IEA EBC Annex 80 - Resilient Cooling

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Climate Action, Environment,
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IEA EBC Annex 80

Series of webinars in cooperation with AIVC & venticool

1. **Indicators to assess resilience of cooling in buildings** [May 10, 15:00-16:15 CEST]
2. Future weather data and heatwaves [May 31, 16:00-17:15 CEST]
3. Examples of resilient cooling solutions [September 13, 15:00-16:15 CEST]
4. Case studies and policy recommendations [September 20, 15:00-16:15 CEST]

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Today‘s Programm

Programme (Brussels time)

15:00	**Introduction to Annex 80, AIVC & venticool** Peter Holzer, OA EBC Annex 80, Institute of Building Research & Innovation, AT	**15:40**	**Example of indicators and application to vulnerable buildings** Abdelaziz Laouadi, NRC, CA
15:05	**Definitions of resilient cooling of buildings & overview of indicators to assess resilience** Peter Holzer, OA EBC Annex 80, Institute of Building Research & Innovation, AT	**15:55**	**Questions and answers**
15:25	**Thermal resilient buildings: How to be quantified? A novel benchmarking framework and labelling metric** Mohamed Hamdy, Associate Professor, NTNU, NO	**16:15**	**End of the webinar**

IEA EBC Annex 80

EBC
Energy in Buildings and Communities Programme

Part 1: Introduction to Annex 80 and State of the Project

Part 2: Definitions of resilient cooling of buildings & overview of indicators to assess resilience

IEA EBC Annex 80

- **Participants**

  36 institutions from 16 countries (Americas, Europe, Asia, Australia)

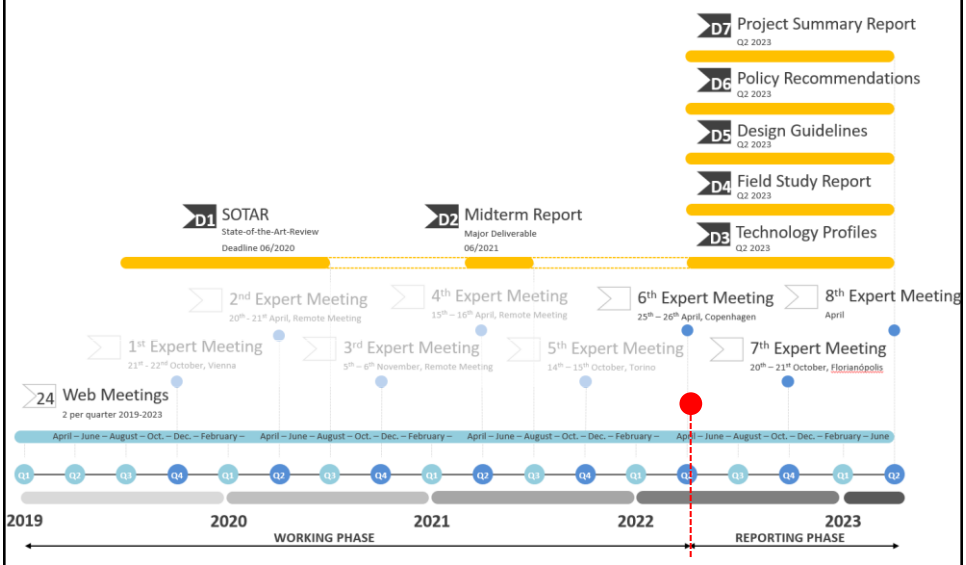
- **Guests** (not part of EBC yet)

  Mexico, **José Roberto Garcia Chavez**, Metropolitan Autonomous University Mexico City

  India, **Rajan Rawal**, CEPT University, CARBSE

1. Preparation Phase (1 year)
   June 2018 – June 2019
2. Working Phase (3 years)
   June 2019 – June 2022
3. Reporting Phase (1 year)
   June 2022 – June 2023

Annex 80 Roadmap



Annex 80 Objectives

*"Support a transition to an environment where **affordable low energy** and **low carbon** cooling systems are the mainstream and preferred solutions for cooling and overheating issues in buildings."*

A Assess benefits, potentials and performance indicators. Provide guidance on design, performance calculation and system integration.

