

Life Cycle Analysis of the Adaptive Solar Facade[☆]

M. Jansen^{a,*}, P. Jayathissa^{a,**}, N. Heeren^b, S. Hellweg^b, A. Schlueter^a

^a*Architecture and Building Systems, Institute of Technology in Architecture,
ETH Zurich, Switzerland*

^b*Ecological System Design, Institute of Environmental Engineering,
ETH Zurich, Switzerland*

Abstract

Text

Keywords: Adaptive Solar Facade, Life Cycle Analysis

1. Introduction

- In the last decades, building integrated photovoltaics (BIPV) have been adopted as part of the energy strategy towards 2050... (advantages of BIPV, potential of BIPV)

- The current developments of light weight efficient thin film technologies have brought new design possibilities for architects in BIPV design... (Adaptive Building Envelopes, Envelope is the barrier between the internal and external environment, Advantages, seamless coupling with solar tracking mechanics)

- The aim of this paper is to analyse the life cycle emissions of an adaptive solar facade and provide comparisons with standard shading systems and static BIPV solutions.

[☆]This document is a collaborative effort.

*Corresponding author

**Principal corresponding author

Email addresses: m.jansen@student.ethz.ch (M. Jansen),
jayathissa@arch.ethz.ch (P. Jayathissa), heeren@ifu.baug.ethz.ch (N. Heeren),
hellweg@ifu.baug.ethz.ch (S. Hellweg), schlueter@arch.ethz.ch (A. Schlueter)

2. Life cycle analysis methodology

The analysis is performed according to ISO14040, ISO14044 and ISO15804...

- Impact category: GWP
- Functional unit: m² (shading) and kWh (PV)
- Scope and system boundaries: embodied, operational, disposal
- Cut-off method used
- Recipe midpoint H allocation method

$$G = \frac{\text{GWP}}{\text{I} \cdot \eta \cdot \text{PR} \cdot \text{LT} \cdot \text{A}} \quad (1)$$

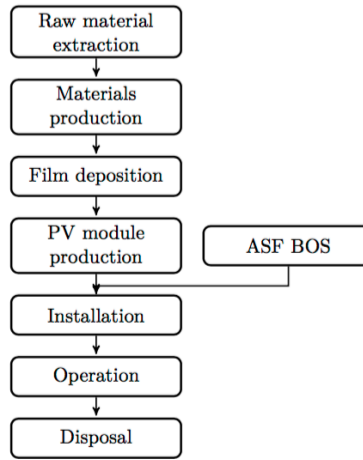


Figure 1: Thin-film incl. BOS (e.g. supporting structures and systems) analysis

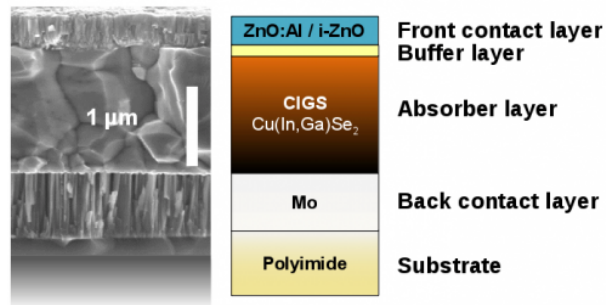


Figure 2: CIGS thin film structure MAKE OWN GRAPH, DO NOT USE THIS ONE FOR FINAL

3. Adaptive solar facade environmental profile (Environmental Performance of the Adaptive Solar Facade?)

The results of the analysis can be summarised in Figure 3...

