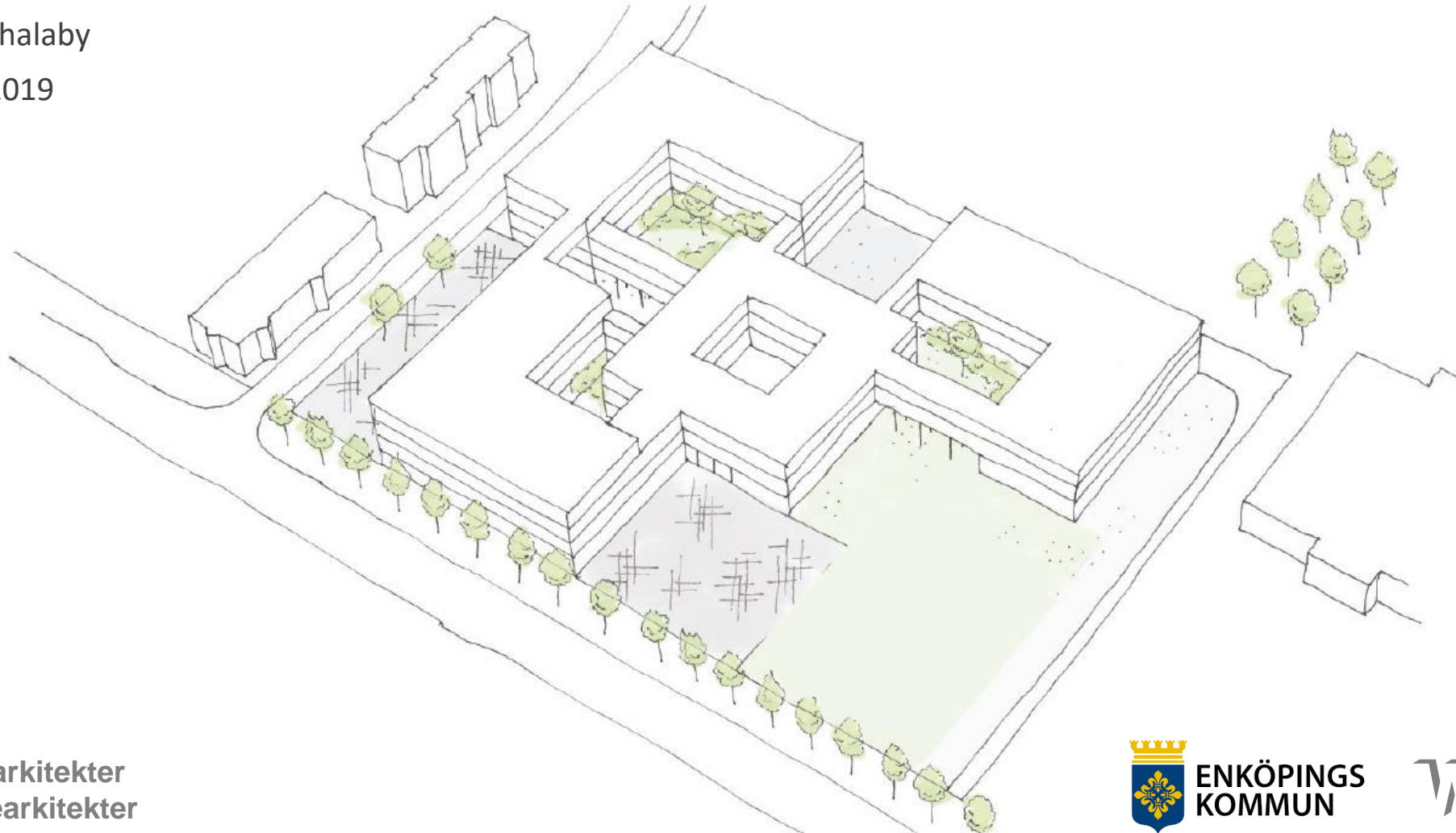


DAYLIGHT: A CONCEPT AND A DESIGN DRIVER

THE CASE STUDY OF ENKÖPING NEW SCHOOL

Maha Shalaby

09-10-2019



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Photo by: Kent Klich, Saint Petersburg, 2001-18, ethnography museum, Stockholm

- **Integrating the simulation process with the design process**
- **Simulation tools and interoperability between software**
- **Simulation results (Sunlight, Daylight, and Comparison with European Standard)**
- **Conclusions and recommendations**

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ANGERAINI



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ANDREAS
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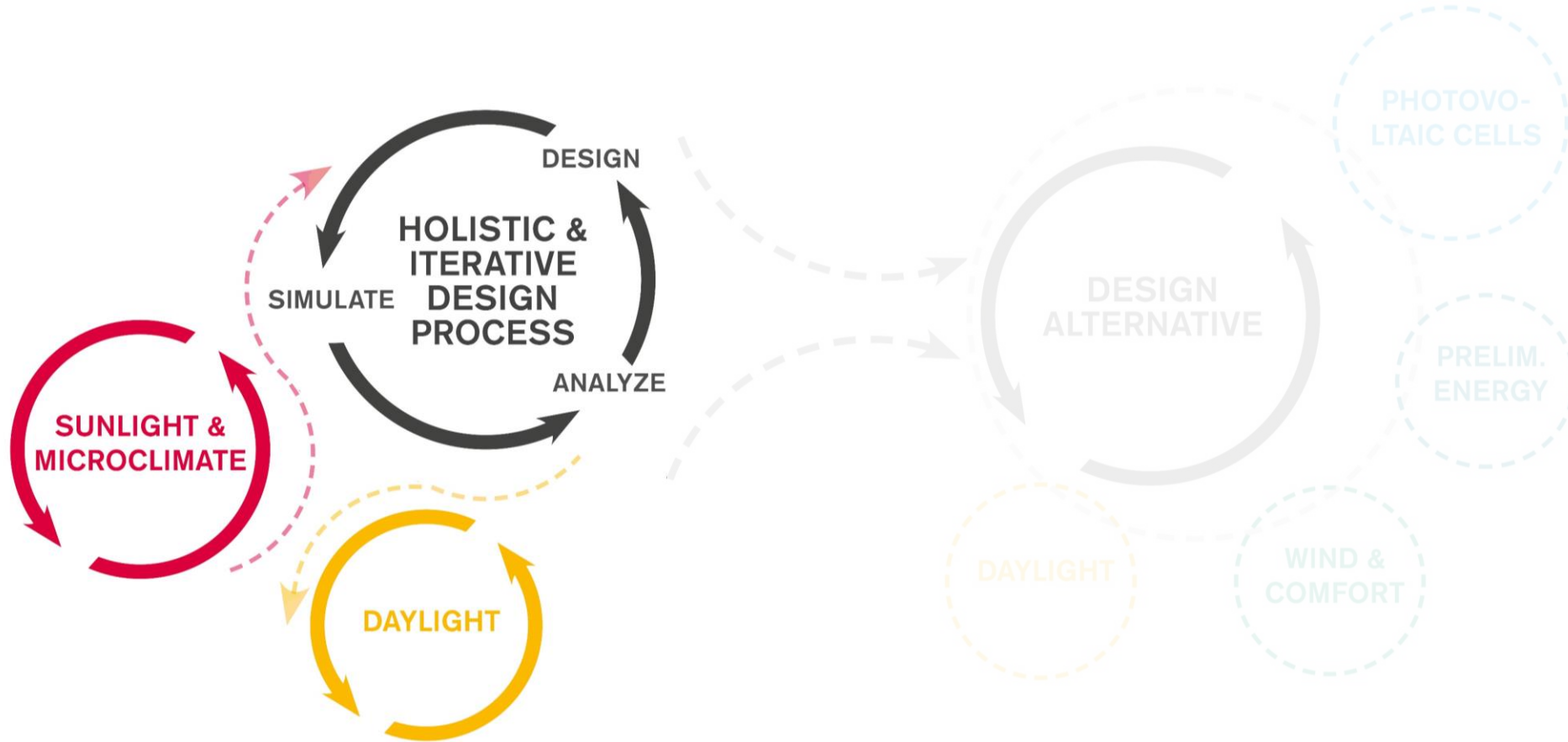


