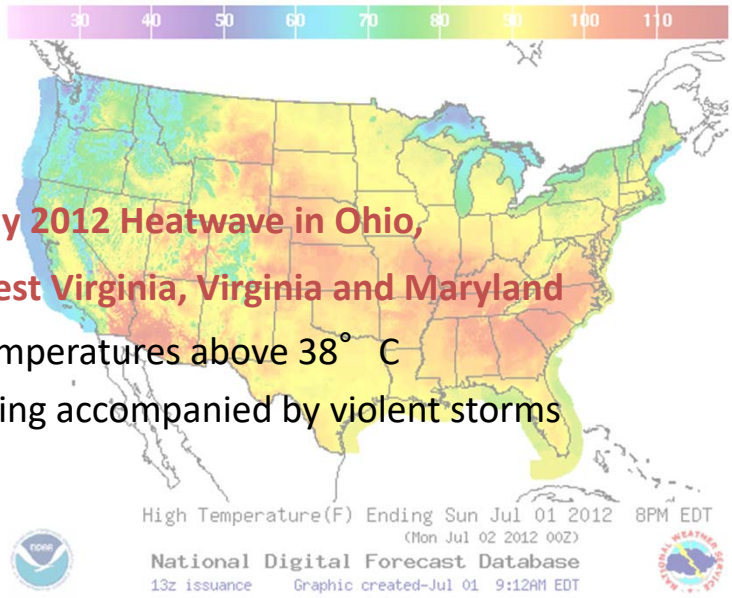

July 2012 Heatwave in Ohio, West Virginia, Virginia and Maryland

Temperatures above 38° C

being accompanied by violent storms

F	°C
60	16
62	17
64	18
66	19
68	20
70	21
72	22
74	23
76	24
78	26
80	27
82	28
84	29
86	30
88	31
90	32
92	33
94	34
96	36
98	37
100	38

http://koeppen-geiger.vu-wien.ac.at/pics/1976-2100-A1FI.gif

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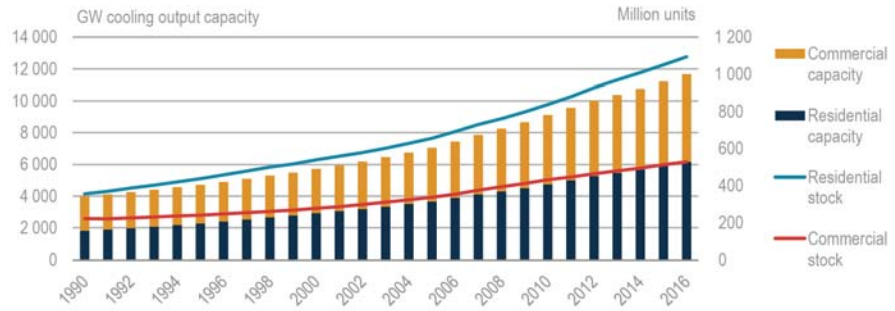
THE SURGE OF AIR CONDITIONING

25Y DEVELOPMENT OF STOCK AND CAPACITY OF AC WORLDWIDE



Tripling within 25 years !

Installed stock and cooling capacity of AC
Source: IEA Report Future of Cooling, 2018

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THREATS OF THE "AC SURGE"

- MAKING HOUSES EVEN MORE VULNERABLE
- MAKING OUTDOOR SPACES EVEN HOTTER AND LESS LIVEABLE
- CHALLENGING THE GOALS OF DECARBONISATION & CLIMATE PROTECTION
- RAISING THE DANGER OF GRID BLACKOUTS

Source: IEA Report Future of Cooling, 2018

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RESILIENT COOLING REQUIREMENTS

- RELIABILITY & FAILURE SAFETY
- AFFORDABILITY & ACCESSIBILITY
- ENERGY EFFICIENCY & CARBON NEUTRALITY
- SOCIAL INCLUSIVENESS

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AFTER DECADES OF COMFORT RESEARCH AND EFFICIENCY RESEARCH:

IT IS NOT ONLY ABOUT COMFORT.
IT IS ABOUT SURVIVAL.

IT IS NOT ONLY ABOUT EFFICIENCY.
IT IS ABOUT SUFFICIENCY AND RESILIENCE.

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ANNEX 80 OBJECTIVES

A **IDENTIFY AND DOCUMENT** POTENTIALS, LIMITATIONS AND BOTTLENECKS. OF COOLING SYSTEMS. PROVIDE GUIDANCE ON DESIGN, PERFORMANCE CALCULATION AND SYSTEM INTEGRATION OF RESILIENT COOLING.
→ SUBTASK A – IMPACT ASSESSMENT

B **DEVELOP AND IMPROVE** SYSTEMS AND TECHNOLOGIES.
DEVELOP NEW SOLUTIONS.
RESEARCH TOWARDS IMPLEMENTATION OF EMERGING TECHNOLOGIES.
EXTEND BOUNDARIES OF EXISTING SOLUTIONS,
INCLUDING USER INTERACTION AND CONTROL STRATEGIES.
→ SUBTASK B – SOLUTIONS

C **EVALUATE** THE REAL PERFORMANCE OF COOLING SOLUTIONS.
IDENTIFY PERFORMANCE GAPS AS WELL AS SUPPORTING CONDITIONS.
→ SUBTASK C – FIELD STUDIES

D **IDENTIFY AND SPREAD** BEST PRACTICE IN POLICY ACTIONS.
→ SUBTASK D – POLICY ACTIONS

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A WARM WELCOME TO STILL JOIN ANNEX 80

http://annex80.iea-ebc.org/

peter.holzer@building-research.at

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