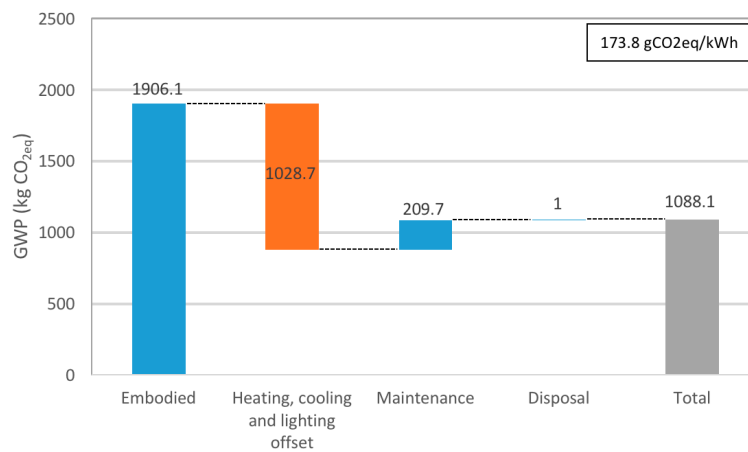


Figure 3: Build-up of total GWP of the ASF

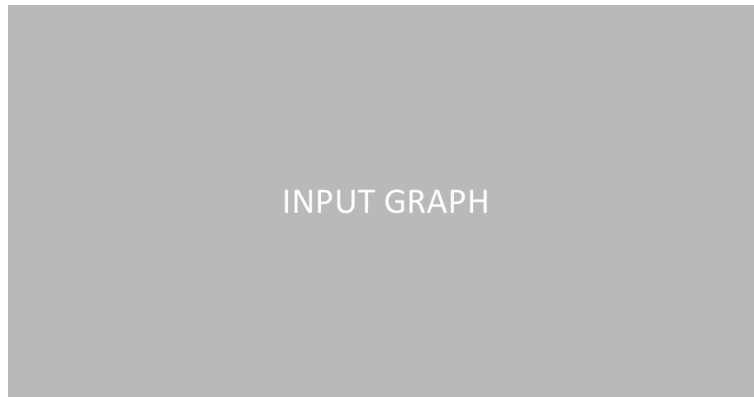


Figure 4: Monte carlo simulation based on input uncertainties

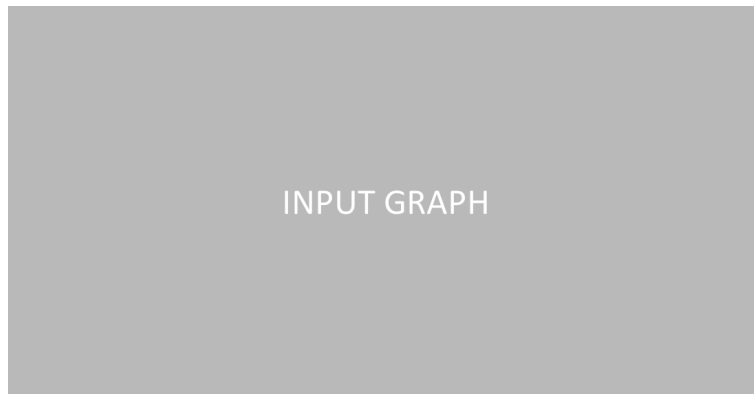


Figure 5: Sensitivity analysis based on sourcing location

4. Comparison to other technologies

The adaptive solar facade was compared with standard facade shading systems and other static BIPV solutions...

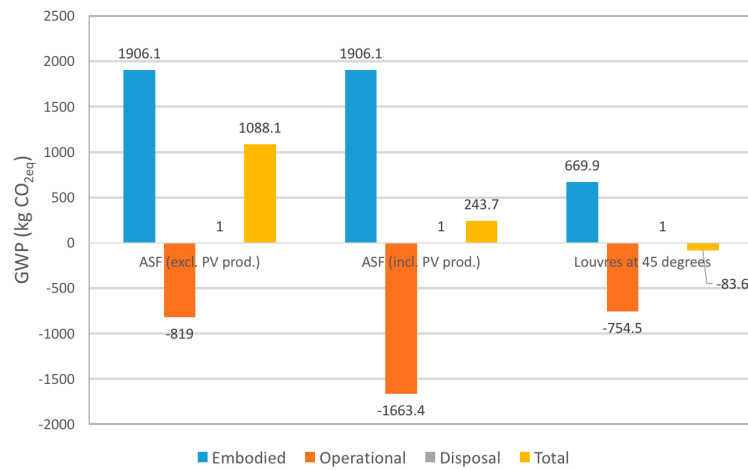


Figure 6: GWP comparison for adaptive solar facade and louvres

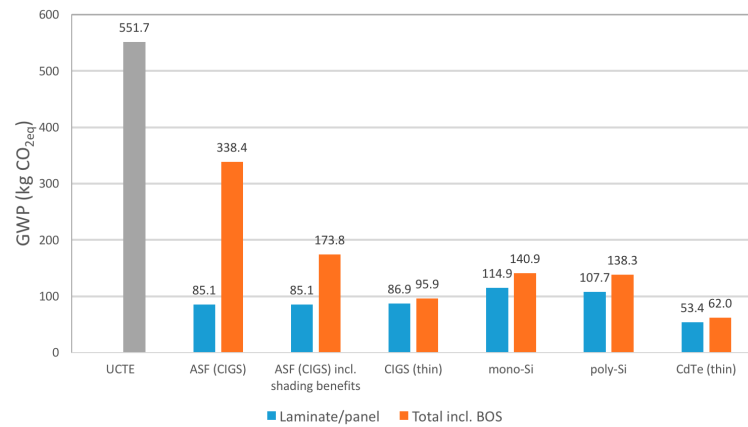


Figure 7: PV comparison for adaptive solar facade and other facade-mounted systems

5. Conclusion

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6. Acknowledgments

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