SOFI NILSSON



RENATO
ADRIASOLA

DESIGN PROCESS



TOOLS & METHODOLOGY: INFORM

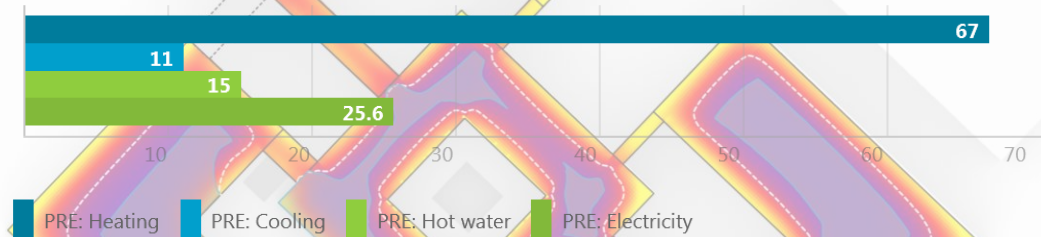
URBAN LEVEL

MICROCLIMATE

DAYLIGHT & SUNLIGHT

Division of primary energy (kWh/m²)

The primary energy = 118.6 which is greater than 80 therefore it is not acceptable

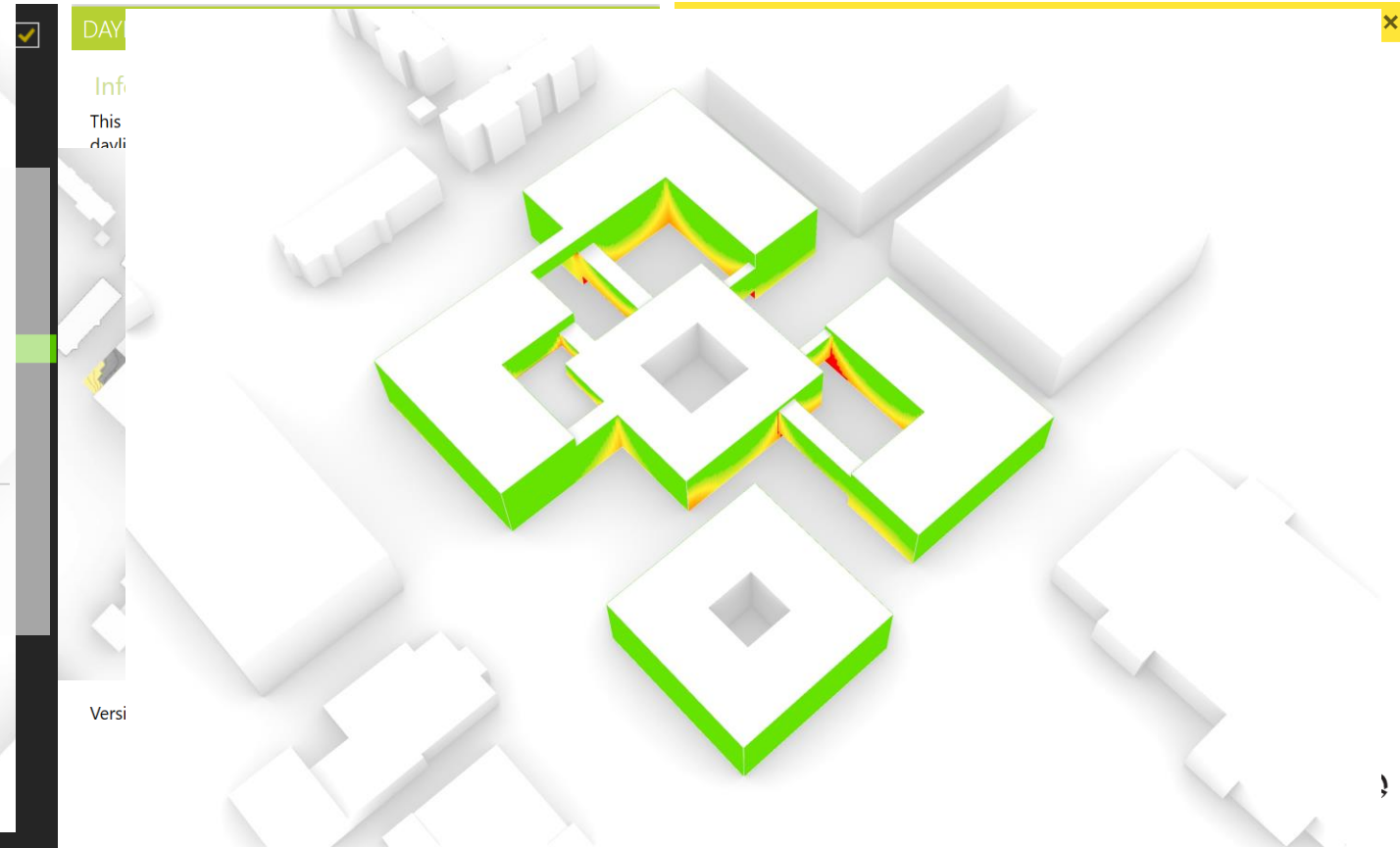


PRE: Heating PRE: Cooling PRE: Hot water PRE: Electricity

BUILDING LEVEL

DAYLIGHT

ENERGY

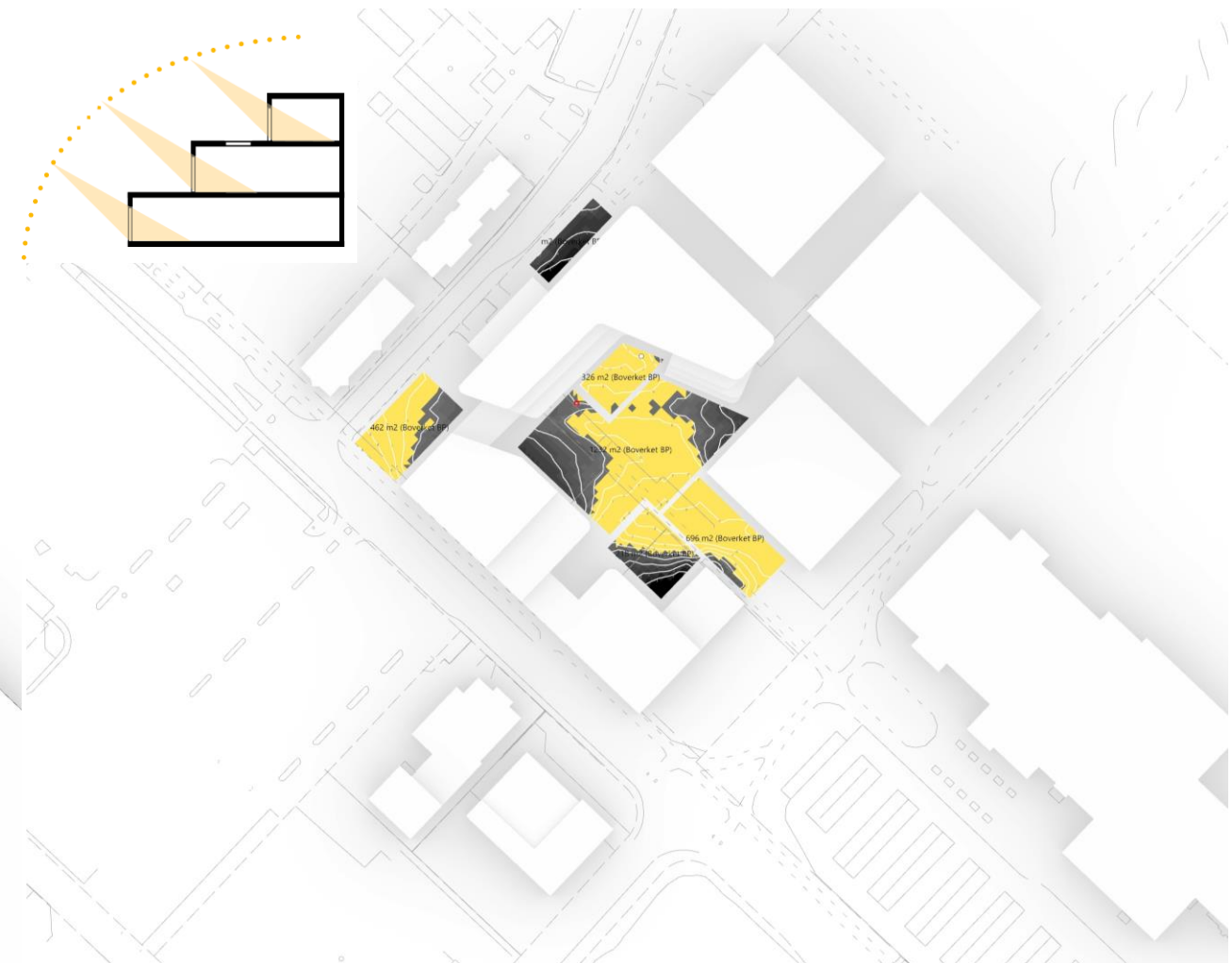
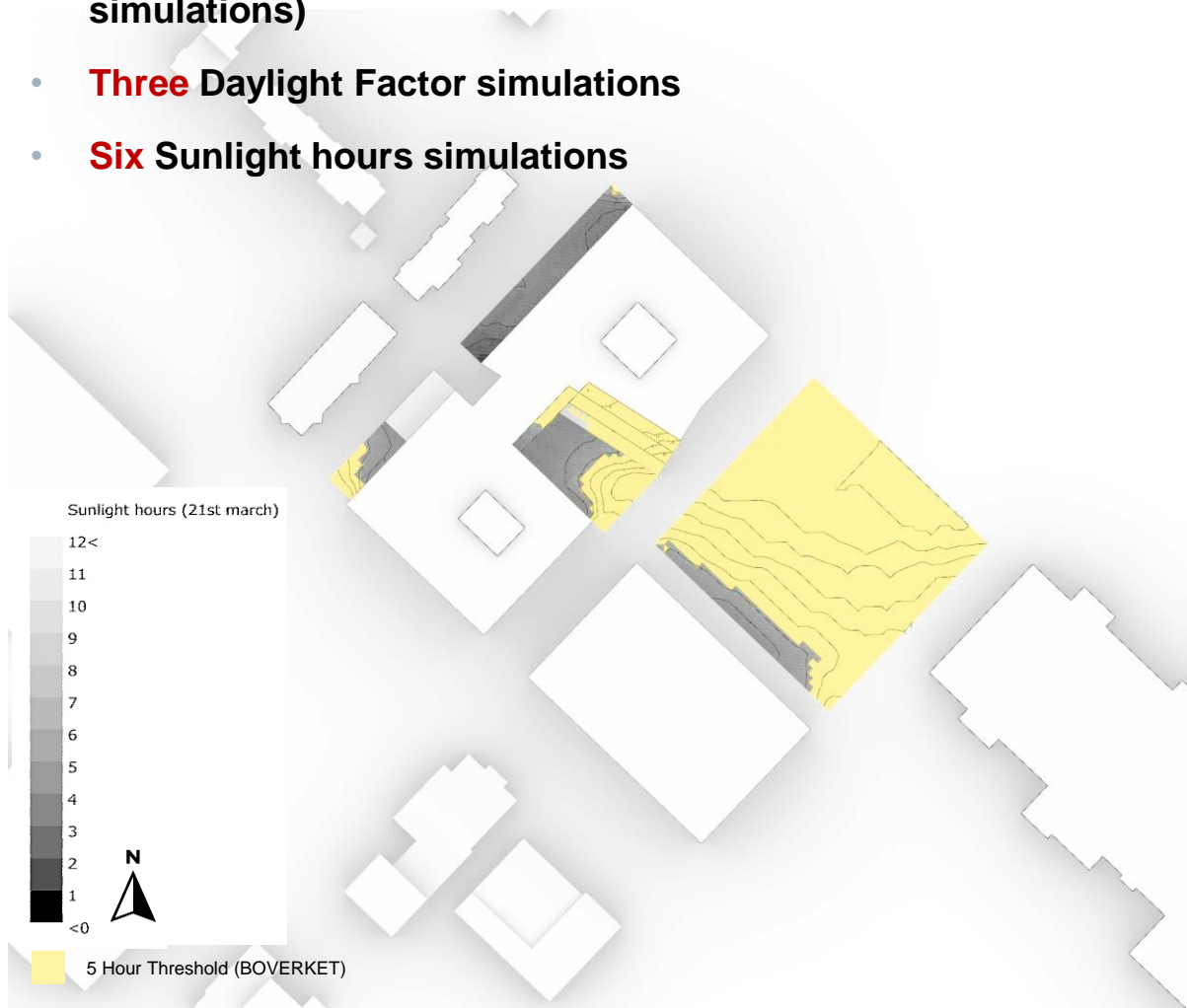


