Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: Architectural Engineering Studio

Personal information	
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Studio		
Name / Theme	AR3AE100 - Architectural Engineering Graduation Studio / Harvest	
Main mentor	Mauro Parravicini	Architecture, Urbanism and Building Sciences – *Design tutor*
Second mentor	Mo Smit Paddy Tomesen	Architecture, Urbanism and Building Sciences – *Research tutor* Architecture, Urbanism and Building Sciences – *Building Technology tutor*
Argumentation of choice of the studio	The Architectural Engineering studio offers the time and space to explore several themes I personally am fascinated about, including current environmental and societal issues, sustainability in different ways, vernacular architecture and finding simple but architectural solutions. I like holding onto a leading concept in my design-research process until the very end of it. The possibility to discover and tackle architecture from other countries and cultures excites me the most in this studio, which is an exciting way to start my graduation year and finish my study.	

Graduation project	
Title of the graduation project	**Wildfire resilient village of the future**
Goal	
Location:	**Village:** Kalemler **Region:** Manavgat, Antalya **Country:** Turkey
The posed problem:	**Background:** In the summer of 2021, an exceptional number of 270 wildfires took place among the entire Turkish Coast (Turkish Red Crescent, 2021). Multiple villages have been partly or completely destroyed. Villagers lost their houses and their income sources from agriculture, machinery and livestock (BBC News Türkçe, 2021). This emerges the question on how these destroyed villages will be rebuilt. According to climate scientists, the wildfires will increase in the future due to hotter summers (KNMI, 2021). Therefore, it is important to research wildfire resiliency guidelines while rebuilding inhabited settlements. The Mediterranean region of Turkey is one of the riskiest wildfire areas and prone to future fires (IAWF, 2019). Kalemler village is one of the most damaged villages (DW Türkçe, 2021), therefore chosen as the research and design area. It is representative for burned down villages in the Mediterranean region of Turkey, in terms of wildfire risks, community and settlement in the landscape. **Problem statement:** 1.The current rebuilding plans only focus on returning back to normality as soon as possible and rebuilding the villages quickly into what they used to be before. However, this limits the opportunities to bring changes in the villages to make them co-exist with future wildfires. Governmental mass-build plans do not involve the locals, are unclear about final costs and lack wildfire resiliency aspects. Locals are not satisfied with those plans, but do not have alternatives themselves other than rebuilding the demolished houses like the pre-wildfire situation. Besides, worldwide research on how to rebuild communities in a wildfire resilient way focuses on the scales of wildlands, cities and building scales. Villages are a missing scale in current works. 2. Looking at Turkish villages in the national scale, Turks always historically provided themselves with self-built dwellings made of stone, earth or wood. A national change was made into building with concrete and brick in the second half of the 20th century.

