

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors, and Delegate of the Board of Examiners one week before P2 at the latest

Personal information	
Name	Danny Westerink
Student number	4540824

Studio	
Name / Theme	Advanced Housing Design - M4H: For Modern Households
Main mentor	Theo Kupers Architecture mentor
Second mentor	Anne Kockelkorn Pierijn van der Putt Ferry Adema Research mentor Research mentor Building Technology mentor
Argumentation of choice of the studio	<p>The Advanced Housing Studio sparks my interest since it offers an opportunity to contribute to the societal challenges we are facing today in the built environment: the 1 Million Home challenge and the goal of becoming climate neutral by 2050.</p> <p>I feel eager to focus on dwelling design to suit the needs of different households, family types, and people with different cultures and migration backgrounds. Besides, as an architect, you are responsible for creating the environment in which people spend approximately 70% or more of their time. I am interested in designing a qualitative environment that improves people's daily life, which also contributes to solving many of the current societal challenges. Here, the social part of designing a sustainable residential building is something I would like to learn more about.</p>

Graduation project	
Title of the graduation project	Recipe for Sustainable Living.
Goal	
Location:	Rotterdam, Merwehaven.
The posed problem,	Human behavior and the increase in population growth have become the main driver of environmental problems and pose a threat to the stability of the Earth system since the Industrial Revolution (Rockström et al., 2009). Continuing the use of natural resources, the current rate of greenhouse gas emissions and industrialized forms of agriculture will lead to undesirable consequences that will increase

	<p>over time, such as global warming, urban air pollution, freshwater shortages, environmental noise, loss of biodiversity. These current demands on nature are compromising the well-being of humanity's future and putting the existence of mankind at risk (Rockström et al., 2009; Steg & Vlek, 2008; Gardner & Stern, 2002; Swim et al., 2011; Wackernagel & Rees, 1996).</p> <p>More recently, a report of the Intergovernmental Panel on Climate Change (IPCC, 2013) has shown that a majority of 95% of the UN's climate researchers agreed that human activity is "the dominant cause of observed warming since the mid-20th century". This means that the environmental problems are attributable to human actions and are rooted in our behavior (Swim et al., 2011). Research shows that a majority of the people who understand the link between human behavior and climate change are unaware of their current behavior and significant negative impact on planet Earth. According to Page & Page (2014), this can be seen as the main reason why our daily behavior continues in an unsustainable way.</p> <p>This unsustainable way of living can be changed into a more desired, sustainable lifestyle by using the concept of nudging. Since current studies on nudging and its potential for sustainable behavior are mostly focusing on the policy-making process or small aspects in the built environment, this graduation project aims to explore the role of nudging in changing behavior towards sustainable living in architecture, more specifically, in residential dwelling design.</p>
<p>research questions and</p>	<p>The purpose of this project is to explore the role of nudging in changing behavior towards sustainable living in architecture in a residential setting. The aim is to take a closer look at the relationship between nudging and sustainability to evaluate if nudging plays an important role in architecture and the built environment that fosters sustainable living. This results in the following research question:</p> <p><i>What is the role of nudging in changing behavior towards sustainable living in architecture?</i></p> <p>To answer the main question, the following supportive research questions are made:</p> <p><i>Supportive Research Question 1: What principles of the nudge theory can be applied in architecture?</i></p> <p><i>Supportive Research Question 2: How can sustainability be integrated into architecture?</i></p> <p><i>Supportive Research Question 3: How can the nudge theory be integrated into sustainable architecture?</i></p>