INTEROPERABILITY BETWEEN TOOLS



DAYLIGHT CONCEPT & FORM FINDING

- **Six** building forms
- **Five** Vertical Sky component (VSC simulations)
- **Three** Daylight Factor simulations
- **Six** Sunlight hours simulations



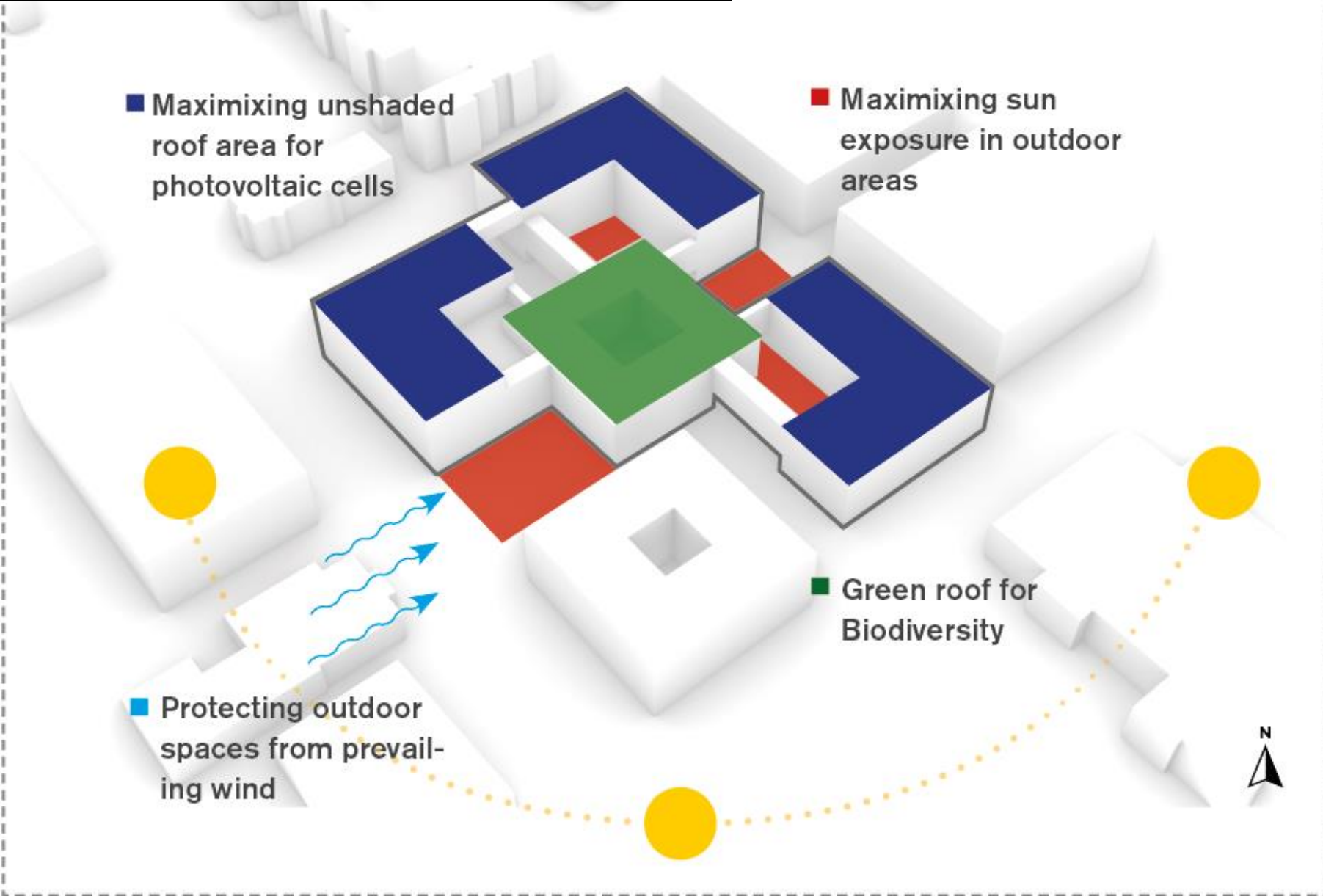
SUSTAINABILITY CONCEPT

■ Maximizing unshaded roof area for photovoltaic cells

■ Maximizing sun exposure in outdoor areas

■ Green roof for Biodiversity

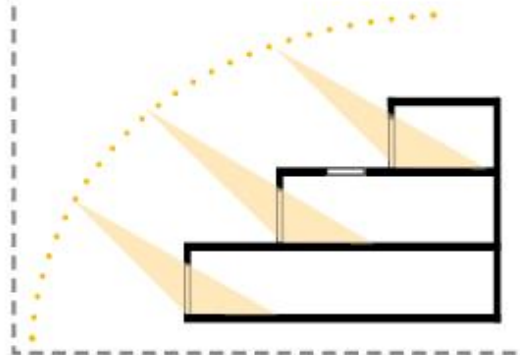
■ Protecting outdoor spaces from prevailing wind



