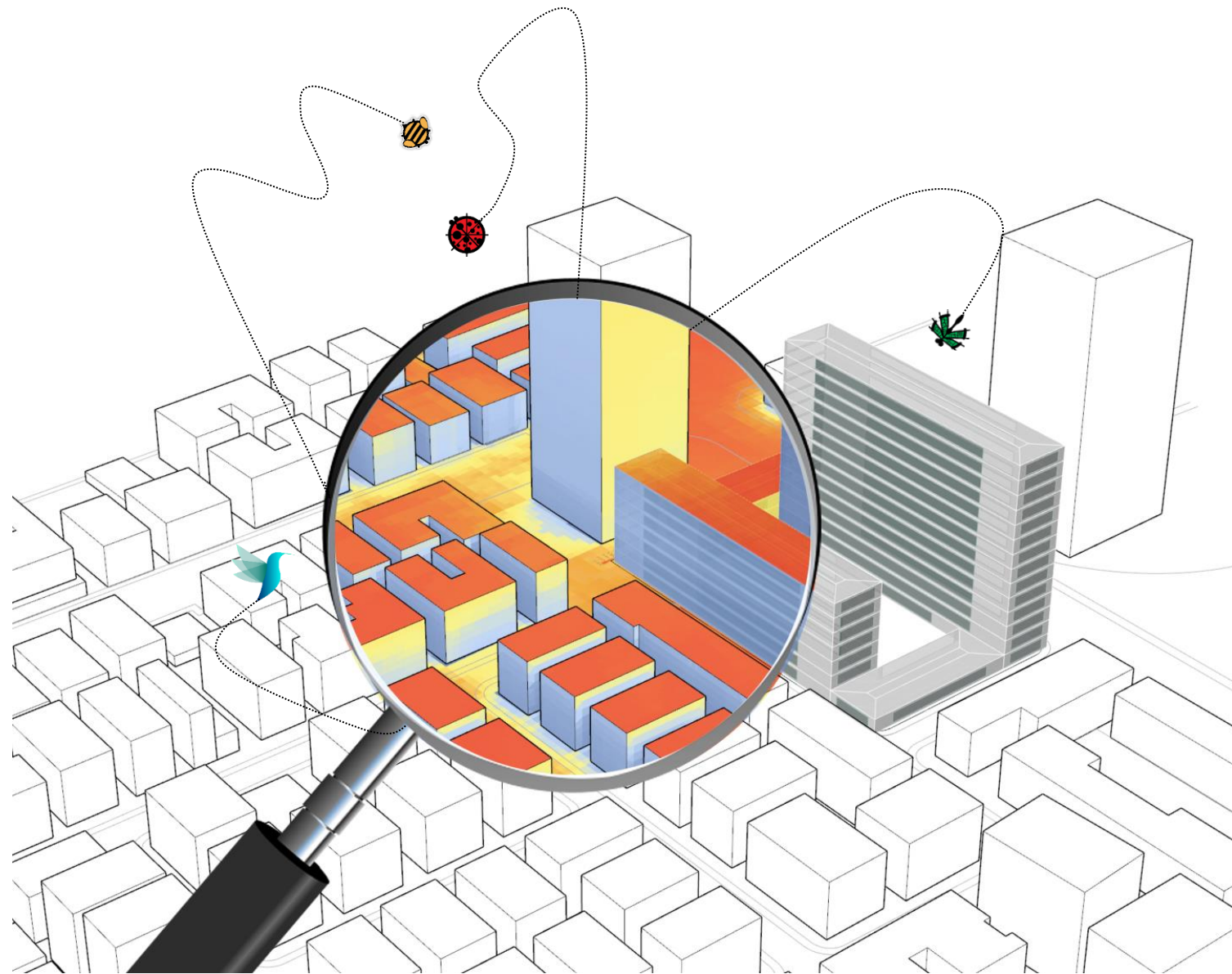


מעבר לבנייה ירוקה: שיטות מתקדמות לחקר תפקוד סביבתי בארכיטקטורה



The Environmental Performance and Design Lab | Technion

Asst. Prof. Jonathan Natanian

ד"ר יונתן נתניאן

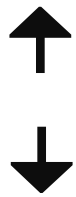
1. הקדמה: בניה ירוקה בישראל ומרוץ התכנון הסביבתי
דרך המעבדה לחקר ביצועים סביבתיים בארכיטקטורה

2. יישומים מתקדמים של כלים להערכה סביבתית
דרך 6 שאלות / פרויקטי מחקר על בניה ירוקה בקונטקסט הישראלי

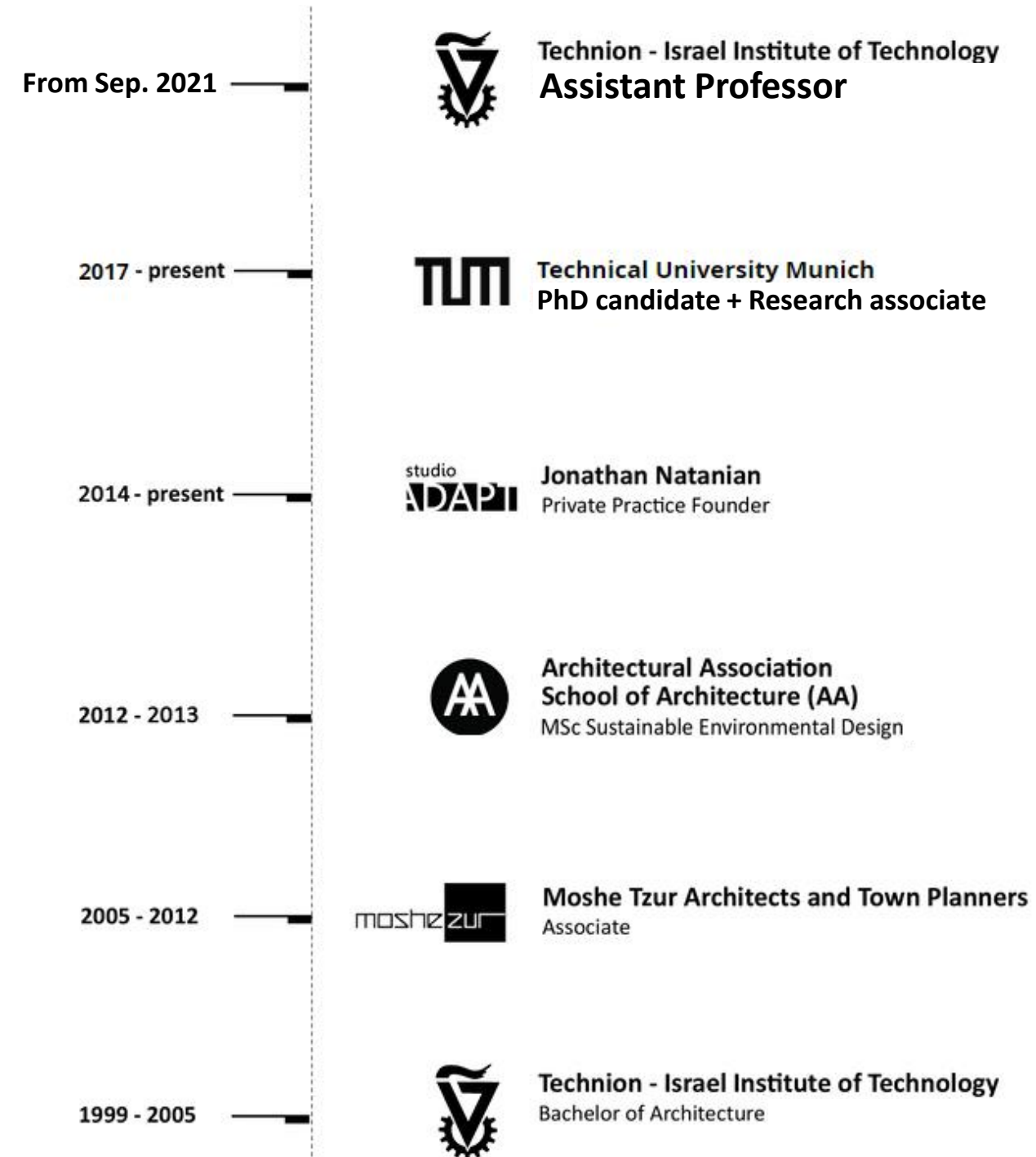
3. מה הלאה?



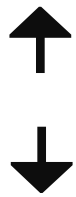
What are the performative implications of architectural design ?
(Architects)



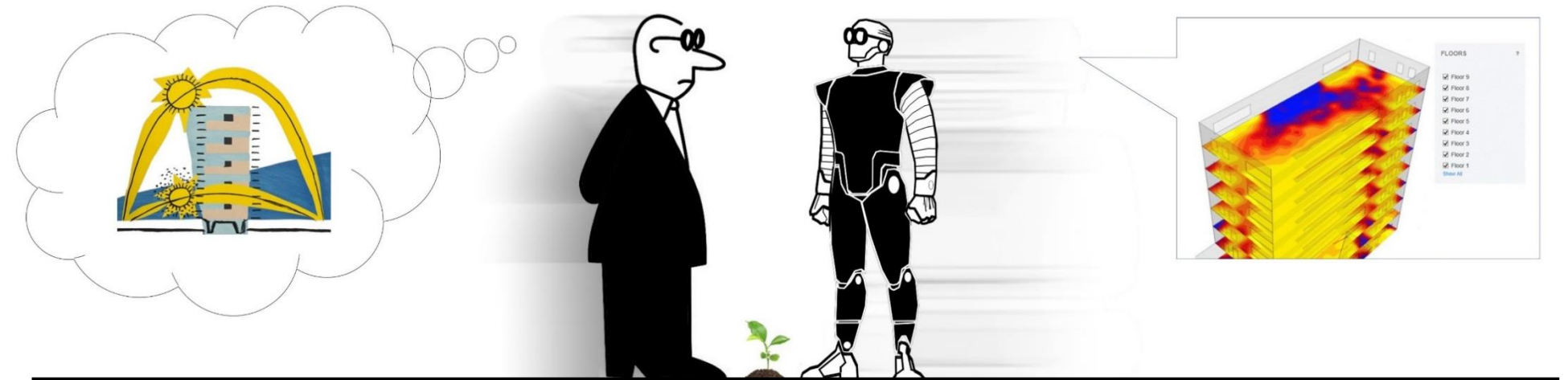
What are the spatial implications of high environmental performance?
(Environmental engineers)



What are the performative implications of architectural design ?
(Architects)

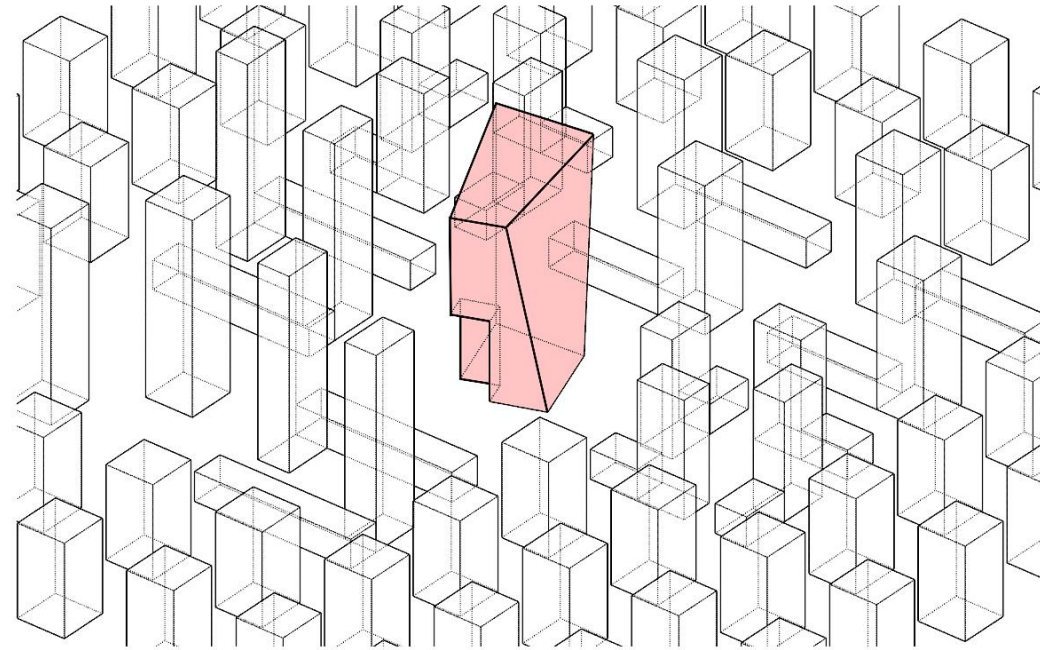


What are the spatial implications of high environmental performance?
(Environmental engineers)

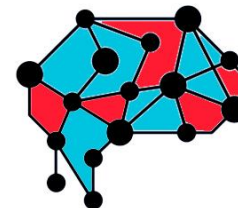
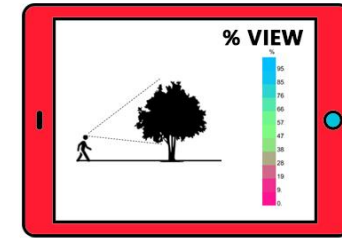


