

Adaptive Façades in Practice: Investigating Predesign Challenges and Opportunities for Sustainable Architecture

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Abstract: Adaptive façade systems have emerged as an advanced technology, offering thermal control and modulating daylighting while lowering energy consumption, all of which contribute to supporting the liveability of dense urban communities. These systems provide significant financial and ecological benefits, which render them a prudent future investment towards developing sustainable cities and communities. Nevertheless, it requires larger initial investments, which could hinder their adoption in facade designs. This study aims to investigate practitioners' perspectives on adaptive façades' potential in advancing sustainable, energy-efficient architecture, with particular emphasis on addressing the challenges they face during the predesign phase of adoption. An online survey was administered to collect professional opinions from architects, engineers, and other professionals from several regions. Despite professionals' respect for the lasting advantages of energy efficiency and occupants' comfort, key findings identify several challenges to implementing adaptive façades, including a lack of awareness among customers, high initial expenditures, and a shortage of experienced specialists. The initial cost of the systems and maintenance was highlighted by the respondents as a key challenge. The study offers a set of recommendations to overcome the identified challenges, including the value of raising awareness through workshops, training, and real-world case studies that support the creation of a sustainable built environment.

Keywords: Adaptive façade; Architecture practice; Pre-design stage; Sustainable architecture

Main highlights:

Lack of customers' awareness and specialists' experience are key challenges of adaptive facade adoption.

The practitioners consider the initial cost of adaptive systems as a key challenge

Educational programmes integrating adapted façades are seen by practitioners as helping increase awareness

Practitioners generally hold moderate to strong optimism about adaptable façades in relation to saving energy.