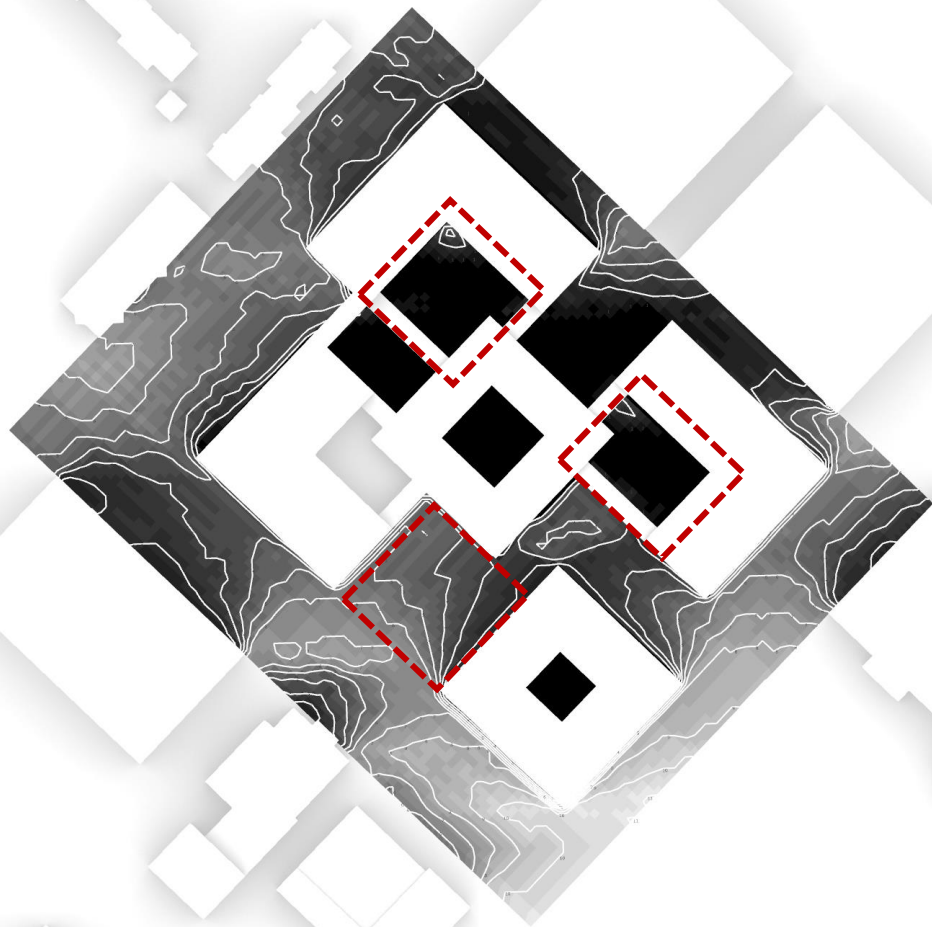
Wooden & energy efficient construction



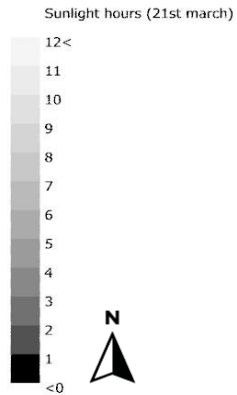
Daylight concepts



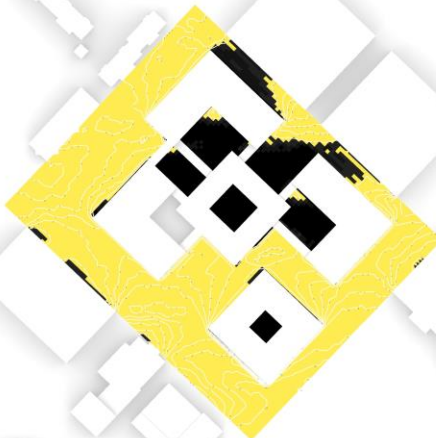
SUNLIGHT HOURS



21ST MARCH

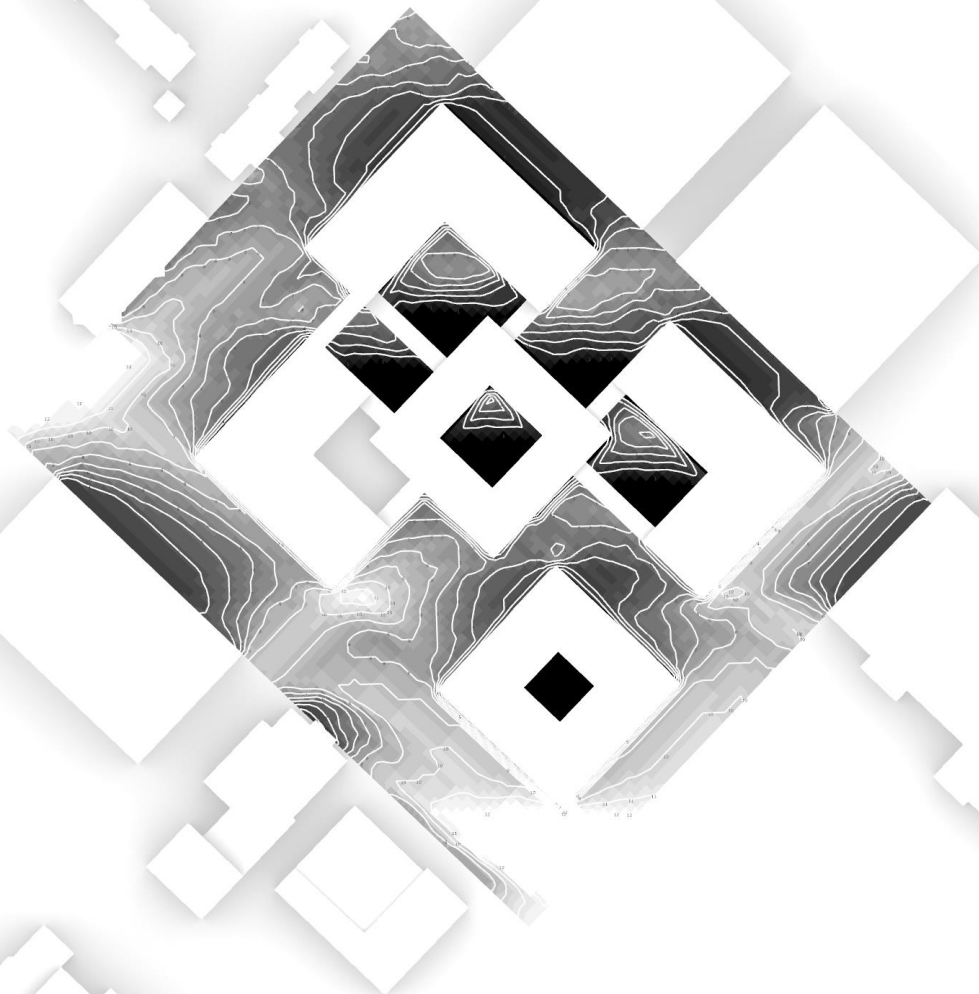


