

**Title:**

WG Sustainability and Comfort

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**Abstract:**

Targeting the environmental efficiency of membrane architectures, their organic shape, the minimum weight, the high flexibility, the translucency of the materials, the fast installation and low maintenance, all are pivotal aspects to be considered and assessed.

Thinking about sustainability of membranes means to understand deeply their life cycle and the strategies and possible actions for their end of life scenarios. The differences between the use of permanent or temporary membrane structures drive different life spans and consequently, the focus on the end of life of the components and materials should be improved to support circularity.

The approach of the Life Cycle Assessment comparison between different membrane materials and technical elements allows, on one hand, to check the environmental impacts generated during the production of the materials and, on the other hand, to deepen the eco-profile of the chosen technical solution and, consequently, on the sizing of the structural system, through the comparison of the weight of the materials, which are transformed into technical elements. Coherently, the application of a comparative LCA in membrane architecture is the appropriate procedure to quantify and compare the environmental impacts and consumption of materials and energy throughout the whole life cycle, within the following levels: Life cycle of matter, Life Cycle of building components, Life Cycle of a whole membrane building.

At the same time analysing the processes and economical circularity means from one side to focus on the end of life scenarios, to deepen the eco-efficiency, to improve sustainability of the existing materials, and from the other side to exploit and discover new sustainable materials, made from eco-efficient / bio-based materials or from recycled materials.

The last tendencies orient towards the nearly zero energy consumption / zero energy buildings during the operational phase, nearly zero emissions from buildings that do not emit harmful emissions and nearly zero residues / zero waste at the end of life. Our aim is to try to give answers to the 6R's explained (STEAM Learning Ltd, 2020): Rethink: what could be done differently?

Refuse: are there materials a designer should not use? Reduce: can the use of materials be reduced?

Reuse: can the product be used again for another purpose?

Recycle: can materials be used that are easy to recycle when the product is finished with?

Repair: can the product be repaired instead of thrown away?

The following topics are analysed:

1. Life Cycle Design, considering circularity and end-of-life possibilities in membrane architecture, LCA analysis of membrane structures and materials, evaluation of the aspects of sustainability and efficiency for and during the design of membrane structures and focus on end-of-life practices for membrane buildings.

2. Material innovation, aiming for low-tech approaches for membrane structures to broaden application potential, eco-efficiency of existing membrane materials and leaving fossil-based raw materials, towards bio-based membrane materials.