*The eco-race in architecture:
caught between intuition and intelligence*

Data acquisition



Environmental Design Interface



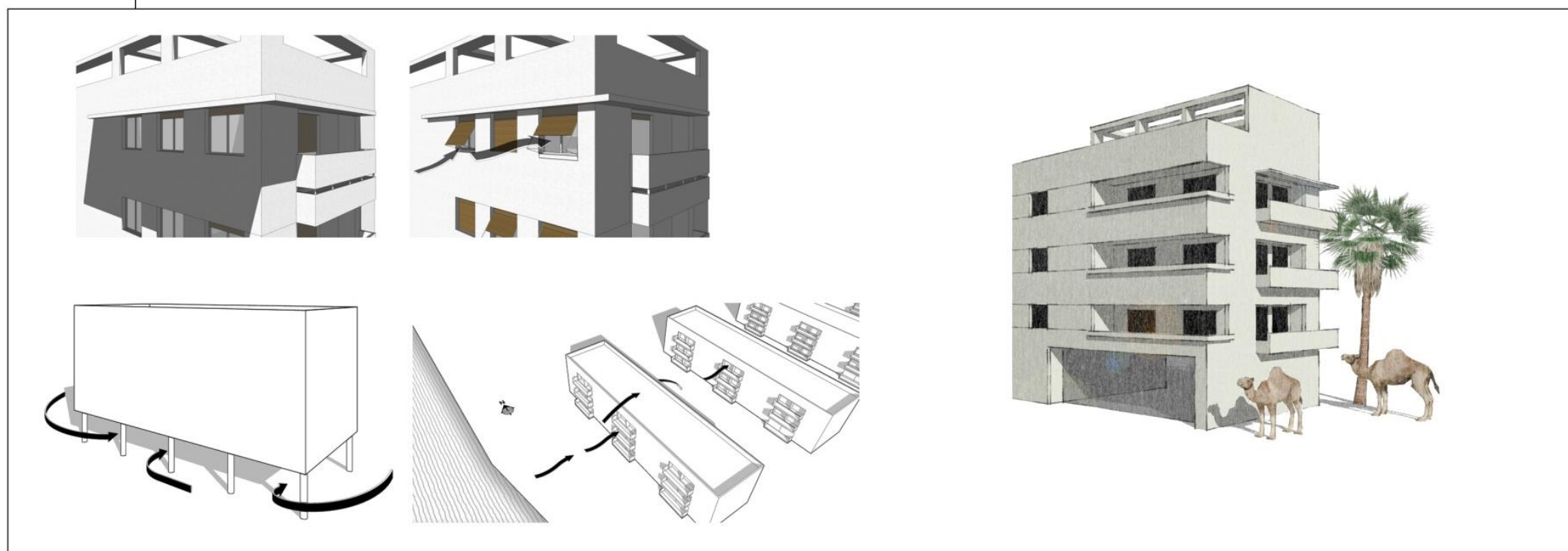
Computational analysis

מרוץ התכנון הסביבתי והמעבדה לחקר ביצועים סביבתיים בארכיטקטורה



Adoption **with** adaptation

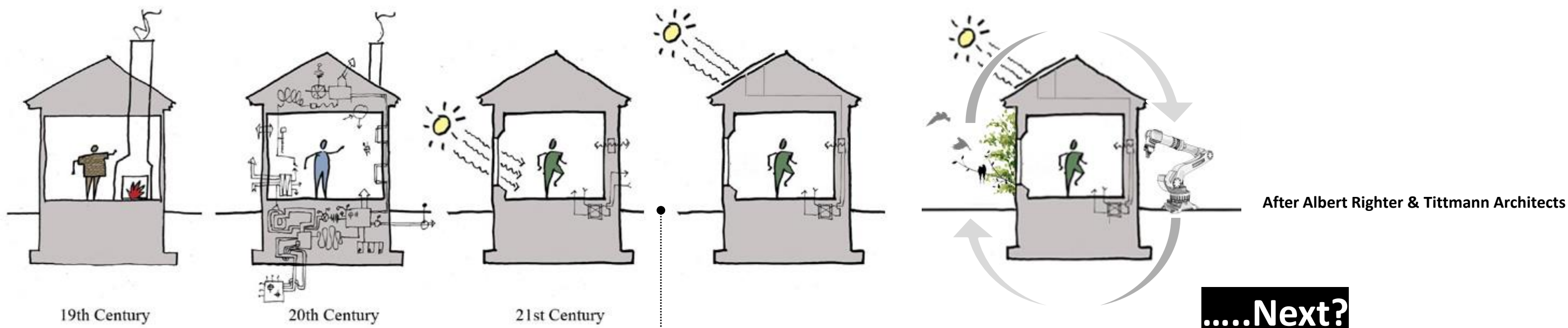
Adoption **without** adaptation





#6 שאלות על בניה ירוקה

From Natural to Artificial to Hybrid and BEYOND

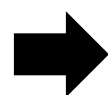


...Then

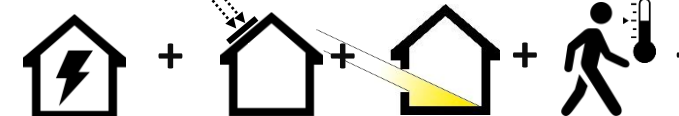
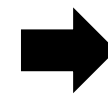
Standards →→



Energy efficiency

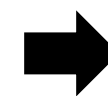


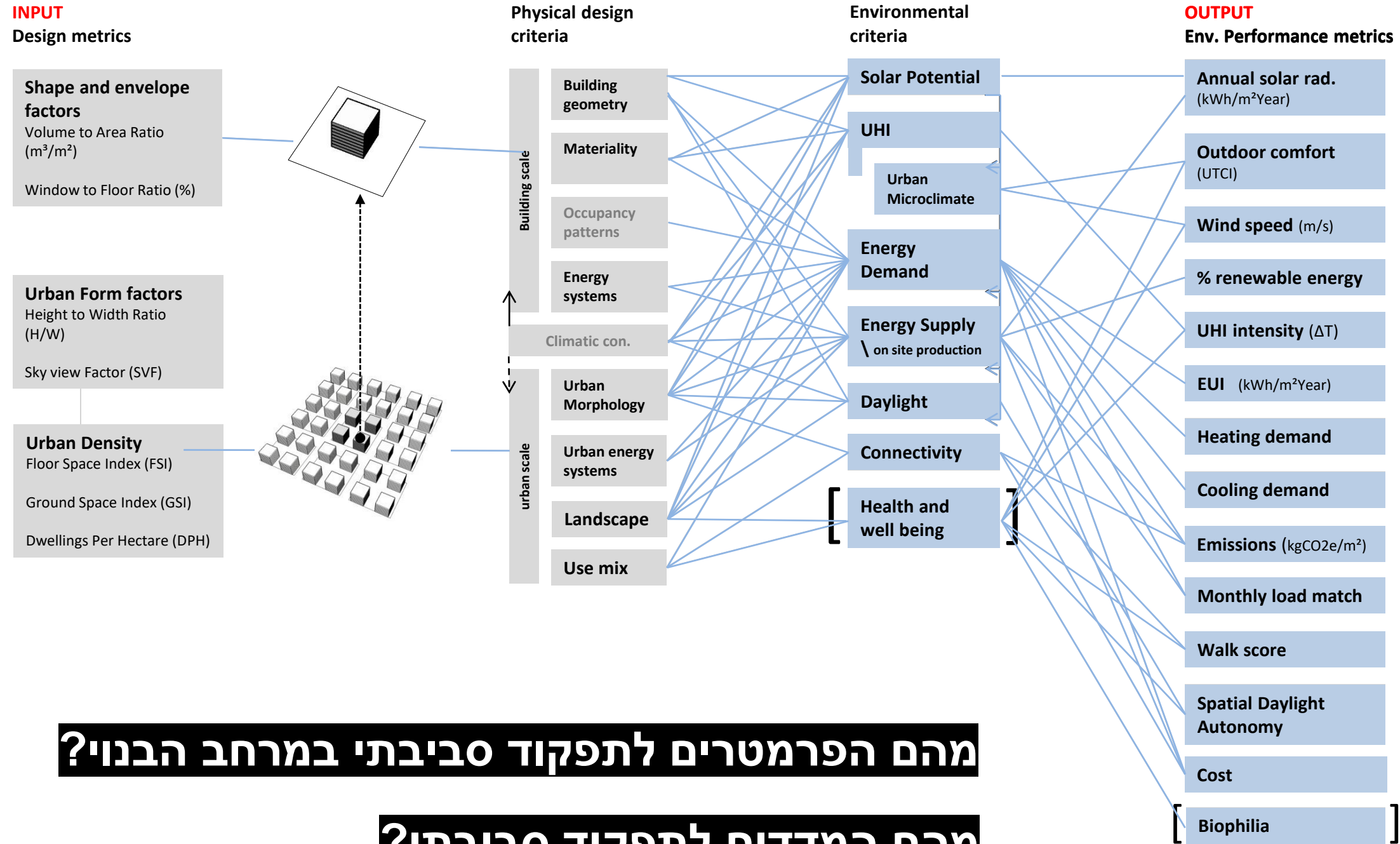
Energy balance



Regenerative design

Tools →→



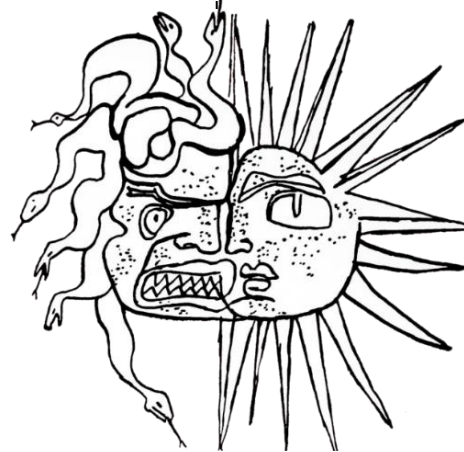


מהם הפרמטרים לתפקוד סביבתי במרחב הבנוי?

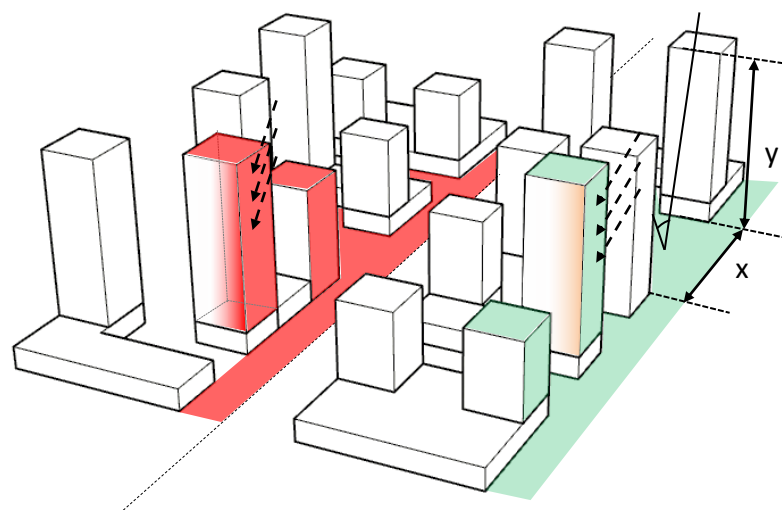
מהם המדדים לתפקוד סביבתי?

מהי הקורולציה בין נתוני תכנון (בניין ועיר) למדדי תפקוד סביבתי?

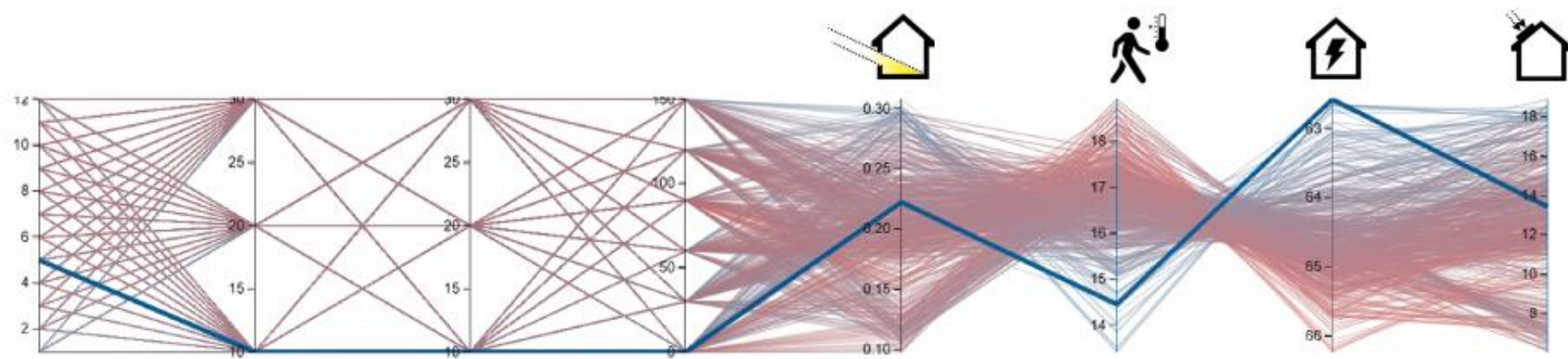
2# מהו גבול התפקוד הסביבתי אליו נוכל להגיע בסביבה צפופה בתרחישי תכנון שונים?