5 HOUR THRESHOLD (BOVERKET)

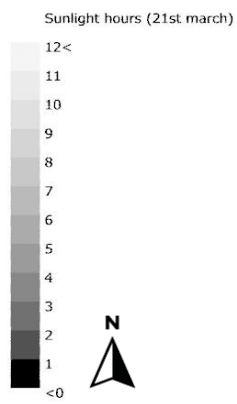


2 HOUR THRESHOLD (BRE)

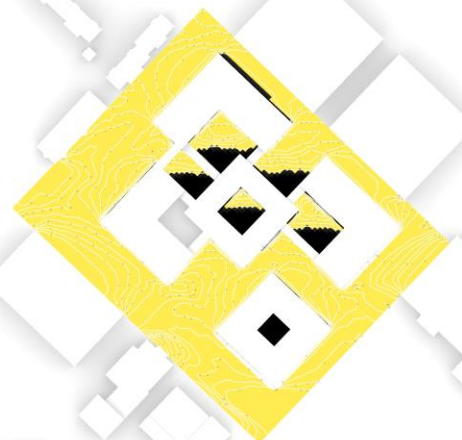
SUNLIGHT HOURS



21ST MAY



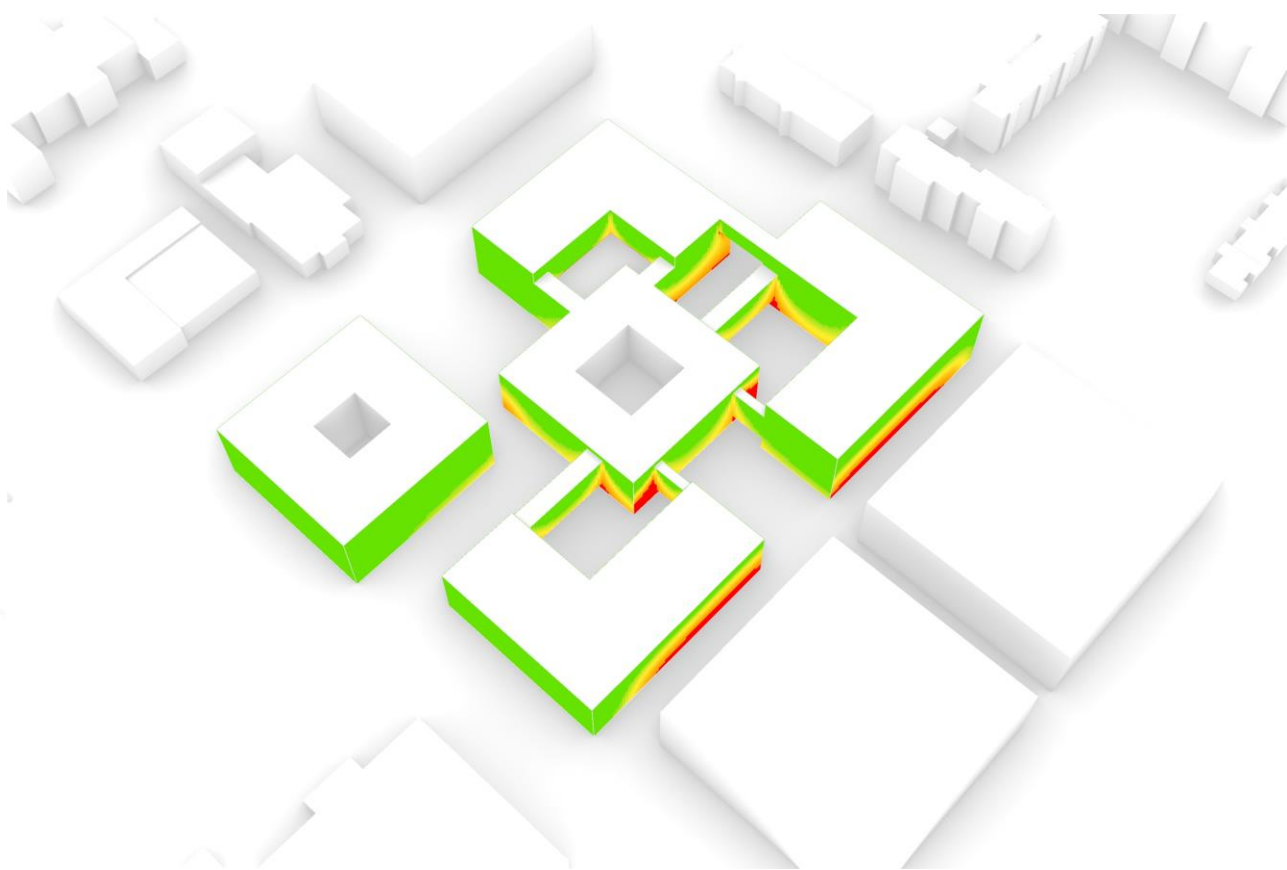
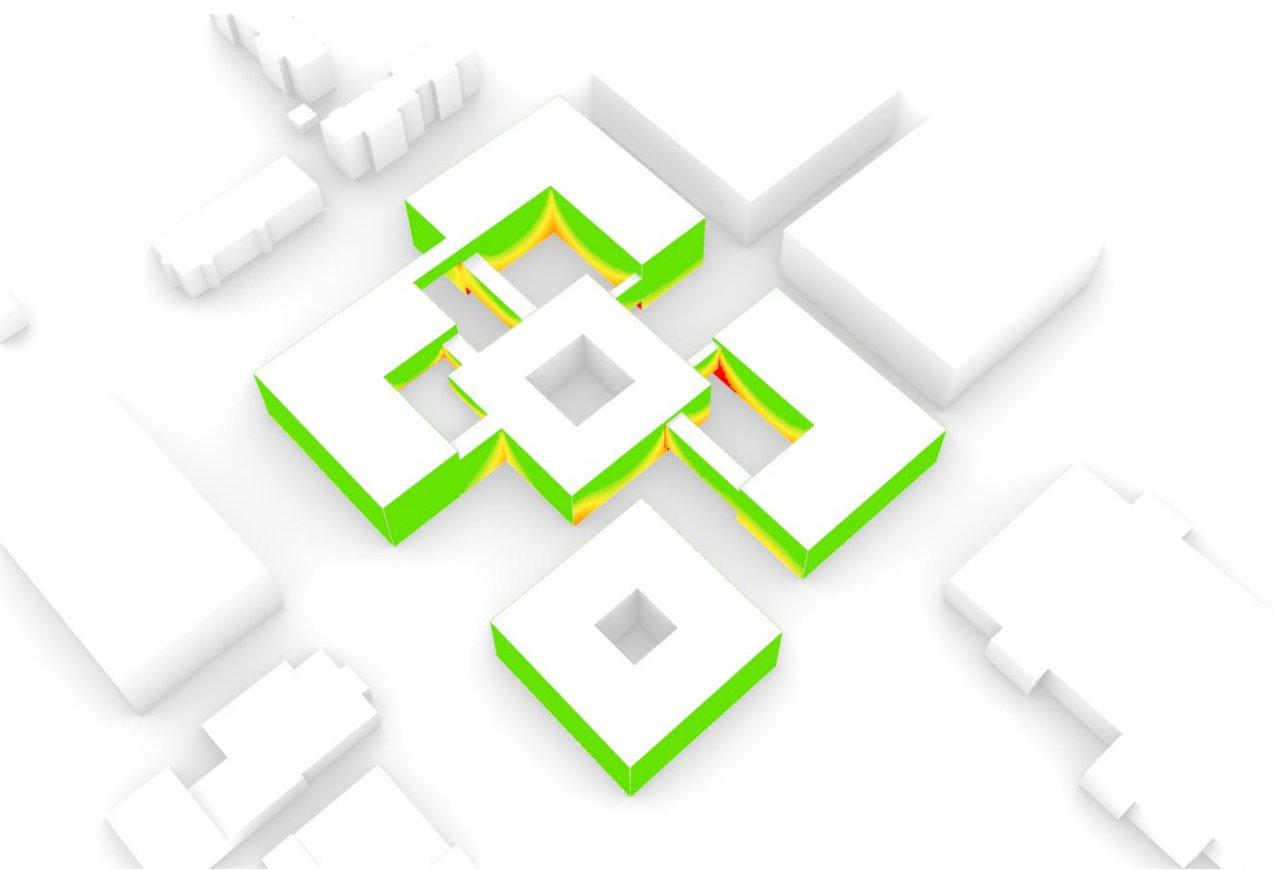
5 HOUR THRESHOLD (BOVERKET)



