EUROPEAN AUTOCLAVED AERATED CONCRETE ASSOCIATION
ASSOCIATION EUROPEENNE DES FABRICANTS DE BETON CELLULAIRE
VERBAND DER EUROPÄISCHEN PORENBETONINDUSTRIE

Sustainable construction
to mitigate and anticipate climate change

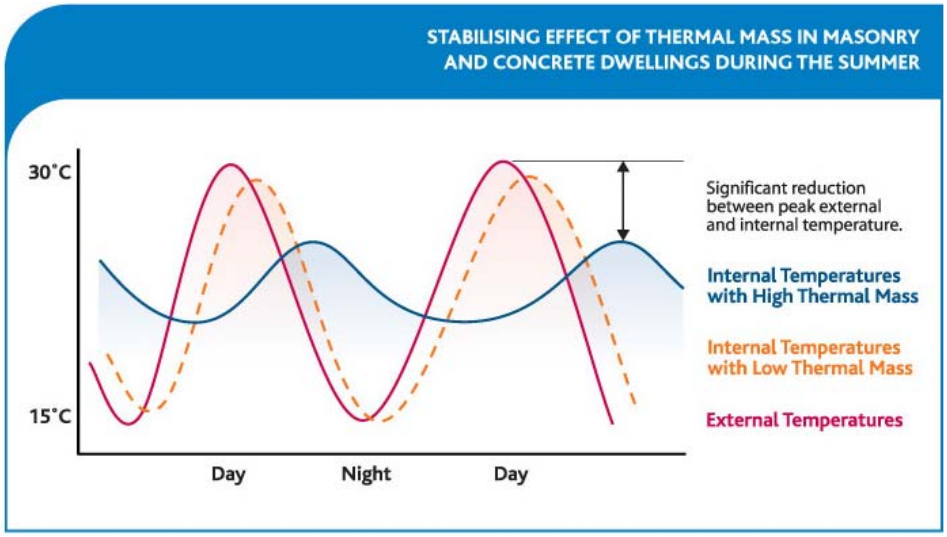
As we have heard, buildings have an impact on energy use and on the climate, therefore we should develop solutions to minimise (and in a longer term neutralise) their energy consumption. But buildings should also be prepared to resist to the consequences of a changing climate. The overall concerns about changing climate and the importance of saving energy have been the cornerstones of EU activities for a few years now. Considering the urgency of the issue and forthcoming initiatives, this thematic focus will remain over the coming months and years. The specific need, not only to mitigate, but also to adapt to the adverse effects of climate change are therefore in the institutional spotlights. In this regard, I would like to pay tribute to the work of European institutions towards a “White Paper on adaptation to the adverse impacts of climate change”, which we will be particularly interested to see in the coming months.

What are the current and foreseeable consequences of climate change? Higher summer temperatures, stronger winds, flooding, other weather events …
How can AAC help to combat some the likely issues associated with Climate Change? Let us quickly look at few of the concerns associated with this.

Summer overheating.

The higher average temperatures that are expected because of climate change make summer overheating a potential problem. As we make our buildings more thermally efficient and airtight, so the tendency is to trap heat within a building during warm periods. This heat is unable to escape if we do not design the building properly. A requirement of some National Regulations is that the designer must check for summer overheating. Thermal mass is recognised as one means of reducing this effect, providing ‘passive cooling’. With heavier materials used in homes, such as masonry construction, the overall temperature is cooler since the products, such as AAC, absorb the heat in the daytime and release this stored heat at cooler times. Summer Overheating is typically a problem for light framed systems. An example is shown here with external temperatures over a few days giving the external temperature shown in red and orange as the internal temperature where low thermal mass is used. It can be seen that the internal temperature closely follows the outside.

In the case of high thermal mass (shown in blue) the peaks of toughs of the external temperatures are evened out to provide a much more comfortable internal temperature throughout the day. Therefore 'passive cooling and heating' should be further emphasised in the EPBD.



EAACA members have expertise in low-energy and climate-resilient buildings. The 'Green House' Project in the UK is a good example of this. In this project shown, the design was to produce a 'zero carbon' building with a very high level of thermal insulation and airtightness. Thermal modelling with expected predicted summer temperatures showed that shading and overhangs alone would not prevent the house from overheating to an acceptable level, and a combination of thermal mass and night-time ventilation would ease this situation. Hence, we know that in the Mediterranean areas the walls are heavy and we have learnt from our ancestors is this respect with old historic buildings.

Air quality also becomes an issue, and again the balance between temperature v air quality v insulation has to be carefully thought about. The house was designed and constructed using solid AAC walls with external thermal as an envelope and all internal walls and floors were of concrete and AAC construction.

Houses with higher mass also have a beneficial effect on the heating pattern in wintertime. When and if the heating system is turned off during the day, the stored heat in the walls is gradually emitted keeping the internal temperature more even. National building codes should better reflect these future requirements.

Flooding

Climate change is likely to mean milder, wetter winters and hotter drier summers in parts of Europe, whilst sea levels will continue to rise. These factors will lead to increased and new risks of flooding within the lifetime of planned developments. In addition, short intense rain-storms are becoming more frequent, often causing severe local flooding, particularly in urban areas with high density development and undercapacity of drainage systems.

To design buildings for flooding, it is worth looking at the UK recommendations based on the selection of either a Water Exclusion Strategy or a Water Entry Strategy. AAC can be used as part of either strategy but performs particularly well in a Water Exclusion Strategy, and in the UK is a recommended material choice, since it can resist moisture ingress for a considerable time and is not damaged by flood water, keeping repairs to a minimum.

Wind speeds are almost certainly likely to rise. The incidence of higher wind speeds has already been seen earlier this year in Northern Spain and SW France and even tornadoes have been evident in Maubeuge (some 80km from Lille) in 2008, causing great damage. Our buildings therefore need to be strong and rigid enough to withstand such forces of nature.

But with high winds often comes an increased incidence of wind driven rain. This again is a potential problem with water ingress increasing becoming a problem. AAC houses have been built in such locations where, with a protective coat of external render or cladding, they can be

made to be weather tight against the elements. Detailing becomes a significant aspect of this, but a good combination of thermal efficiency and weather resistance can be achieved.

Depending upon the location in Europe increased temps can lead to the emigration of new insect, pest as well as decay problems, which do not currently exist. We are seeing in the UK new forms of insects that could potentially damage houses and resilient materials such as AAC are need against theses new threats. Higher temps and moisture content can also potentially lead to mould and algae growth as well as decay and sustainable material has to be carefully selected.

In conclusion, low energy buildings is a necessary, but not sufficient design criterion; a balance design of material, which can withstand the future climate challenges as well as low wastage, will also be needed. Higher summer temperatures, stronger winds, more frequent flooding and other extraordinary weather events are among the likely adverse effects of climate change. Resilience, passive heating and cooling are some of the strengths of AAC building structures. Building structures will need to be adapted to these new conditions: more resilient, further use of passive cooling (to face hotter temperatures without increasing the use of air conditioning), etc.

We need to consider sustainability since we are building today for tomorrow's needs: Future weather conditions should be anticipated in today's design rules. We would be happy to provide you with further information on this issue, or propose visits to AAC buildings.

Cliff Fudge
Vice-Chairman of EAACA