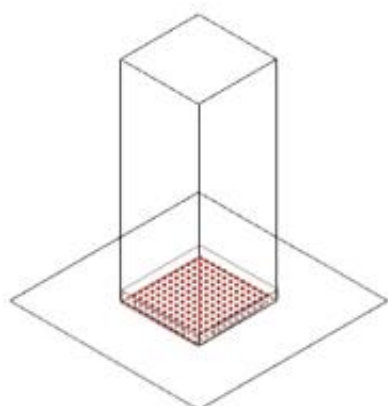
Mask of Medusa (Le Corbusier)



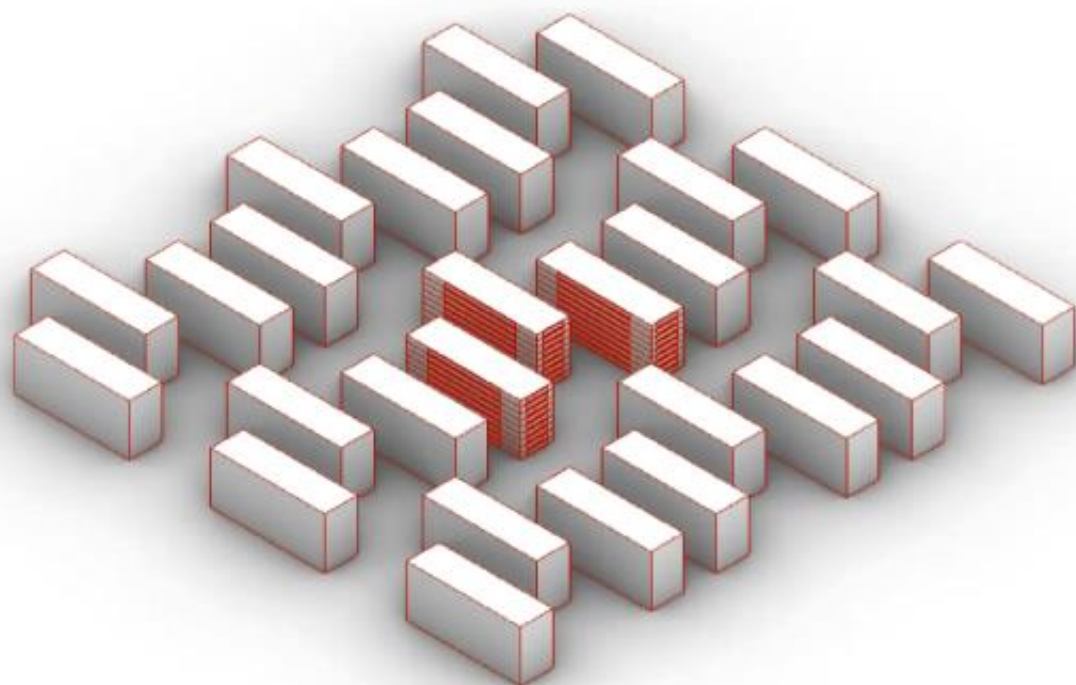
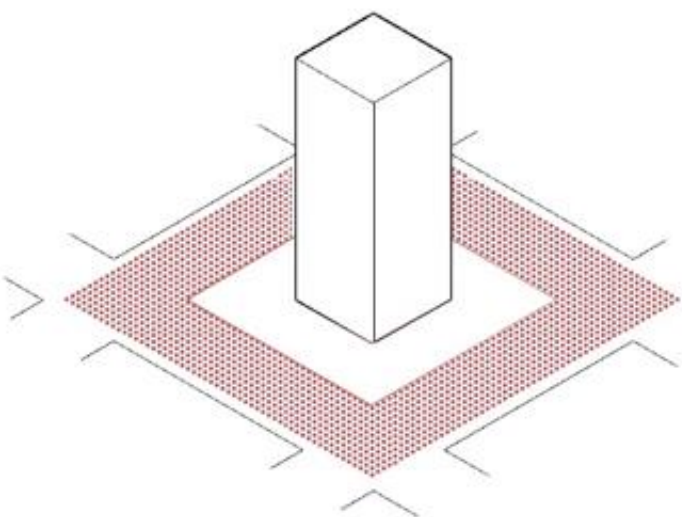
2# מהו גבול התפקוד הסביבתי אליו נוכל להגיע בסביבה צפופה בתרחישי תכנון שונים?



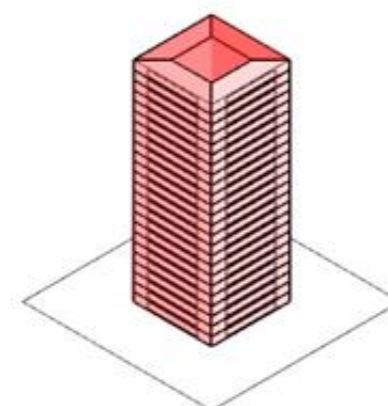
Daylight Availability



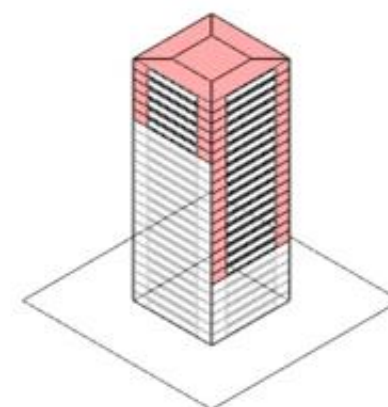
Outdoor comfort



Energy demand



PV energy supply



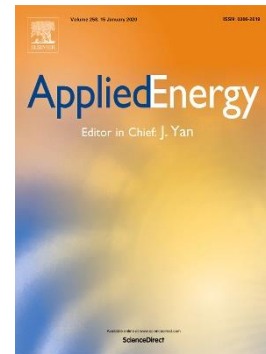


#2 מהו גבול התפקוד הסביבתי אליו נוכל להגיע בסביבה צפופה בתרחישי תכנון שונים?

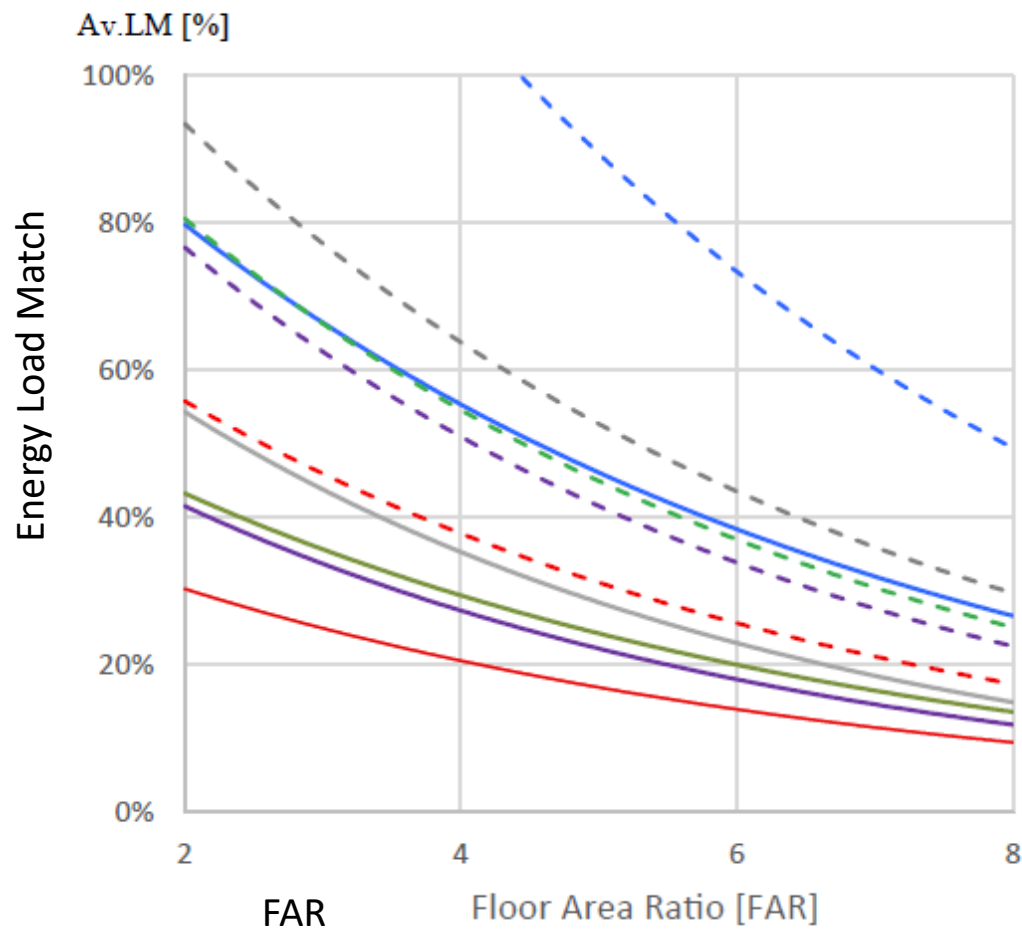
Natanian Jonathan, Aleksandrowicz Or and Auer Thomas.

A parametric approach to optimizing urban form, energy balance and environmental quality: The case of Mediterranean districts.

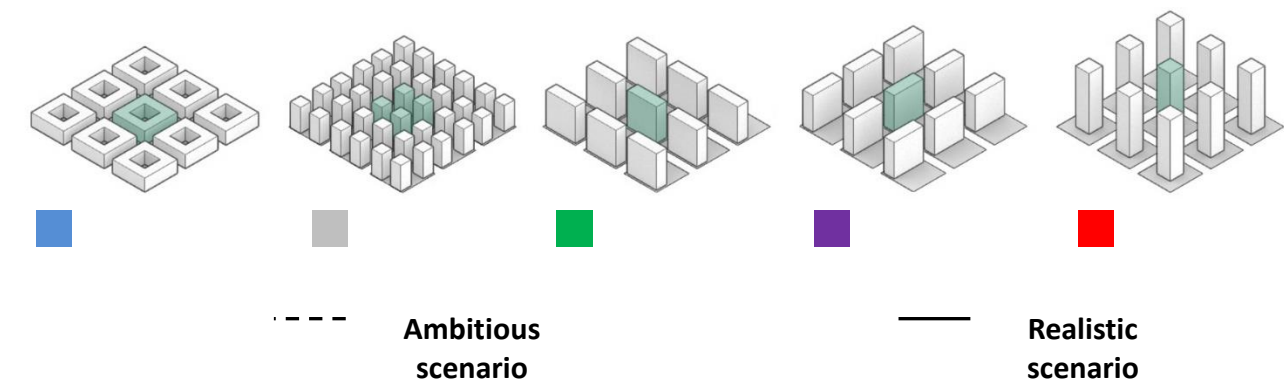
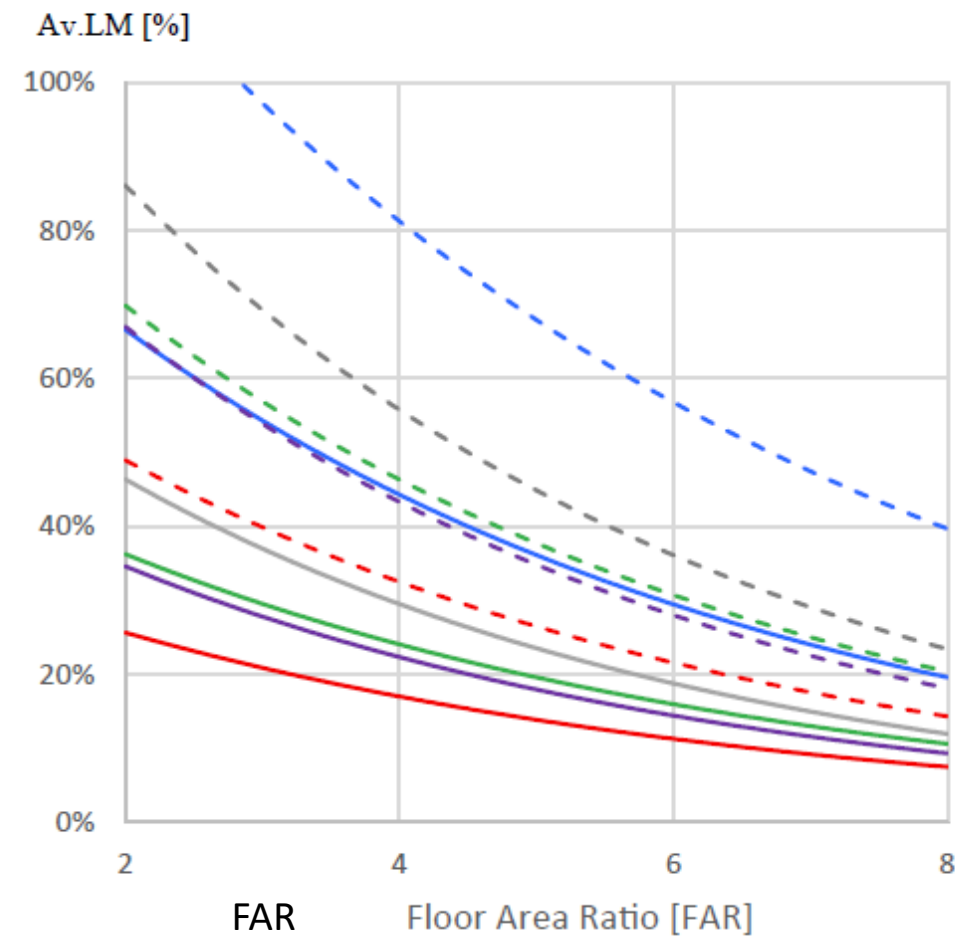
<https://doi.org/10.1016/j.apenergy.2019.113637>



