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Life Cycle Thinking and Integrated Product Deliveries in Renovation Projects: Extending the Concept of Integrated Product Deliveries to Product Service Systems

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The term "Integrated product deliveries (IPD)" encompasses complex building solutions, that not only include building materials and components but also different necessary services linked directly to them, as design and planning tasks, production, assembly, delivery and construction work. Furthermore, IPDs are produced in an industrial context, allowing higher quality products at competitive costs. Expanding the term to also include services during the components use phase and continued responsibility for the end-of-life, offers new possibilities for enhancing the sustainability of building components.

The Danish building stock with its specifically high allocation of multi-storey social housing blocks from the 1960s and 70s, built mainly from prefabricated, modularized concrete elements in combination with new low energy building regulations creates a great market potential for IPDs aiming at the renovation of this building typology.
With the current focus on reducing the energy demand of buildings, the impacts related to the production and construction of buildings seem to be underestimated. At the same time it seems that there are no incentives for a more material-focused approach in product development in the construction sector, as building materials usually have relatively low values and - in general – seem not to be dependent on yet-scarce resources.
Sustainable IPDs can be categorized into two main streams – "sustainable by design" and "sustainable through operation". The first type represents a sustainable product at the cradle-to-gate stage, while IPDs belonging to the second category will have produced considerable benefits to the buildings overall sustainability at the end-of-life.

The research presented is mainly based on case studies on renovation projects from Denmark, using different forms of IPDs for façade renovation and discusses the different stakeholder's perspectives on life cycle thinking and their interests and values regarding sustainable building.
Furthermore is the concept of Product Service Systems (PSS) as a valuable extension to the concept of IPDs discussed. Due to extended product responsibility, the concept of PSSs will offer new possibilities of planning and pre-defining life cycles of IPDs more precisely than for regular building components. Reducing or eliminating point-of-sales will induce producers to optimize IPDs with regard to longevity and adaptability.

The new type of service-focused IPD and the related life-cycle responsibility (development, building phase, maintenance and dismantling/adaption/recycling) creates incentive to integrate life cycle thinking into the development process of IPDs, resulting in more sustainable building solutions with a greater extend of positive environmental, economical and social impacts.
The research presented will also show the importance of adaption and configuration of these complex building components by architects and planners, as they will have a great influence on the building's design and in effect the durability of not only the chosen solution, but also the whole building.

Another main driver for connecting IPDs and PSS and thus expanding the producer's responsibility for the product delivery, is the clients' request for reducing risks in renovation projects. The combination of high quality building components, economical security and defined performance over an agreed time span can be the key factor to access the marked for renovation of subsidized housing.