B Research towards implementation of emerging technologies. Extend boundaries of existing solutions.

C Evaluate the real performance of resilient cooling solutions.

D Develop recommendations for policy actions.

Annex Subtasks

The Annex is structured in four subtasks:

A Fundamentals

B Solutions

C Field Studies

D Policy Actions

Subtask A – Fundamentals

Objectives:

- Definition of Resilient Cooling in terms of buildings
- Definition of Key Performance Indicators
- Composition of Resilient Cooling Design and Operation Guidelines (deliverable)

Definition of Resilient Cooling

"Affordable low energy and low carbon cooling solutions, strengthening the ability of individuals and communities to withstand and prevent the thermal - and other - **impacts of changes in global and local climates."**

Groups of Technologies

a. **Reduce heat loads to people and indoor environments**

b. **Remove sensible heat from indoor environments**

c. **Enhance personal comfort apart from space cooling**

d. **Remove latent heat from indoor environments**

Technology Review - Subtask B

A. Reduce heat load to indoor environments and people indoor
   1. **Advanced solar shading/advanced glazing technologies**
   2. **Advanced cool materials**
   3. **Green roofs, roof pond, green facades, ventilated roofs and ventilated facades**
   4. Thermal mass utilization including, PCM and off-peak ice storage

B. Remove sensible heat from indoor environments
   1. **Ventilative cooling**
   2. **Adiabatic/evaporative cooling**
   3. Compression refrigeration
   4. **Absorption refrigeration, including desiccant cooling**
   5. **Natural heat sinks, such as ground water, borehole heat exchangers, ground labyrinths, earth tubes, sky radiative cooling,**
   6. **High temperature cooling system: Radiant cooling, chill beam**

C. Enhance personal comfort apart from space cooling
   1. Comfort ventilation (elevated air movement)
   2. **Micro-cooling and personal comfort control**

D. Remove latent heat from indoor environments
   1. High performance dehumidification including desiccant humidification

Subtask B - Solutions

Objectives:

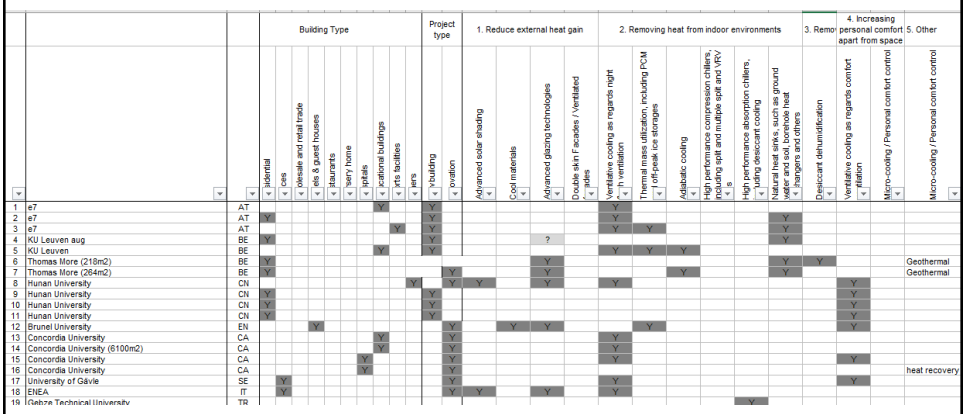
- Assessment of technologies in future weather scenarios
- Extension of range of resilient cooling systems
- Derivation of rules for successful implementation
- Composition of Technology Profile Sheets (deliverable)

Subtask C – Field Studies

Objectives:

- Analysis and evaluation of implemented Resilient Cooling Technologies
- Identification of barriers and performance gap examination
- Composition of Field Studies Report (deliverable)