RESIDENTIAL



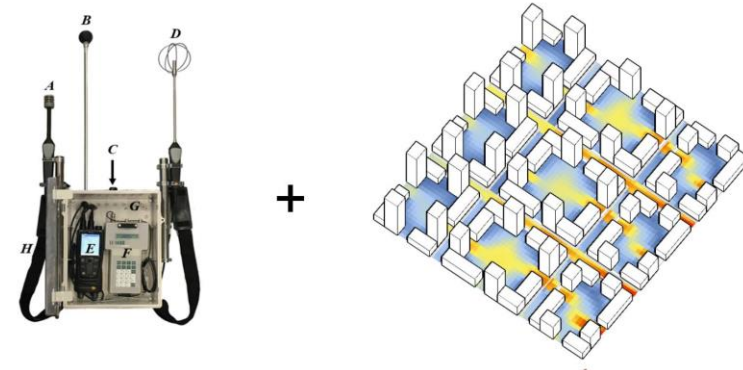
OFFICES



3# כיצד מיקרו-האקלים העירוני משפיע על התפקוד הסביבתי בתרחישים שונים?

Sensing Copenhagen's microclimates through combined measurements and modelling approaches

Tutors:
Danielle Santucci
Jonathan Natanian
Daniella Maiullari
Prof. Emanuele Naboni



Sensing Copenhagen's microclimates through combined measurements and modeling

Technische Universität München 



The Royal Danish Academy of Fine Arts
Schools of Architecture, Design and Conservation
School of Design





3# כיצד מיקרו-האקלים העירוני משפיע על התפקוד הסביבתי בתרחישים שונים?

Natanian Jonathan, Maiullari Daniela, Yezioro Abraham and Auer Thomas.
Synergetic urban microclimate and energy simulation
parametric workflow.

<https://doi.org/10.1088/1742-6596/1343/1/012006>

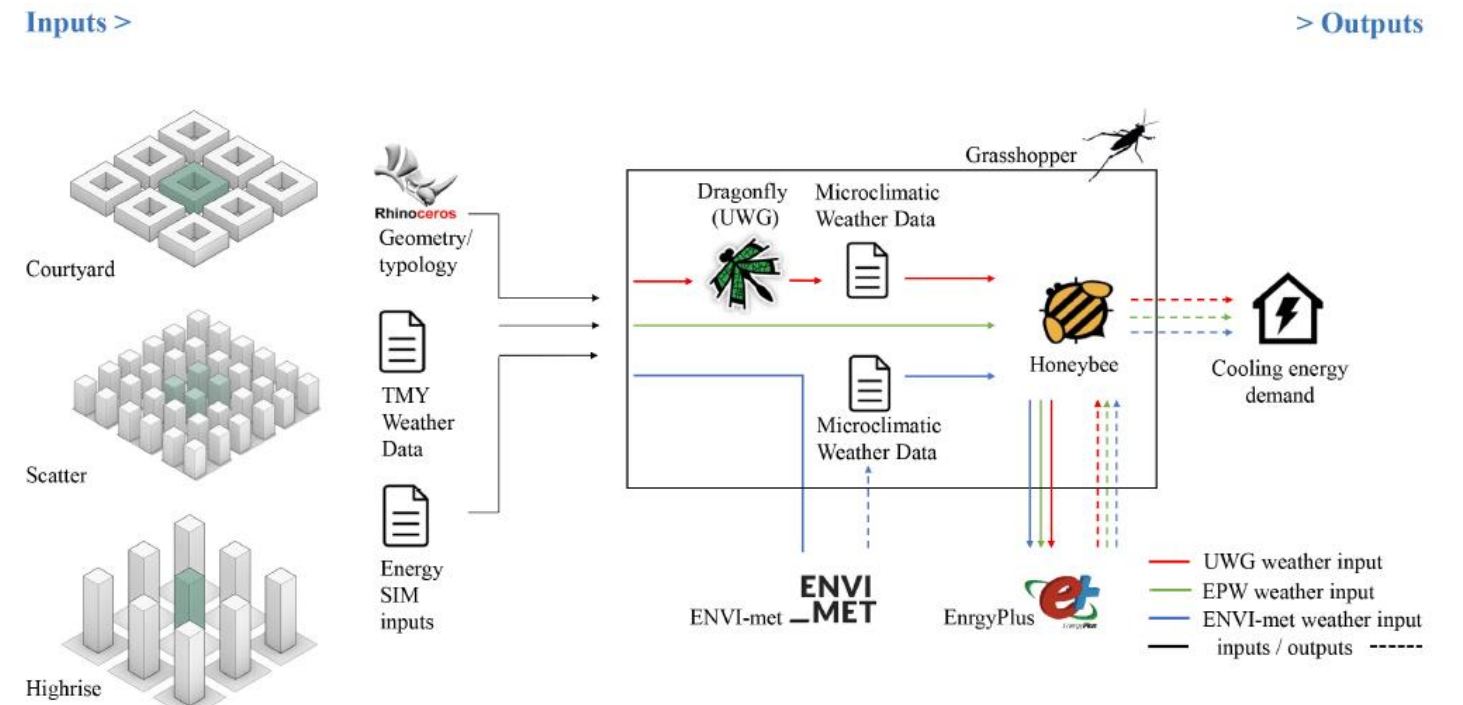
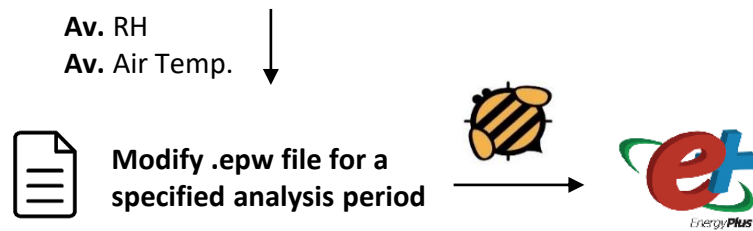
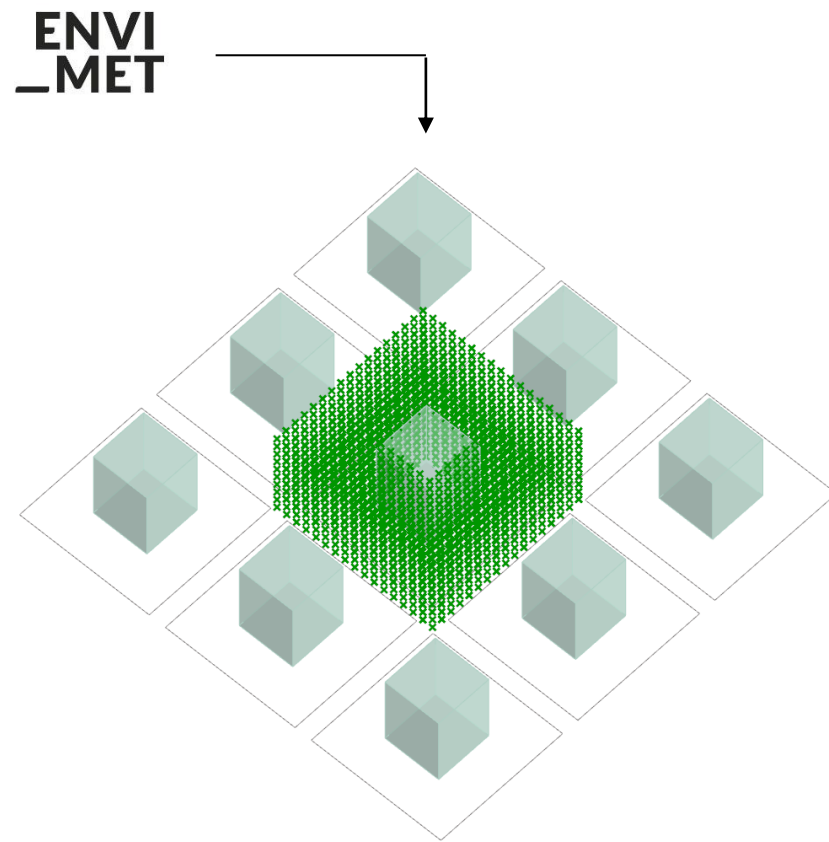
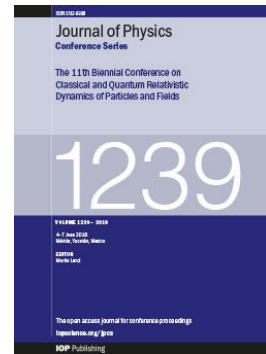
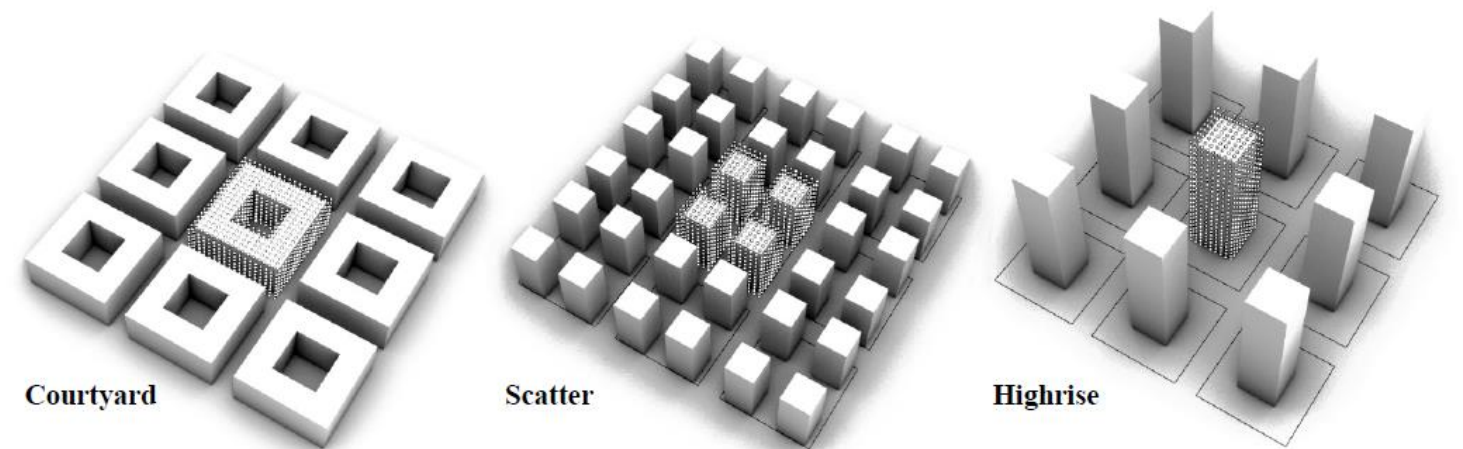
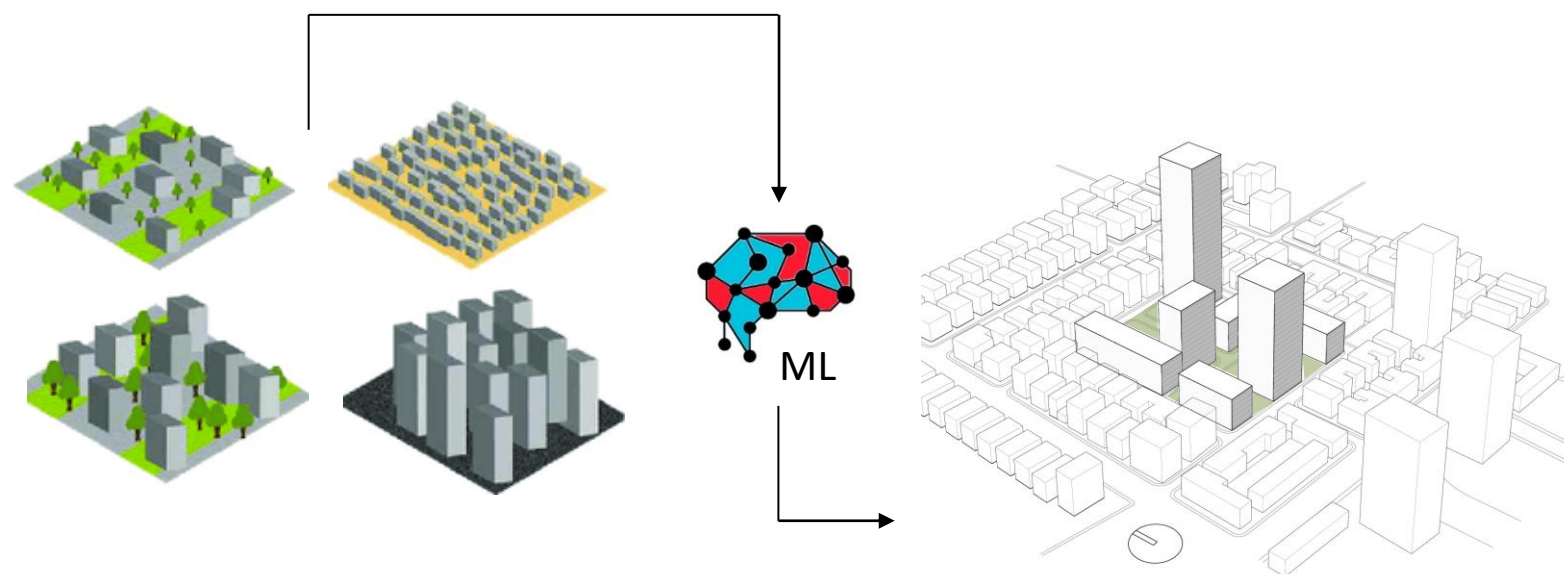


Figure 1. Analysis workflow



3# כיצד מיקרו-האקלים העירוני משפיע על התפקוד הסביבתי בתרחישים שונים?



