5 REFLECTION

Due to the increasing pressure on the housing market, finding livable shelter for reasonable prices has started to become a major social, economical, political, and technical issue. As a future member of not only the housing market but also a citizen in the Netherlands and an employee in the field of architecture, this issue is important to me. Additions to the building supply need to be made but the challenge is to do so in a sustainable manner. To solve this, building planners will need to rely more and more on new techniques to build responsibly. The building industry however is notoriously inert when innovation is concerned and it is therefore essential to explore the potential of all aspects that can help with solving the crisis.

Within my studies at the faculty of architecture however, there seems to be a stereotype that you either are an architect, the artist who designs the buildings, or anyone else, who are concerned with the planning, technical details, financing, politics, simulations etc. of buildings and neighbourhoods. This black-white approach is detrimental to the field and to me, the ultimate architect can take the most integral perspective and look at all diverging aspects of a plan in a holistic way. This is where the field of computer science and mathematics can be a great boon, simply as a tool to support one's decision. However, there are not many courses that are offered that teach 'actual' generative design with regard to the many aspects that have to be considered when building, and beyond a few mandatory courses on 3D modelling, might go under the radar of a student. Multi-criteria decision analysis and multi-objective optimization has been widely applied to other industries, but in construction (engineering) less so. The large number of diverging actors and factors in construction design and engineering are fertile ground for research into MCDA methods. With an increasing adoption of digital methods from the industry, this topic within the field of Architecture and specifically Building technology is increasingly relevant with regular new research and development into space allocation, building massings, and energy systems. The benefits of this to the industry are promising but consistency, validation, and reproducibility remain issues. The goal of the research was therefore to develop such a methodology to learn about the benefits and difficulties of implementing such a method into an early design stage.

By education, I am not a mathematician or programmer. This has provided some difficulties while developing the method. Conventions, notations, best practices and even syntax, data structures, and general concepts that might seem trivial to others were unknown at the beginning of the research project. The research I have presented in the previous chapters is therefore first and foremost an exercise and demonstration, and not a proposal for the very best method to solve these kinds of problems. The lessons learned lie mostly in how I would approach a comparable problem if starting over again. I have learned about the general concepts involved in applying these methods as well as most importantly: the question you ask already holds the answer to the problem: the phrasing of the objectives (and therefore also the choosing of the objectives) is a critical aspect of finding a workable method. If the objective and variables relate to each other in a more straightforward way, modeling and therefore solving the problem becomes a much more straightforward matter. Having to do it all over again, I would therefore be much more mindful of what exactly it is I want to achieve by applying these methods. The research method as described was a valid approach to the problem in my opinion. Never-

theless, some issues were encountered and the graduation process was delayed. I did not at all times take full advantage of my mentors and was overly hesitant to ask for help or provide updates. The lighting especially is in my opinion an underdeveloped aspect of the research. The CoVid pandemic certainly did not help in this regard since a lot of the study was done at home, but in the future I should commit myself to more readily ask for help or support when I need it. Also, simply working in proximity to someone else has helped a great amount in regards to motivation. Another issue I ran into was that of having an overly ambitious scope at the beginning of the research process. Limiting the number of aspects to research was a good decision that could have been taken earlier in hindsight.

The results are quite satisfactory but some matters might still warrant further exploration. Mainly finding alternative ways to define the daylighting potential (aside from the yearly illuminance) of the configuration is of interest to me. I am however content with the framework itself and all the new techniques and libraries I have learned to use. Beyond that, I think the research is a valuable addition the the field that can help planners and designers alike to make informed decisions and I am excited to continue working on these kind of problems. When used correctly, and with the increasing performance of computers, new techniques, and new research, these methods can greatly improve the quality of the buildings we live in in the future.