	Local practices of earth construction almost disappeared overtime in the villages, because the knowledge became outdated. Despite the many destroyed woods, earth is still an affordable and locally harvestable building material. Besides, earth is a non-combustible material (Minke, 2000, p.36), which makes the disappearance of earth construction methods seem contradictory for wildfire risk areas. → These problems provide insights on new possibilities and opportunities in the rebuilding process of the destroyed villages, with the perspective of doing this in a wildfire resilient way: involving the locals, harvesting local soils, innovating local skills and knowledge on self-building with earth, and combining earth construction with innovative wildfire resilient solutions.
Research questions:	**Overall Design Question:** How can destroyed villages in wildfire risk areas be rebuilt in a new wildfire resilient way, involving local building skills and knowledge in the Mediterranean region of Turkey? *Sub questions:* -How does the wildfire resilient rebuilding strategy contribute to rebuilding the village, on the scales of construction detail, building planning, village typology, landscape and community? - How could innovation of vernacular façade earth construction methods contribute to a wildfire resilient rebuilding strategy for burned down villages in the Mediterranean region of Turkey? **Thematic Research Question:** How could innovation of vernacular façade earth construction methods contribute to a wildfire resilient rebuilding strategy for burned down villages in the Mediterranean region of Turkey? *Sub questions:* -What earth construction methods were used in this region historically, focused on the façade? -To what extent are earth construction skills and knowledge present within the current building culture of self-built village houses and which potentials are there to reintroduce earth construction to builders who now use other materials? -How is the regional landscape with corresponding soil types characterised and how can this local earth be formed into façade building materials? -How can vernacular earth façade construction methods be innovated in order to enhance a wildfire resilient way of (re)building? **(The façade was chosen to focus in-depth in the thematic research paper, as it occupies the largest percentage of the total building and is a large fuel source for wildfires.)*
Design assignment in which these result:	Kalemler as the wildfire resilient village of the future, designed on five scales from the wildfire resilient rebuilding strategy: community, village, building typology, construction and landscape. This translates into the following design project elements: 1. Wildfire resilient village rebuilding plan 2. Wildfire resilient village house design 3. Building guidelines for local builders
Process	
Method description	
The design is made using the wildfire resilient rebuilding strategy, concerning the five scales. The main research question showed the innovation of vernacular façade earth construction contributes to the wildfire resilient rebuilding strategy for burned down villages in the Mediterranean region of Turkey on two scales from the total strategy, namely the construction detail and community. This research was conducted by architectural ethnography, geobased local mining, consistency tests and literature. Rammed earth was proposed as the innovative construction method, in order to enhance a wildfire resilient way of (re)building on the two scales. All in all, the introduction of rammed earth façade construction methods could contribute to a wildfire resilient rebuilding strategy, because wildfire damage will be reduced by non-combustibility and villagers will be able to rebuild and repair their houses easily with this newly introduced method. Furthermore, the scale of building typology is tackled with results from the architectural ethnographic research, references of the local building spatial planning, voronoi-principle and additional literature. The village scale is tackled with literature on wildfire rebuilding, analysing existing structures and design testing. The scale of landscape is tackled with references from scientific literature on wildfire resilient rebuilding from other countries. All scales are tested with research by design. All in all, the outcome of all research helps developing a wildfire resilient village rebuilding plan, wildfire resilient village house design and building guidelines for local builders.	

Literature and general practical preference

In graduation plan:

BBC News Türkçe. (2021, August 3). *Manavgat: Yangında kül olan köyler* [Video file]. Retrieved from https://www.youtube.com/watch?v=rCcHGmm6Uaw

DW Türkçe. (2021, August 2). *Kalemler köyü tamamen yandı | 'Cenneti cehenneme çevirdiler' - DW Türkçe* (Kalemler village is fully burned) [Video file]. Retrieved from https://www.youtube.com/watch?v=xFGyvNih95w

KNMI. (2021). Bosbranden. Retrieved 1 October 2021, from https://www.knmi.nl/kennis-en-datacentrum/uitleg/bosbranden

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Literature:

Federal Insurance and Mitigation Administration. (2016). *Rebuilding After a Wildfire*. FEMA. Retrieved from https://www.fema.gov/sites/default/files/documents/rebuilding-after-a-wildfire_2016.pdf

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Minke, G. (2000). *Earth Construction Handbook: The Building Material Earth in Modern Architecture* (1st ed.). Southhampton, United Kingdom: WIT Press.

Minke, G. (2009). *Building with Earth. Design and Technology of a Sustainable Architecture (2nd ed.)*. Basel, Switzerland: Birkhäuser.

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Rael, R. (2009) Earth architecture. New York, N.Y.: Princeton Architectural Press.