Microclimate metamodels training

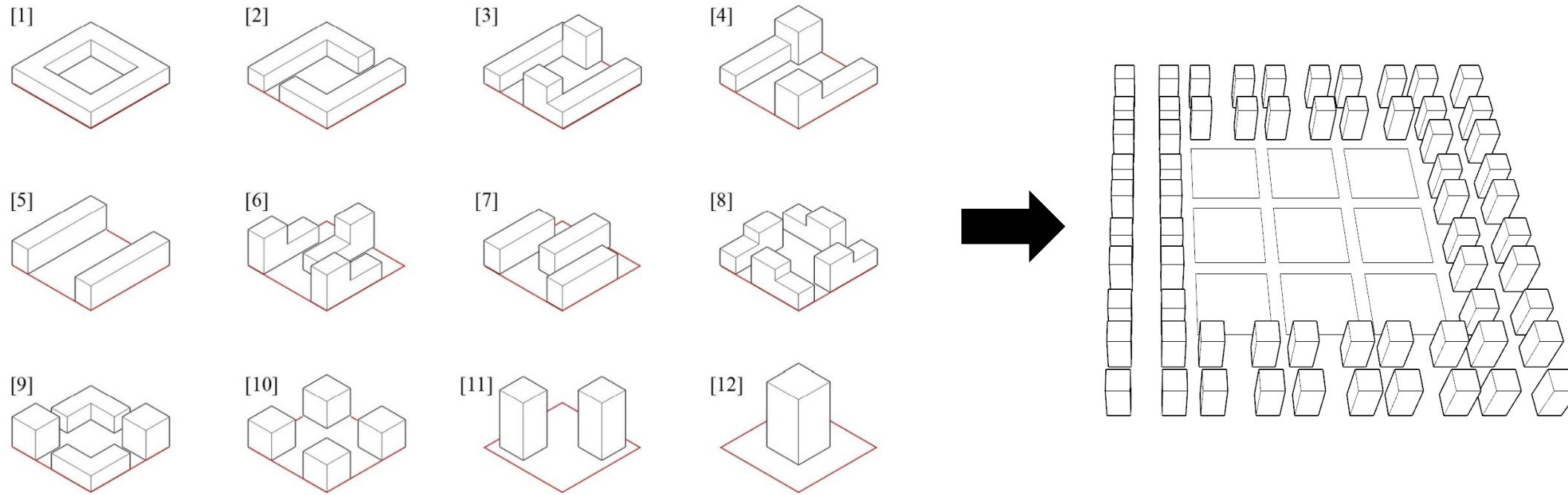
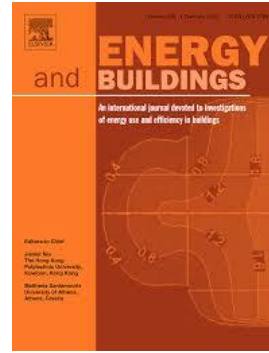
>>

for microclimate integrated energy evaluation



4# כיצד נבצע אופטימיזצית תפקוד סביבתי בקני מידה גדולים

Natanian Jonathan and Wortmann Thomas.
Evaluation Metrics for Generative Zero Energy Urban Design:
A Morphological Study on Residential Blocks in Tel Aviv.
<https://doi.org/10.1016/j.enbuild.2021.110916>

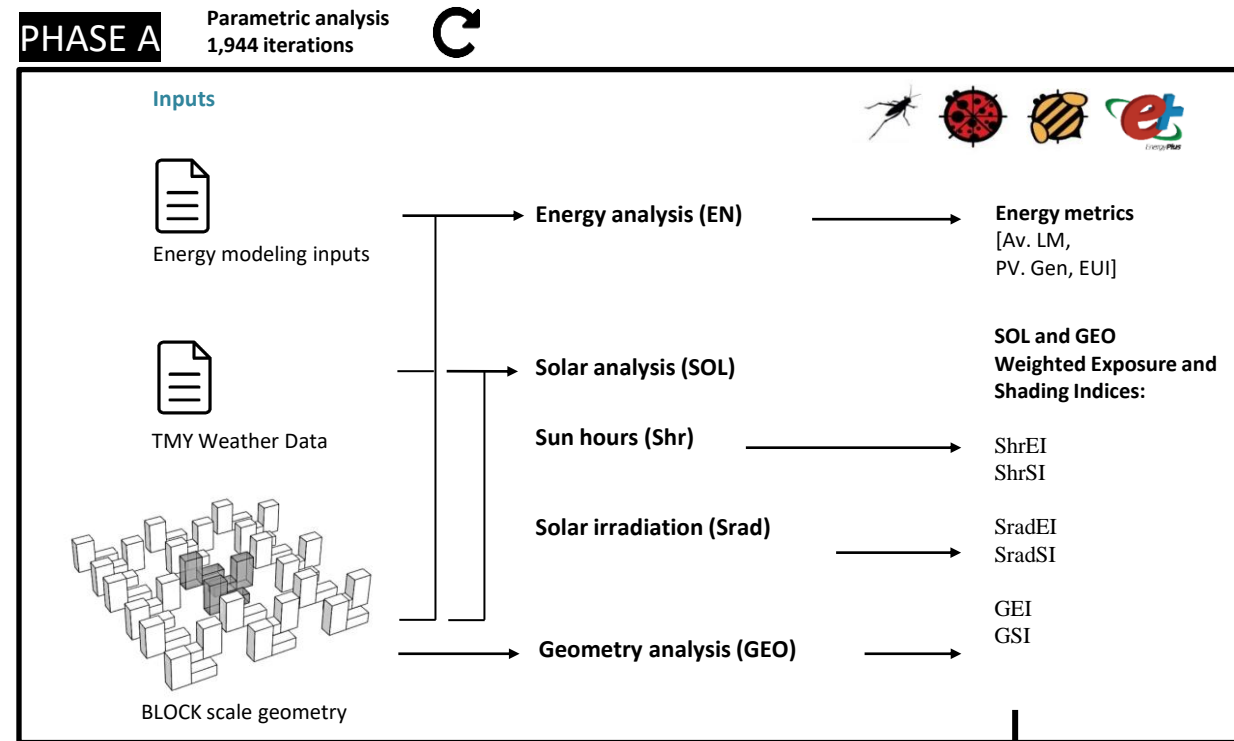


5,159,780,352 combinations (!?)

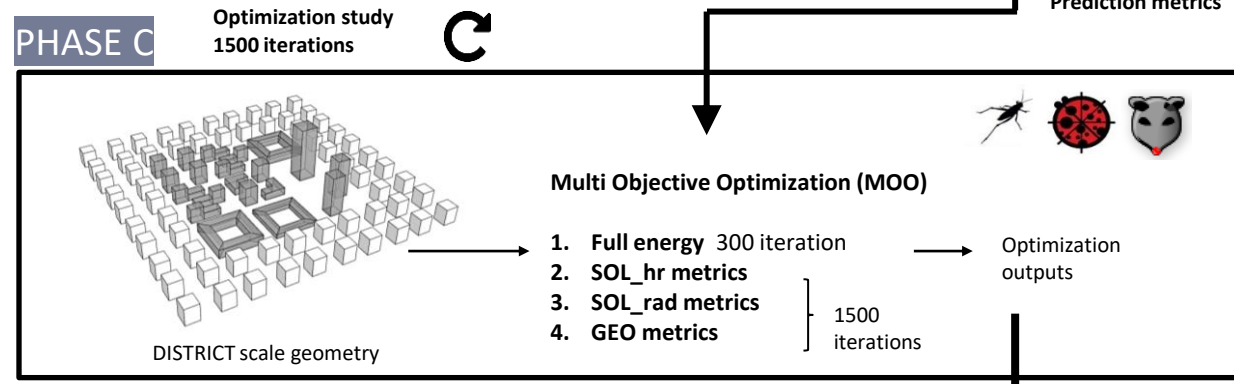
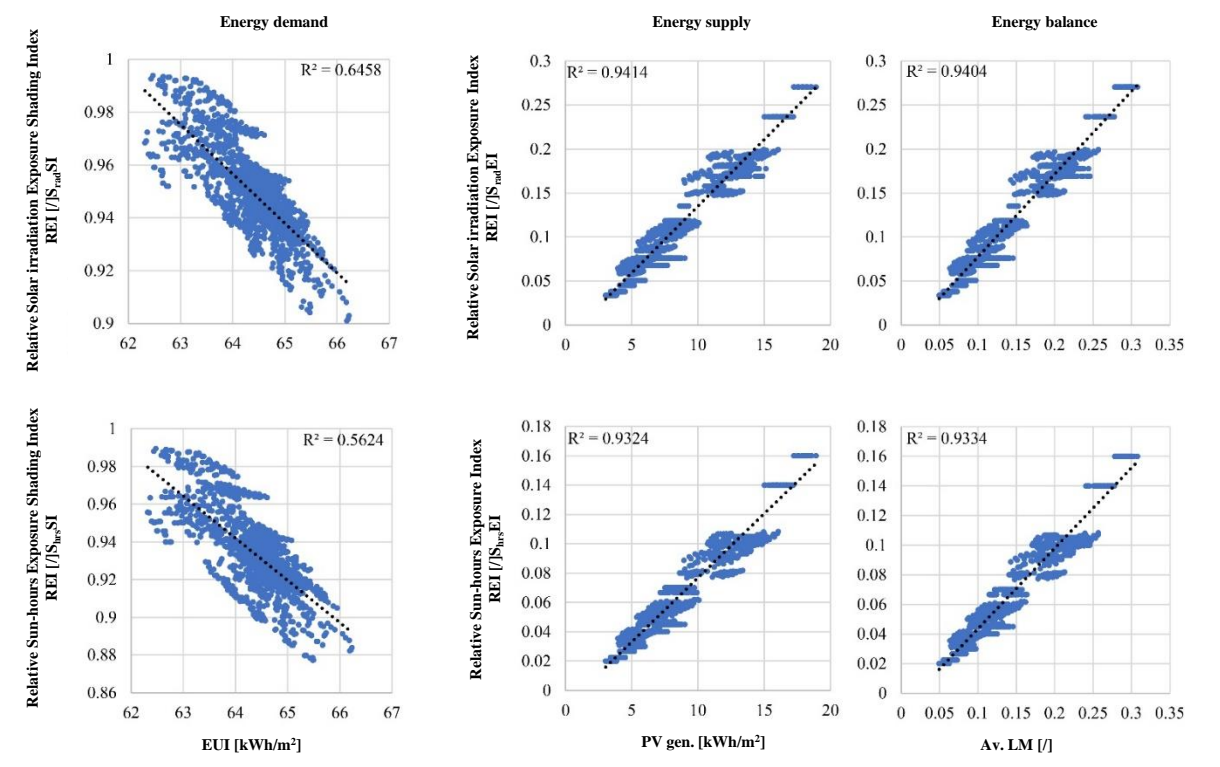
+ ADD

FAR > X6 possibilities
STREET WIDTH > X 6 possibilities
ROTATION > X6 possibilities

In Collaboration with
Tenure Track Prof. Thomas Wortmann (Universität Stuttgart)