2 HOUR THRESHOLD (BRE)



VERTICAL SKY COMPONENT



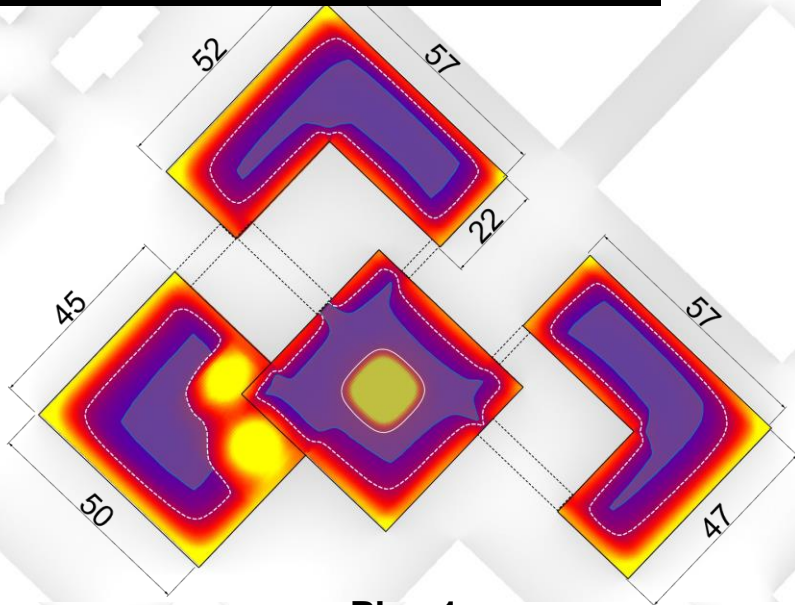
Visualize results



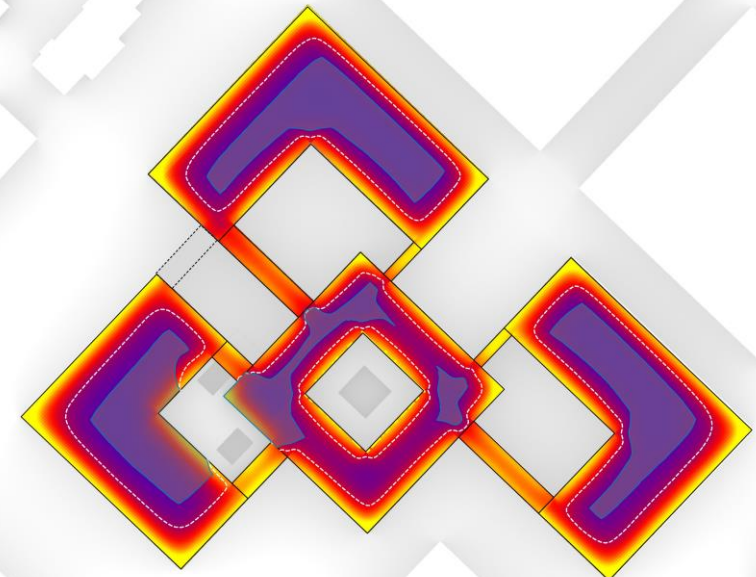
Results below 12-15% means that the façade will not receive enough daylight

DAYLIGHT FACTOR- MILJÖBYGGNAD SILVER

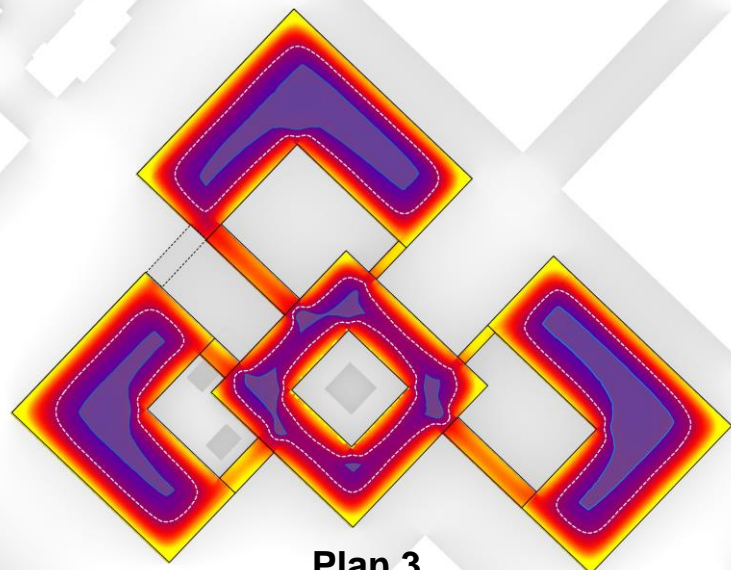
- 1.2% Daylight Factor threshold for Miljöbyggnad silver
- 30-35% Window to wall ratio as a recommendation based on steady state energy calculation