Schroeder, H. (2012). Modern earth building codes, standards and normative development. *Modern Earth Buildings*, 72–109. https://doi.org/10.1533/9780857096166.1.72

Skidmore, Owings & Merril. (2021). *Designing Communities for Wildfire Resilience*. Retrieved from https://www.som.com/wp-content/uploads/2021/09/Designing-Communities-for-Wildfire-Resilience_reduced_FINAL-1632896152.pdf

UCDavis. (2021, October 20). The House That Doesn't Burn. Retrieved 11 January 2022, from https://www.ucdavis.edu/climate/news/wildfire-resistant-housing

Zafar, S. (2020, October 16). How Towns Can Rebuild After a Wildfire. Retrieved 21 December 2021, from https://www.ecomena.org/how-towns-can-rebuild-after-a-wildfire/

Own thematic research paper:

Kiliçaslan, E. (2022). *The reintroduction and innovation of earth façade construction in wildfire risk villages in Turkey.*

Personal interviews from site visit

Reflection

1. **The relation between graduation (project) topic, the studio topic, master track, and master programme:**

Within the master track Architecture, my graduation topic intersects multiple aspects from the built environment like building construction, landscape and sustainability. Design and research are key tools in my project to deal with contemporary technical and social challenges in the chosen Turkish context. I wanted to challenge myself

with a totally different building context than the Dutch one, which I have been designing for during my whole study career. The studio Architectural Engineering Graduation also focuses on finding technical and architectural solutions to current environmental issues. My graduation topic fits this vision of the studio. It also reflects the Harvest scope, focusing on harvesting the elements at hand and using this in the research and design. Within this scope, my graduation project crosses different elements like earth construction, local self-building practices and cultural values. I focus on self-buildable technicality, which is inseparable with the cultural norms and values of the design location. It is important to design buildings that fit the social practices of the location, since buildings influence behaviour and vice versa. Within the studio, my project touches upon interdisciplinary perspectives, which are the building blocks for my design and those are inextricably linked with each other.

2. Relevance of graduation work in the larger social, professional and scientific framework

Social: this graduation work aims to help village communities with rebuilding their houses in a responsible, wildfire resilient way. The local knowledge and skills on how to self-build with earth can be improved with 'simple' earth construction methods combined with innovative building methods like water catching roofs. This way, a sustainable future of living in wildfire risk areas can be provided for the villagers, as wildfire damages will be reduced with earth as the main building material and the 'wildfire-closed building envelope'. In cases of unforeseen damage, the villagers will be able to repair and rebuild themselves with the sustainable knowledge on a newly introduced earth construction method. All in all, villagers will be able to return to their daily business in a responsible way.

Professional: this graduation work could help architects, designers and researchers design for the housing need in Turkish villages in wildfire risk areas. It is also generalizable for designing in other countries with the same circumstances regarding villages in wildfire risk areas. The wildfire resilient rebuilding guidelines could be used as the framework for rebuilding houses, but maybe even on larger scales and in cities.

Scientific: villages were a forgotten scale in currently available state of the art on designing for wildfire resilient communities. This graduation work adds value on the scale of villages. The water system in my project could be furtherly transferred to Turkish water management scientists to explore more in depth and apply in the mountain slope-villages in wildfire risk areas.

Glossary

Own definitions:

- **Wildfire resilience:**

"*The ability to cope with wildfires in such a way that as little damage as possible is caused to the environment, including buildings, people, flora, fauna, work and daily life. This concept encompasses several aspects, one of which is architectural resistance to fires. Other aspects are the urban layout, social collaboration and landscaping.*"

- **Wildfire resilient rebuilding strategy:**

"A village rebuilding plan with the aim of making a village and its community wildfire resilient. This strategy includes the following scales: details, building planning, village typology, landscape and the community. The design project outcome has taken into account all these scales."

- **Wildfire resilient village of the future:**

"A village is wildfire resilient when it meets the following requirements: the community is able to (re)build their houses and other buildings with local building knowledge and skills, with materials that prevent damage in terms of a little or no demolishment. They can continue their daily lives or pick it immediately after a forest fire happens. In case of unforeseen destruction, they can easily repair the damage themselves. The typology and landscape of the village is designed specifically in a way that it prevents wildfires from spreading. These requirements are the indicators of measurement."