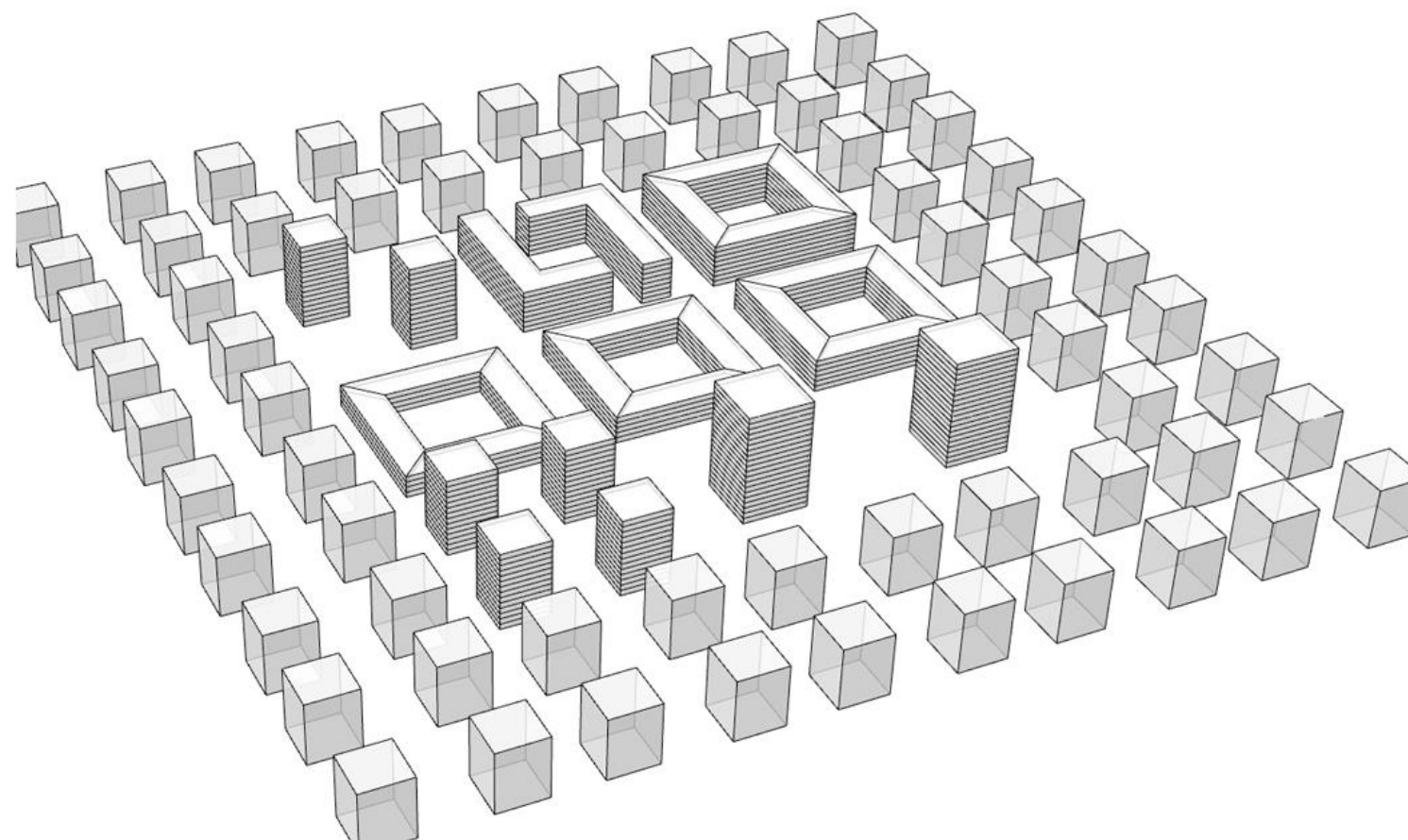
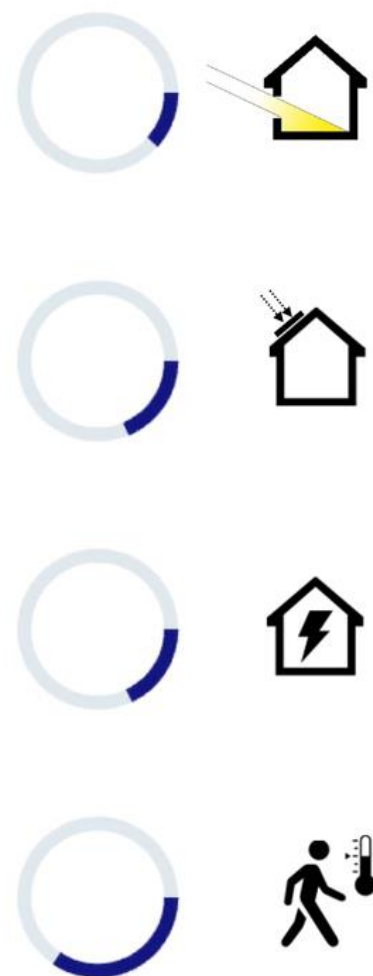


PHASE B
Regression analysis



PHASE D

Comparison of best performing (non-dominated) results from full energy and prediction metrics optimizations



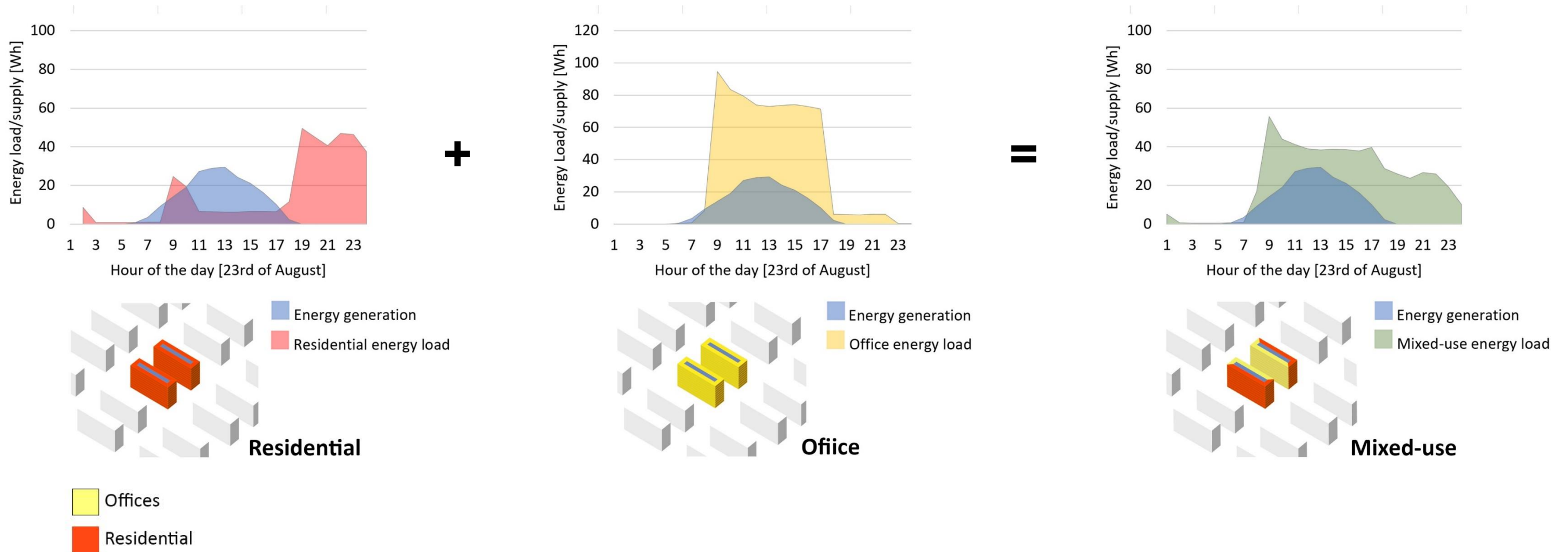


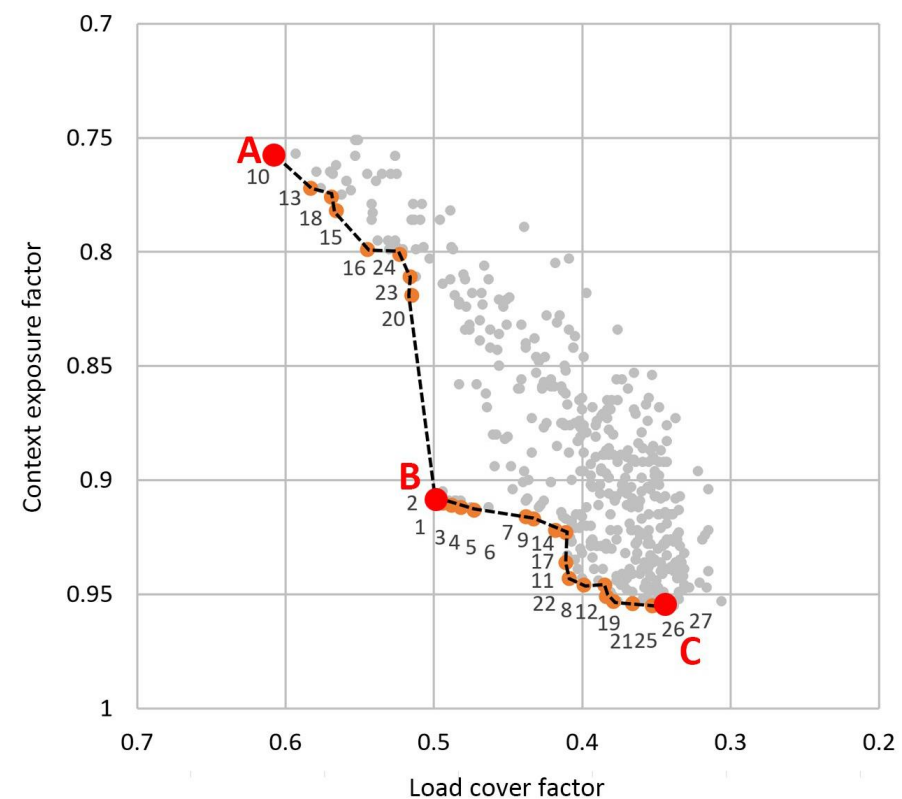
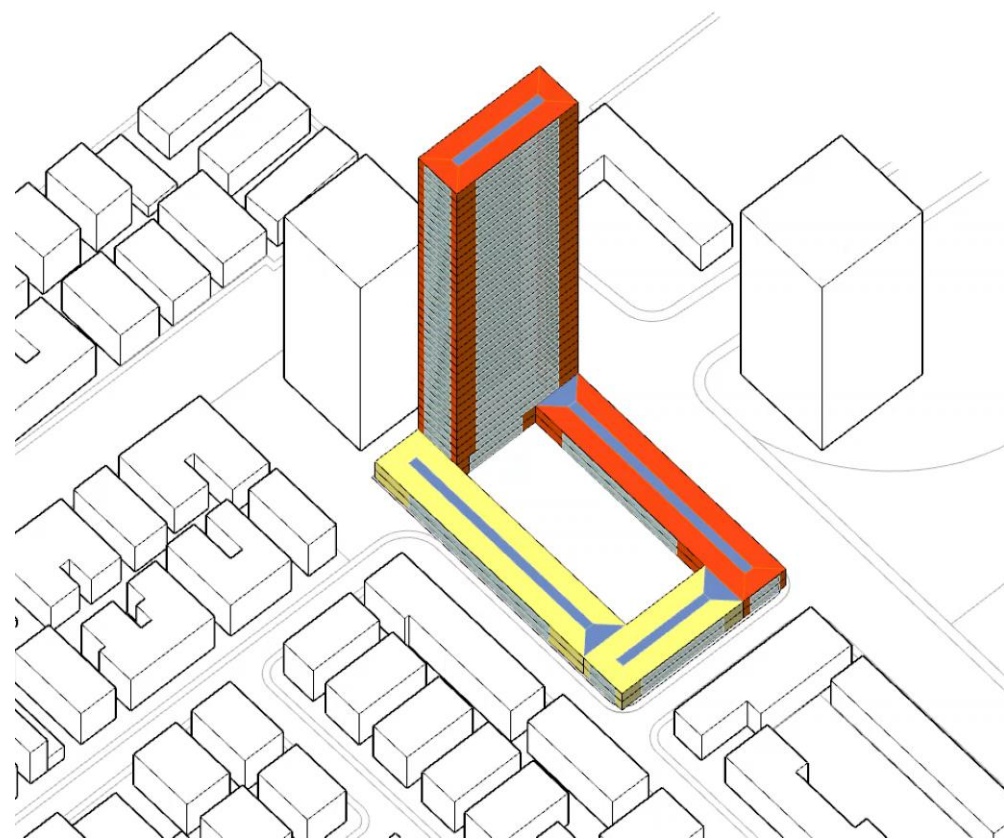
5# מהן המשמעויות התפקודיות של מגוון טיפולוגיות ושימושים במרחב העירוני?

