Resilient Cooling Technology Profiles from the EBC Annex 80

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SUMMARY

The world is facing a rapid increase of air conditioning of buildings. This is driven by multiple factors, such as urbanisation and densification, climate change and elevated comfort expectations together with economic growth in hot and densely populated climate regions of the world. The trend towards cooling seems inexorable therefore it is mandatory to guide this development towards sustainable solutions.

Against this background, it is the motivation of Annex 80 to develop, assess and communicate solutions of resilient cooling and overheating protection. Resilient Cooling is used to denote low energy and low carbon cooling solutions that strengthen the ability of individuals and our community as a whole to withstand, and also prevent, thermal and other impacts of changes in global and local climates. It encompasses the assessment and Research & Development of both active and passive cooling technologies.

A wide range of cooling technologies and solutions is already available. Nevertheless, significant joint efforts are still needed to really guide the mainstream development of cooling into the direction of sustainability and resilience. The Resilient Cooling Technology Profiles systematically assess existing cooling technologies, their potentials, limitations, qualities of resilience and identify barriers as well as conductive conditions to implementation. The aim is to provide well-structured collection of technology descriptions. The Technology Profiles shall support decision makers within the process of urban planning, building investment and building design with well-structured information to draw their attention towards resilient cooling options.

The list of technologies assessed is based on the list of technologies that have already been subject of the EBC Annex 80 State of the Art Report. A total of 16 Technology Profiles have been developed, each one having a maximum of 2500 characters and/or 5 pages, excluding images and tables. The following table presents a summary of the technologies covered.

Table 1: List of Resilient Cooling Technology Profiles

1.	**Reducing Heat Loads to People and Indoor Environments**
1.1.	Solar Shading Technologies
1.2.	Cool Envelope Materials
1.3.	Glazing Technologies
1.4.	Ventilated Façades
1.5.	Green Roofs and Green Façades
2.	**Removing Heat from Indoor Environments (Production, Emission and Combined)**
2.1.	Ventilative Cooling
2.2.	Thermal Mass Utilization
2.3.	Evaporative Cooling
2.4.	Sky Radiative Cooling
2.5.	Compression Refrigeration
2.6.	Adsorption Chillers
2.7.	Natural Heat Sinks
2.8.	Radiant Cooling

3.	**Increasing Personal Comfort Apart from Space Cooling**
3.1.	Comfort Ventilation and Elevated Air Movement
3.2.	Micro-cooling and Personal Comfort Control
4.	**Removing Latent Heat from Indoor Environments**
4.1.	Dehumidification

For every Technology Profile an author or team of authors within the Annex 80 group was assigned corresponding on the field of expertise.

Each Technology Profile is composed of 4 chapters. The description gives information about the physical principles, the function, and the characteristic applications of the specific Resilient Cooling Technology. Further, relevant subtypes are also listed. In the next chapter, called Key Technical Properties, information about relevant technical qualities and indicators of the specific Resilient Cooling Technology are given. Also, properties of the technology which are relevant when designing and/or purchasing the system are characterized. The third chapter, Performance and Application, gives information on the possible effect of the specific technology on the whole building performance, also describing synergies with others technologies. Special information is given, in which way the specific technology contributes to qualities of resilience in the meaning of the Annex 80's definition of resilience of a building against heat waves with or without power outage and against long-term climate change. Exemplary quantitative outputs from the simulation studies, for indicative building types in indicative climate zones in the midterm future is provided in most Technology Profiles. Information about the range of possible applications as well as about limitations of the specific technology is given, including aspects of climate dependency, building type, physical influences, such as internal gains, solar gains, ventilation, information about compatibility and incompatibility with other technologies and information about recent level of availability and about expected developments ahead. The final chapter, Further Reading, is offering links to further information to the reader if desired.

The outcome of the collaboration are 16 created Technology Profile Sheets giving recommendations for good implementation, commissioning and operation, barriers to application and opportunities. These shall support the Annex 80 mission of a rapid transition to an environment where resilient low energy and low carbon cooling systems are the mainstream and preferred solutions for cooling and overheating issues in buildings.

KEYWORDS

Cooling Technologies, Resilient Cooling, Resilience, Technology Profiles, Technology Descriptions

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