	<i>Supportive Research Question 4: What is the relationship between nudging and sustainability in architecture?</i>
design assignment in which these result.	Design question: <i>How to design a dwelling complex in Merwehaven that nudges modern households towards sustainable living?</i>
Process	
Method description	
<p>The first step in the research phase is to begin with an outline of the theoretical understanding of the concept of nudging, determined through literature review. The purpose of this methodology is to examine several theories about the nudge theory, such as 1) <i>Nudge, Improving Decisions about Health, Wealth, and Happiness</i> from the behavioral economists Richard Thaler and Cass Sunstein.</p> <p>The second step is to examine the meaning and goals of sustainable development through literature review, to get a better understanding of the notion of sustainability. This part aims to look into the three interconnected pillars of sustainable development, namely the environmental, social, and economic pillars.</p> <p>Furthermore, the third part of the research focuses on the relationship between the nudge theory and sustainable development, which is also determined through literature review. The goal of this chapter is to investigate how the nudge theory can be applied to sustainable architecture.</p> <p>The last part of the research phase covers four case studies, which are used to explain, describe and explore the concept of nudging and sustainability in the everyday context. This method offers additional insights and tries to connect theory with the practical implementation of both concepts. Four different case studies have been chosen, because of their vision towards sustainable living: 1) <i>Urban Village Project</i> by Effekt Architects and SPACE10, 2) <i>Recipe for Future Living</i> by MAD Arkitekter, 3) <i>Sundsholmerne</i> by architect C.F. Møller, and 4) <i>Solaris</i> developed by Huggenbergerfries Architekten AG. These residential projects are analyzed based on the three pillars of sustainable development. Following, these architectural sustainable goals and interventions are substantiated based on the nudge theory. This will result in a better understanding of the relationship between the nudge theory and sustainable living in architecture and will define the role of nudge theory in changing behavior towards sustainable living in architecture.</p> <p>The results of the research will give a better understanding of the nudge theory and implementation of architectural interventions towards sustainability. There are needed to guide and inform the designer in the first phase of the design process. Here, the context of the design plot and user group will also be investigated to get a clear overview of the needs and wishes of the modern households on a national scale as well as a local scale.</p>	

Literature and general practical preference

An overview of the main literature I intend to consult for research and design process:

- Cornel, S. (2018). The effectiveness of nudging in increasing recycling behaviour. University of Amsterdam.
- David W., Wu, L., Digiacomo, A., Kingstone, A. (2013). A Sustainable Building Promotes Pro-Environmental Behavior: An Observational Study on Food Disposal. PLoS ONE, 8(1). <http://dx.doi.org/10.1371/journal.pone.0053856>
- Forberger, S., Reisch, L.A., Kampfmann, T., & Zeeb, H. (2019). Nudging to Move: A Scoping Review of the Use of Choice Architecture Interventions to Promote Physical Activity in the General Population. International Journal of Behavioral Nutrition and Physical Activity, 16(1), 77. <https://doi.org/10.1186/s12966-019-0844-z>
- Gardner, G. T., & Stern, P. C. (2002). Environmental problems and human behavior. Allyn & Bacon.
- Gardner, G.T., Stern, P.C. (2008). The short list: The most effective actions US households can take to curb climate change. Environment: Science and Policy for Sustainable Development, 50(5), 12-25. <https://doi.org/10.3200/ENVT.50.5.12-25>
- Gibson, J. (1950). The perception of the visual world. The Riverside Press.
- Goepel, N., Rahme, M.R., & Svanhall, F. (2015). Strategic Recommendations for the Design of Nudges towards a Sustainable Society. Blekinge Institute of Technology, Karlskrona, Sweden.
- Haglund, A. (2017). Nudging: A way to Encourage Public Tenants to More Sustainable Behaviour?: A study on how public landlords can make the sustainable choice easier KTH, School of Architecture and the Built Environment (ABE), Real Estate and Construction Management.
- Gibson, J. (1979). The Ecological Approach to Visual Perception. Lawrence Erlbaum Associates, Inc., Publishers.
- Hansen, P., & Jespersen, A. (2013). Nudge and the Manipulation of Choice: A Framework for the Responsible Use of the Nudge Approach to Behaviour Change in Public Policy. European Journal of Risk Regulation, 4(1), 3-28. <https://doi.org/10.1017/S1867299X00002762>
- Hollands, G.J., Shemilt, I., Marteau, T.M., Jebb, S.A., Kelly, M.P., Nakamura, R., Suhrcke, M. & Ogilvie, D. (2013). Altering micro- environments to change population health behaviour: towards an evidence base for choice architecture interventions. BMC Public Health 13, 1218. <https://doi.org/10.1186/1471-2458-13-1218>
- IPCC (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
- Klege, R.A., Visser, M., Datta, S., & Darling, M. (2018). The Power of Nudging: Using Feedback, Competition and Responsibility Assignment to Save Electricity in a Non-Residential Setting. School of Economics, University of Cape Town, South Africa.
- Ly, K., Mažar, N., Zhao, M., & Soman, D. (2013). A practitioner's guide to nudging. Rotman School of Management, University of Toronto.