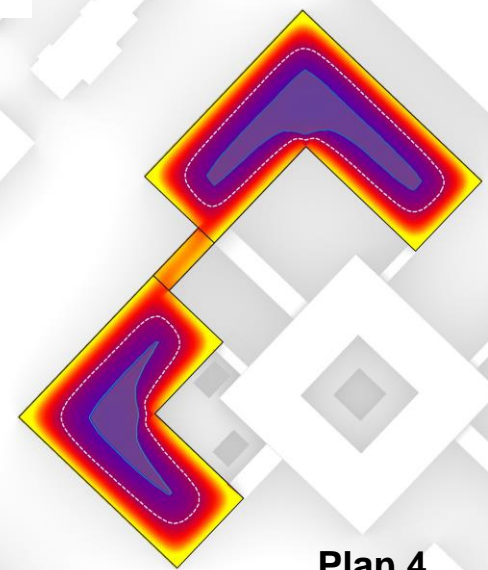
Plan 1



Plan 2



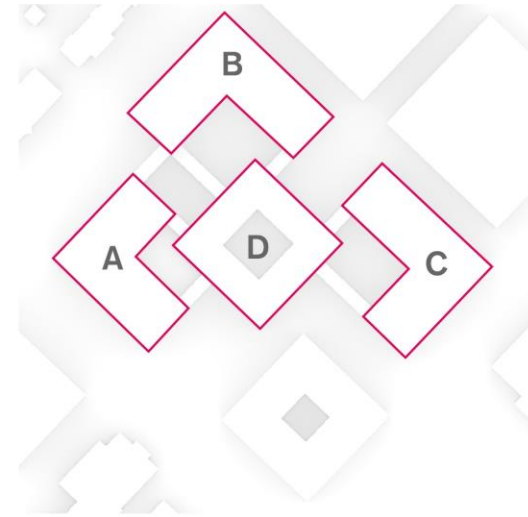
Plan 3



Plan 4



SUMMARY OF THE RESULTS



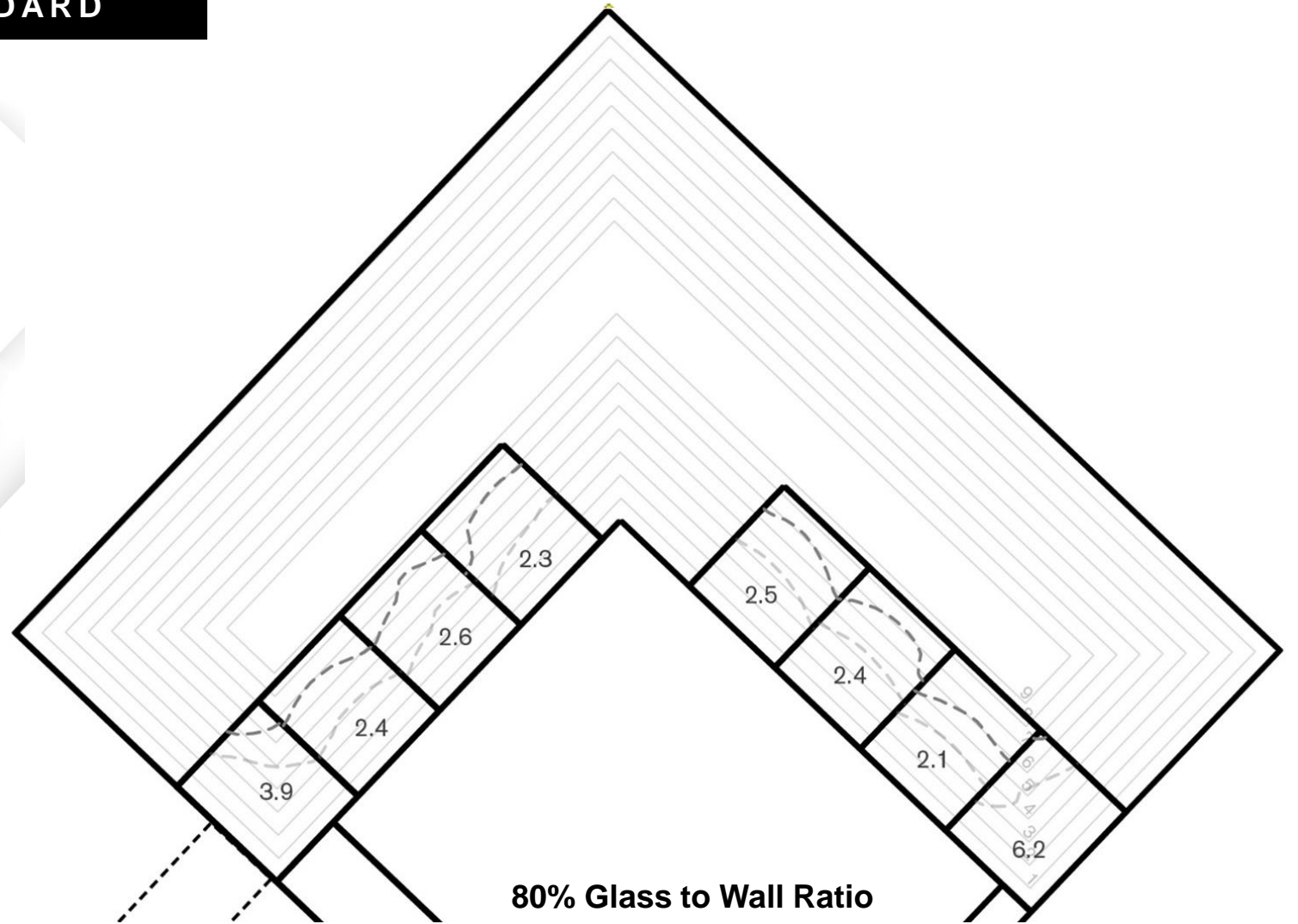
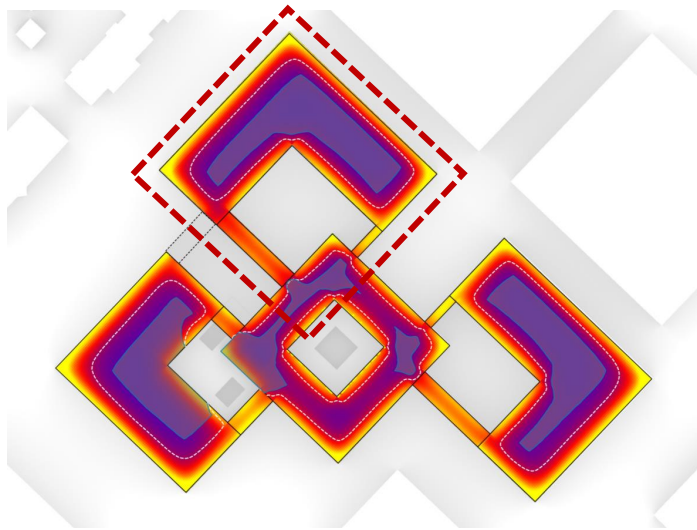
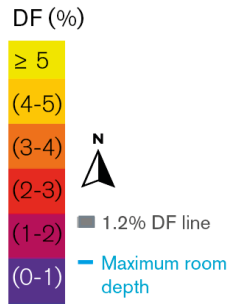
Area (m²)



- Non-Daylit area
- Daylit area
- Areas with daylight requirement

Floor plan

COMPARISON WITH EUROPEAN STANDARD



- 40% Glass to Wall Ratio
- .-.- 80% Glass to Wall Ratio

80% Glass to Wall Ratio
Median Daylight Factor

Plan 2

CONCLUSIONS AND RECOMMENDATIONS

- **Optimizing the use of tools within the design process is a key factor towards a daylit space and comfortable outdoor spaces.**
- **Working Interdisciplinary is essential at an early stage**
- **It is a challenge to meet the European Standard in the Swedish Climate.**



THANK YOU

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