Natanian Jonathan De-Luca Francesco and Naboni Emanuele

From repetition to diversity: A workflow for energy-driven optimization of heterogeneous urban blocks in hot climates

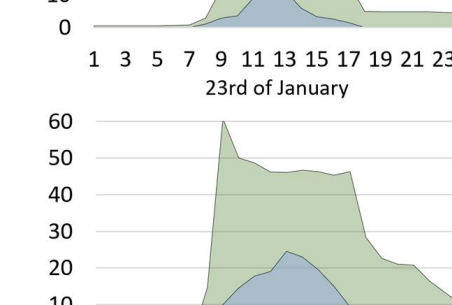
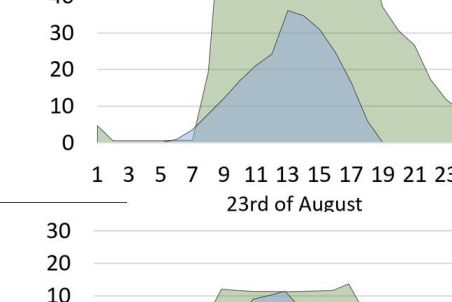
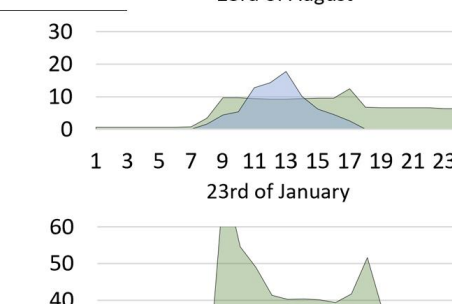
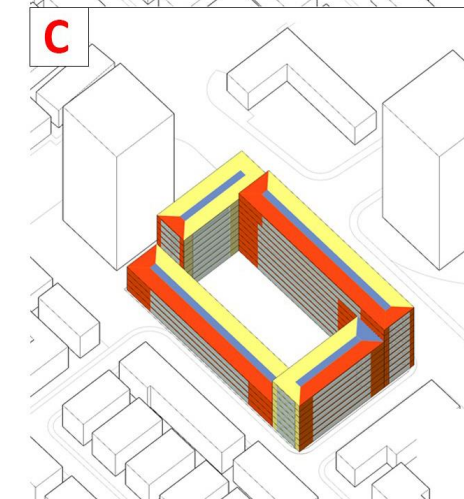
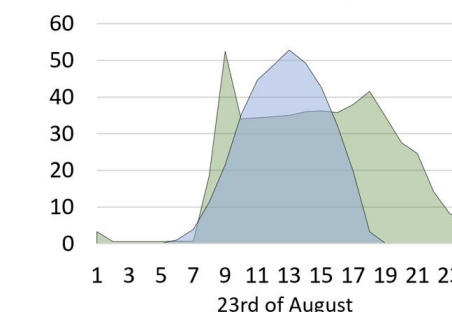
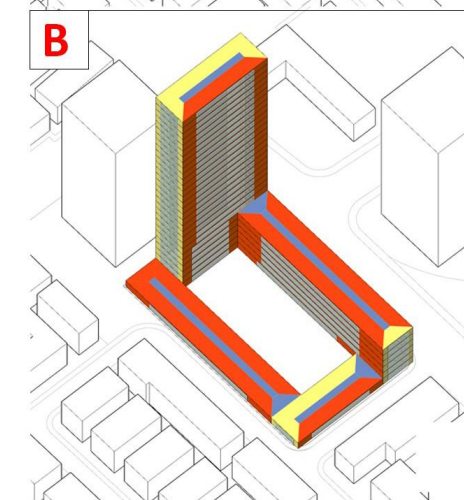
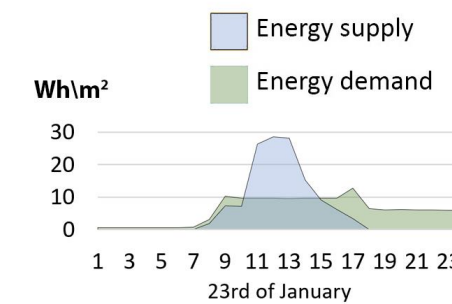
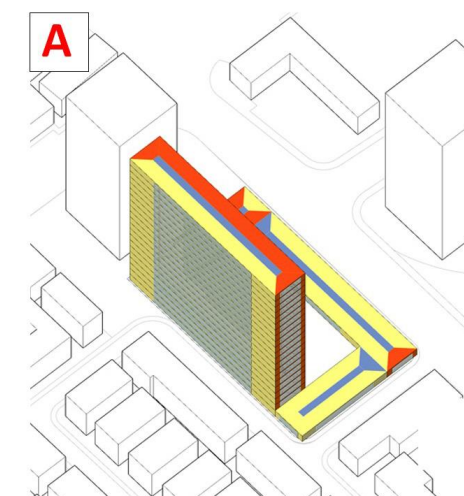
<https://www.researchgate.net/publication/365760820> From repetition to diversity A workflow for energydriven optimization of heterogeneous urban blocks in hot climates



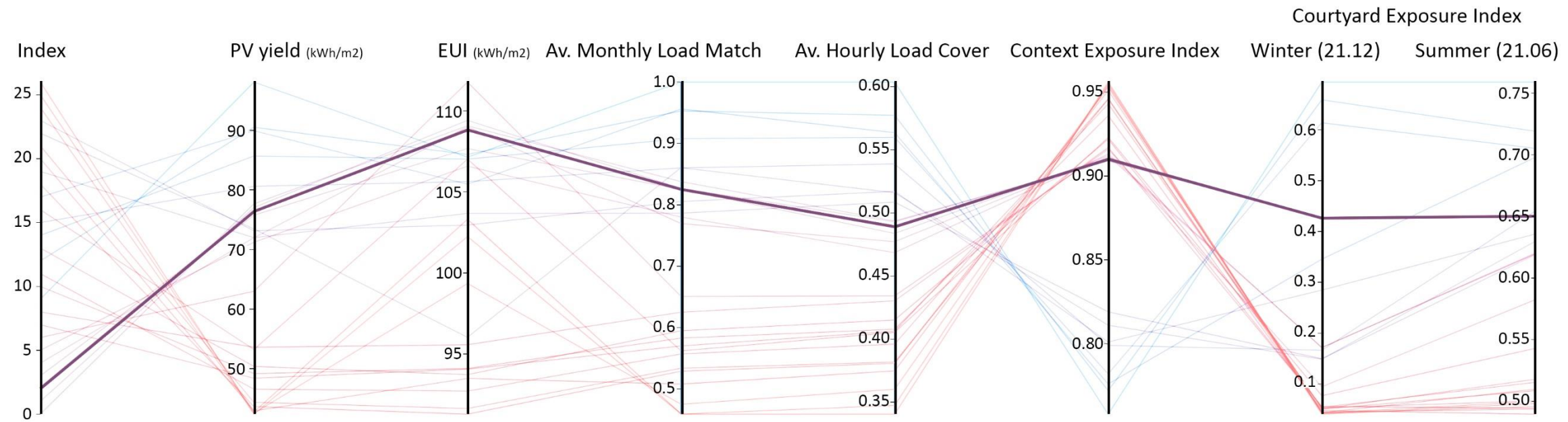


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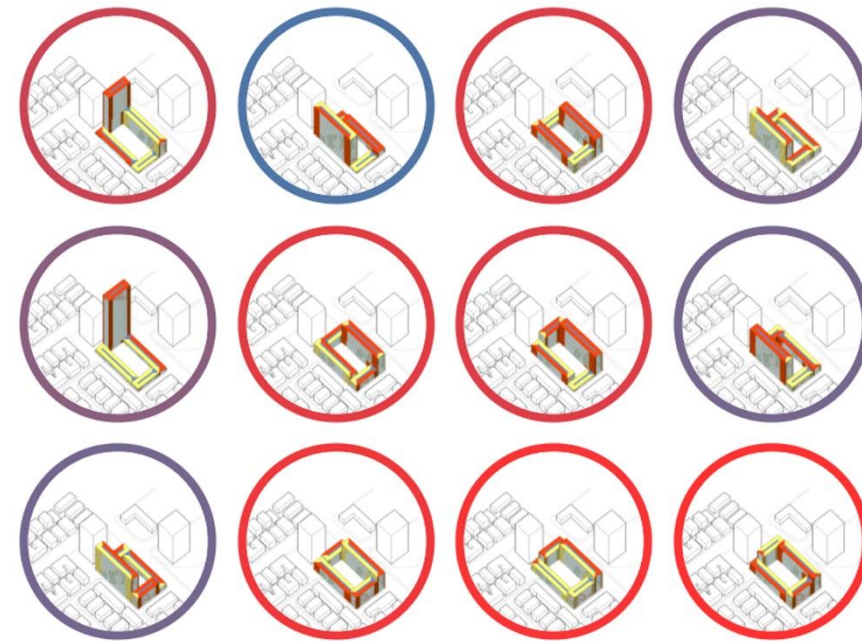
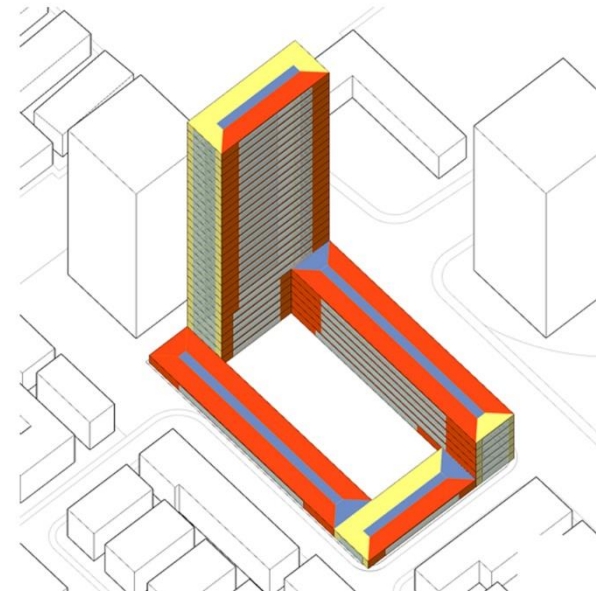


5# מהן המשמעויות התפקודיות של מגוון טיפולוגיות ושימושים במרחב העירוני?



Attributes

Index : 2
PV : 76.391062
EUI : 108.82232
AMLM : 0.825147
LCF : 0.489008
CEI : 0.91
WinterEI : 0.425995
SummerEI : 0.65123
Rating : 0