Subtask C – Field Studies



			Building Type										Project type	1. Reduce external heat gain				2. Removing heat from indoor environments							3. Remo	4. Increasing personal comfort apart from space		5. Other
			Residential	Offices	Wholesale and retail trade	Hotels & guest houses	Restaurants	Sanitary home	Hospitals	Educational buildings	Sports facilities	Others	Retrofitting	Advanced solar shading	Cool materials	Advanced glazing technologies	Double skin Facades / Ventilated cavities	Ventilative cooling as regards night ventilation	Thermal mass utilization, including PCM	Adiabatic cooling	High performance compression chillers, including split and multiple split and VRVs	High performance absorption chillers, using desiccant cooling	Natural heat sinks, such as ground water and soil, borehole heat exchangers and others	Desiccant dehumidification	Ventilative cooling as regards comfort elation	Micro-cooling / Personal comfort control	Micro-cooling / Personal comfort control
1	e7	AT								Y			Y					Y										
2	e7	AT	Y										Y					Y					Y					
3	e7	AT									Y		Y					Y	Y				Y					
4	KU Leuven aug	BE	Y										Y			?							Y					
5	KU Leuven	BE								Y			Y					Y	Y	Y								
6	Thomas More (218m2)	BE	Y													Y							Y	Y				Geothermal
7	Thomas More (264m2)	BE	Y											Y		Y				Y			Y					Geothermal
8	Hunan University	CN										Y		Y	Y			Y								Y		
9	Hunan University	CN	Y										Y													Y		
10	Hunan University	CN	Y										Y													Y		
11	Hunan University	CN	Y										Y													Y		
12	Brunel University	EN				Y								Y		Y	Y		Y							Y		
13	Concordia University	CA								Y				Y				Y										
14	Concordia University (6100m2)	CA								Y				Y				Y										
15	Concordia University	CA							Y					Y				Y								Y		
16	Concordia University	CA							Y					Y														heat recovery
17	University of Gävle	SE		Y										Y				Y								Y		
18	ENEA	IT		Y										Y	Y		Y	Y										
19	Gebze Technical University	TR																				Y						

Subtask D – Policy Actions

Objectives:

- Support implementation and mainstreaming of Resilient Cooling Technologies
- Develop recommendations for regulatory policies (labelling programmes, building regulations, standards and compliance requirements)
- Report on recommendations for legislation and standards (deliverable)

Subtask D – Policy Actions

Annex 80 Deliverables

D1	State-of-the-Art-Report	▪ Research community and associates ▪ Real Estate developers ▪ Urban planning experts ▪ Policy makers	OA, STA, STB, STC, STD
D2	Midterm Report	▪ Research community and associates ▪ IEA and EBC Programme	OA, STA, STB, STC, STD
D3	**Technology Profiles**	▪ Building component developers and manufacturers ▪ Architects and design agencies ▪ Engineering offices and consultants	STB
D4	**Field Studies**	▪ Building component developers and manufacturers ▪ Architects and design agencies ▪ Engineering offices and consultants ▪ Real Estate developers	STC
D5	**Design and Operation Guidelines**	▪ Architects and design agencies ▪ Engineering offices and consultants ▪ Real Estate developers	STA, STB, STC
D6	**Recommendations for policy actions, legislation and standards**	▪ Policy makers ▪ Legal interest groups ▪ Experts involved in building energy performance standards and regulation	STD
D7	**Project Summary Report**	▪ Research community and associates ▪ IEA and EBC Programme ▪ Real Estate developers ▪ Policy makers	OA, STA, STB, STC, STD

Annex 80 Publications

1. "**Developing an understanding of resilient cooling**: a socio-technical approach City and Environment Interactions" (Wendy Miller et al; published in Elsevier City and Environment 2021) https://doi.org/10.1016/j.cacint.2021.100065
2. "**Resilient cooling of buildings to protect against heat waves and power outages**: key concepts and definition" (Shady Attia et al; published in Energy and Buildings 2021) https://doi.org/10.1016/j.enbuild.2021.110869
3. "**Resilient cooling strategies - a critical review and qualitative assessment**" (Chen Zhang et al; published in Energy and Buildings 2021) https://doi.org/10.1016/j.enbuild.2021.111312
4. Report of Thermal Conditions Task Group "**Framework to evaluate the resilience of different cooling technologies**" (Shady Attia et al; published) http://dx.doi.org/10.13140/RG.2.2.33998.59208