- Mont, O., Lehner, M., & Heiskanen, E. (2014). Nudging: A tool for sustainable behaviour? The Swedish Environmental Protection Agency.
- Neutel, S.M.R. (2017). The Concept of Nudging in Landscape Architecture and Planning: Understanding Nonconscious Human- Environment Interaction in a Natural Context. Wageningen University, Department of Environmental Sciences.
- Page, N., Page, M. (2014). Climate change: Time to do something different. *Frontiers in Psychology*, 5. <https://doi.org/10.3389/fpsyg.2014.01294>
- Purvis, B., Mao, Y. & Robinson, D. (2018). Three pillars of sustainability: in search of conceptual origins. *Sustainability Science*. <https://doi.org/10.1007/s11625-018-0627-5>
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Stuart, C., Lambin, E.F. ... Foley, J. F. (2009). A safe operating space for humanity. *Nature*, 461, 472–475. <https://doi.org/10.1038/461472a>
- Steg, L., Vlek, C. (2008). Encouraging pro-environmental behavior: An integrative review and research agenda. *Journal of Environmental Psychology*, 29, 309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
- Swim, J.K., Clayton, S., & Howard, G.S. (2011). Psychological and contextual drivers. *American Psychologist*, 66(4), 251–264. <https://doi.org/10.1037/a0023472>
- Thaler, R.H., Sunstein, C.R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*. Yale University Press.

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

The design of a sustainable dwelling complex for a diverse group of residents that nudges them towards sustainable living (graduation topic), contributes to the goal of the topic of the studio. This studio focuses on providing suitable, affordable housing for the modern households, as well as the notion of inclusiveness and equality (studio topic). Therefore, the topic of the studio plays an important role in the architectural environment (master track Architecture) and the contribution to the challenge of building 1 Million Homes by 2030. Therefore, completing this project will offer valuable insights into the implementation of the nudge theory in the built environment, which relates very well to the master of Architecture, Urbanism, and Building Sciences.

2. What is the relevance of your graduation work in the larger social, professional, and scientific framework?

Since not much research has been done on the role of nudging in changing behavior towards sustainable living in residential architecture, and the relationship between the nudge theory and choice architecture interventions that stimulate sustainable behavior, the aim is to take a closer look at the relationship between nudging and sustainability to evaluate what role nudging plays in architecture and the built environment, and how. One of the contributions of the project is an in-depth analysis of four case studies that are analyzed on the three pillars of sustainability

and substantiated with the nudge theory and a sustainable dwelling complex in which the nudge theory is implemented. This project offers additional insights that try to close the gap between theory and practical interventions. Furthermore, this project will be beneficial for architects and students who are interested in learning more about the psychology of human behavior, their impact on the daily life of the users they are designing for, and the different sustainable nudge interventions they can implement. Finally, this project contributes to the societal challenges we are facing today: 1) adding 1 Million Homes to the housing stock by 2030, and 2) becoming climate neutral by 2050, and is therefore relevant in the larger social, professional, and scientific framework.