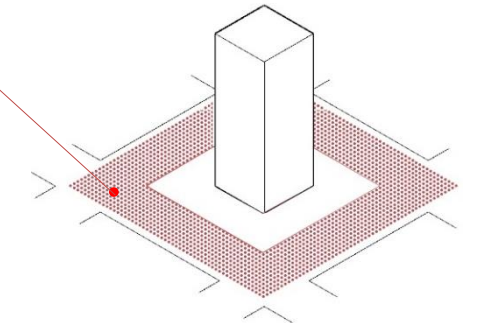
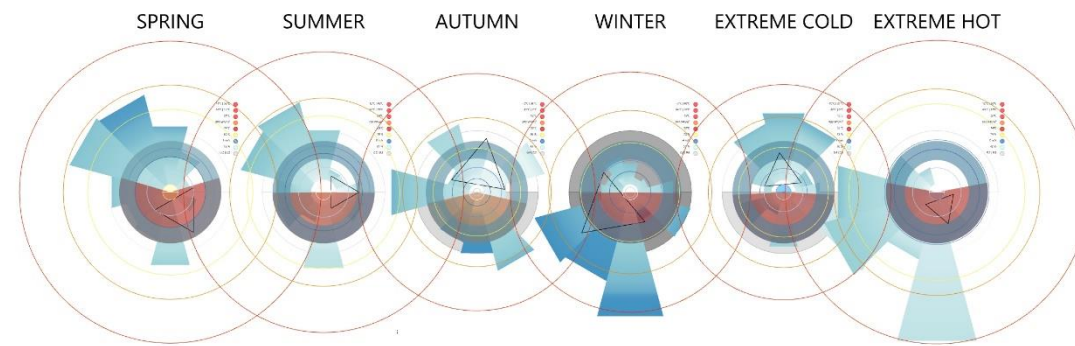
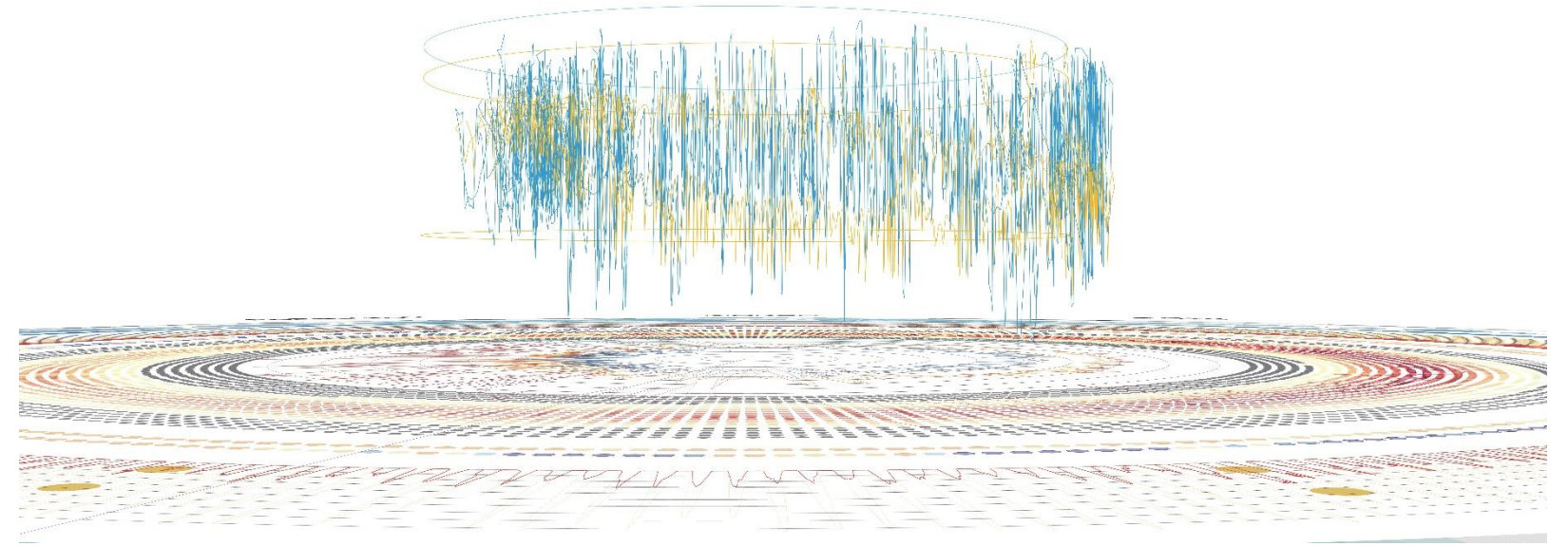
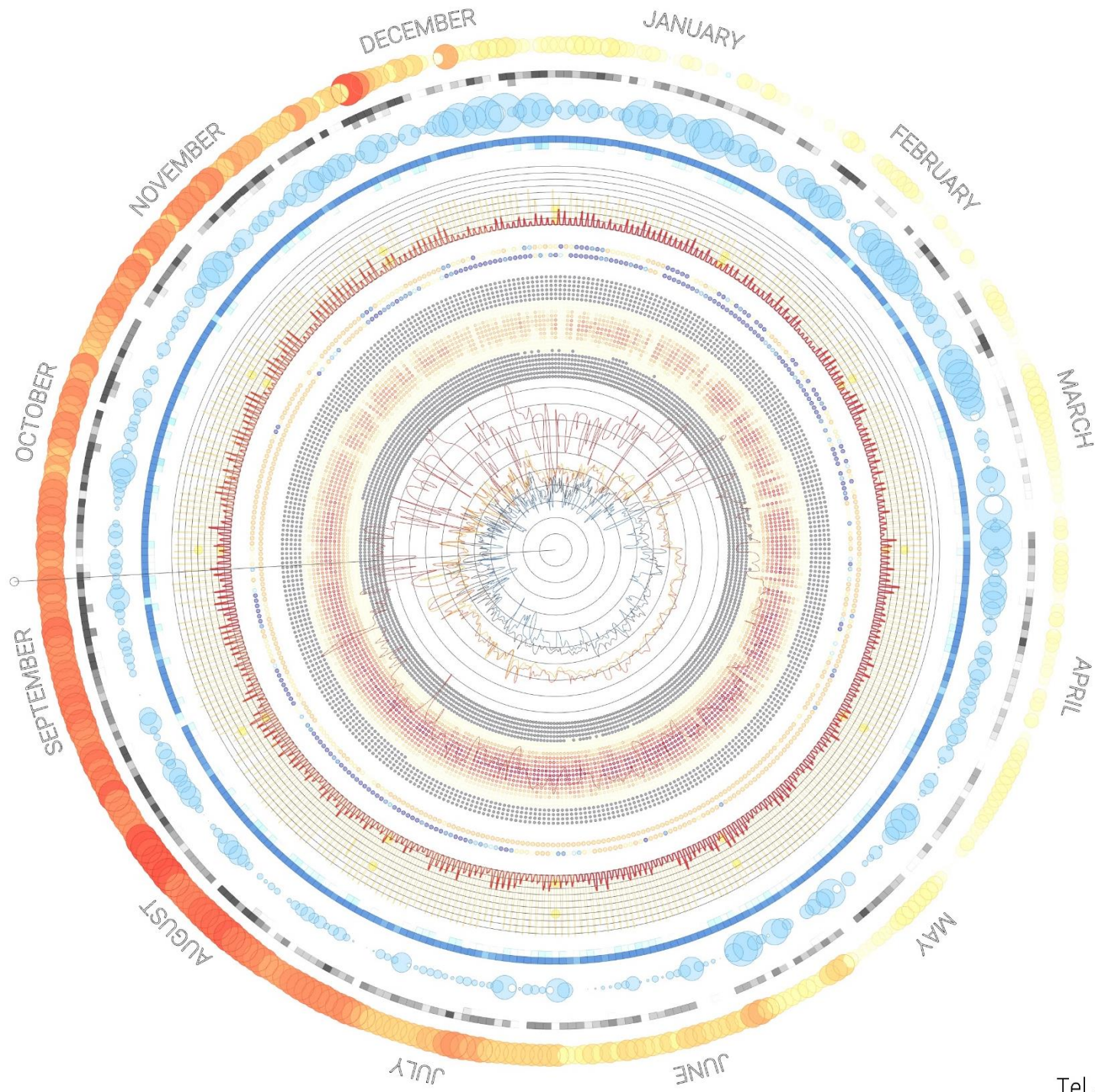


#6 כיצד נוכל לתקשר את הנתונים והתוצאות באופן אפקטיבי לקהלים שונים?

Technische
Universität
München



The Royal Danish Academy of Fine Arts
Schools of Architecture, Design and Conservation
School of Design



Tel Aviv-Bet Dagan
32.00° N
34.82° E

Cfa | Humid subtropical climate
Durban, Tokyo, Trieste

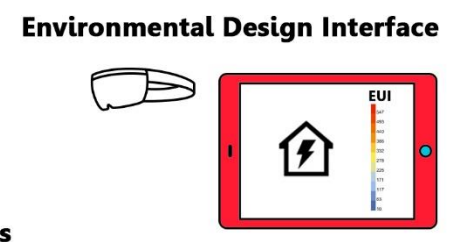
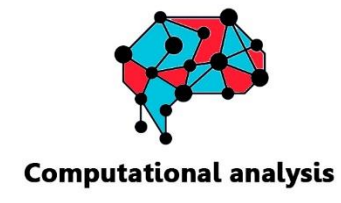
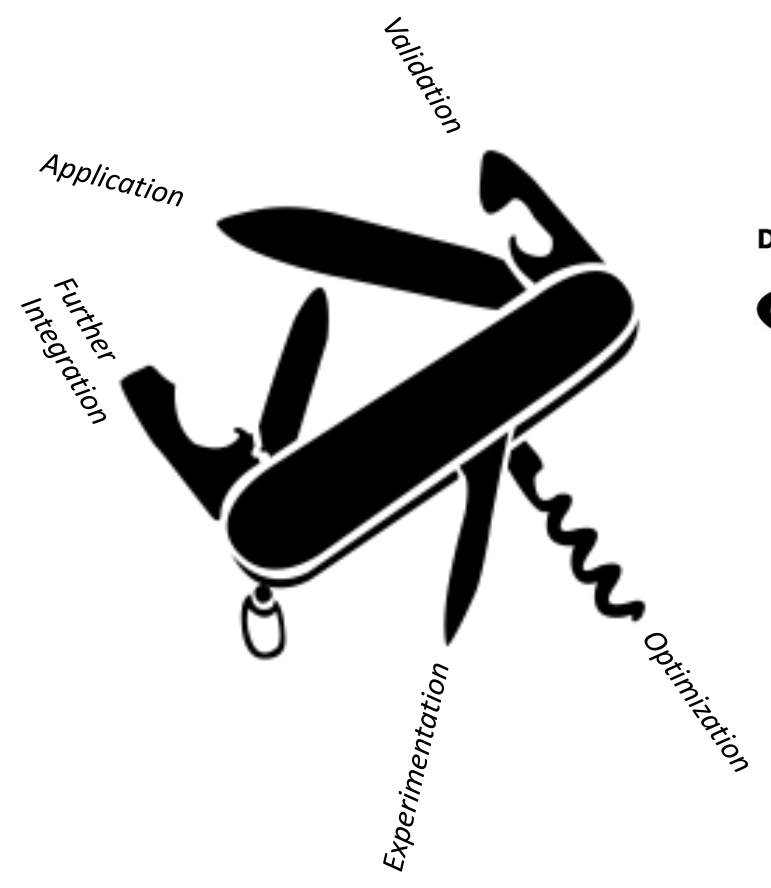




#6 כיצד נוכל לתקשר את הנתונים והתוצאות באופן אפקטיבי לקהלים שונים?
מודול לוויזואליזציה של נתוני תפקוד סביבתי נבנה בימים אלה
בשיתוף פעולה עם CIL - <https://cities.ait.ac.at/site/>



מה הלאה << ?



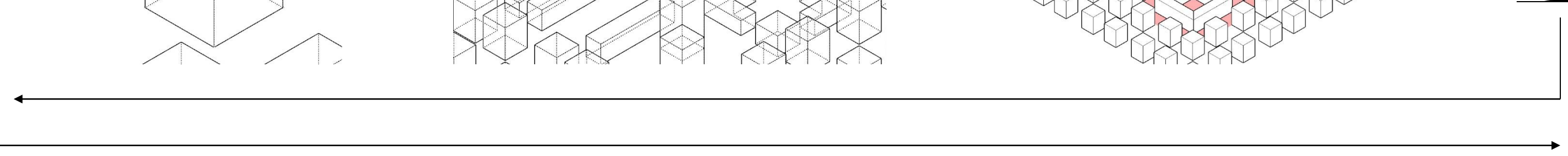
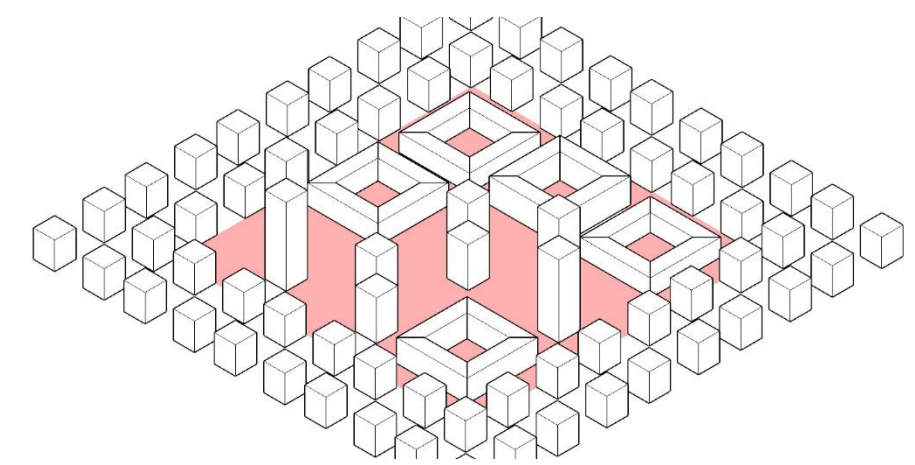
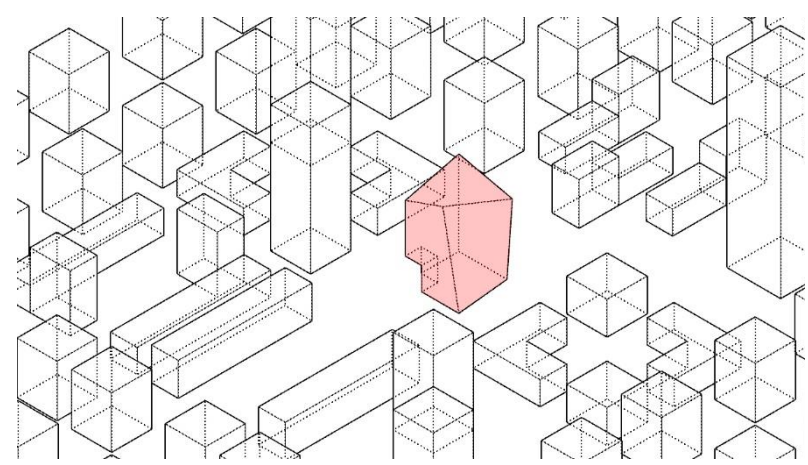
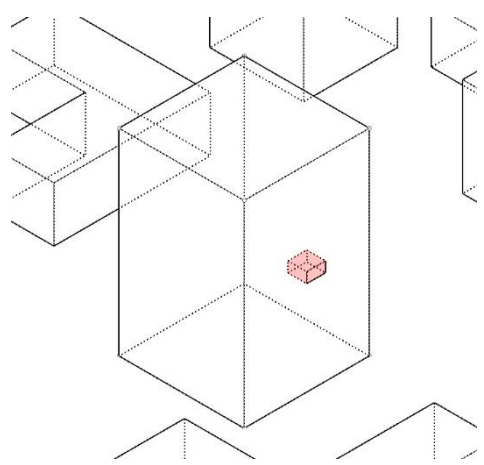
Human-centered approach

Shoe box

Building

Urban Block to district

Nature-based solutions





תודה על ההקשבה

Jonathann@technion.ac.il

<https://epdl.net.technion.ac.il/>