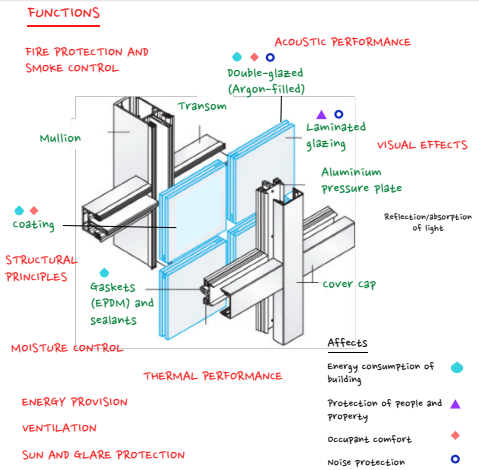

Figure 1: Highlights the many functions and complexity of the modern-day building envelope (typical DGU)

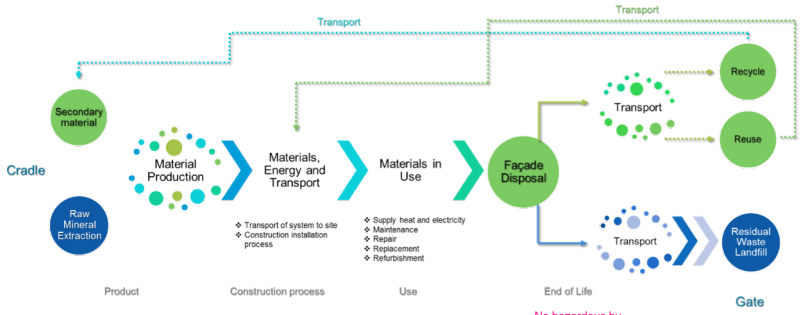

Figure 2: Transition through the façade lifecycle in terms of energy used

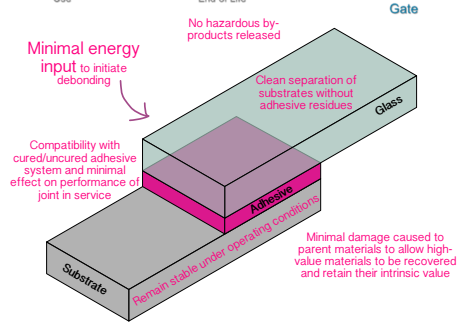

Figure 3: Factors to consider and evaluate in debonding effectiveness

Addressing the end-of-life challenges in façade design

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Overview | Over the past few decades, the building envelope has significantly evolved in design complexity to meet increased legislation on energy performance during building operation. Facades are often designed without consideration for end-of-life and the process of recovery of constituent materials. An increasing number of parts and more permanent connections have endorsed hybrid composite systems that are difficult to take apart at end-of-life (Fig.1). This research aims to address the existing technical barriers to the recovery of façade materials at the end-of-life and highlight the environmental savings that better recovery strategies would bring.

Outcomes and Impact | This research will develop a simple tool to help identify the best approach from an environmental perspective for the recovery of materials from different curtain walling designs, taking into account the whole-life energy performance (Fig.2) and material deterioration. Further, the effectiveness of different technical methods to enable reuse, including the separation of laminated glass and debonding of adhesives (Fig.3), will be closely evaluated through experimental research. As low-carbon and zero energy buildings (ZEBs) become more common it is important to look for ways to improve the end-of-life opportunities for façade systems in order to avoid simply shifting the energy use in the material lifecycle and to optimise the useful lifetime of all components.

Work Involved | During the first year, the PhD research outlined the existing barriers and opportunities to façade reuse through a semi-structured interview with various stakeholders from the façade supply-chain and consequently developed a simple model to analyse different end-of-life scenarios for façade materials. During the second and third year, experimental research will be conducted to develop methods that address the technical barriers to reuse in terms of laminated glass and adhesive removal. Further, an environmental assessment tool will be developed to apply to more façade systems and incorporate whole-life performance.

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