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.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Rexhina Basha
Student number	5817773

Studio		
Name / Theme	Metropolitan Ecologies of Places / Energy Transition	
Main mentor	Dr. Daniela Maiullari	Section of Environmental Technology and Design
Second mentor	Dr. Marcin Dąbrowski	Section of Spatial Planning and Strategy
Argumentation of choice of the studio	Growing up in the city of Elbasan, I witnessed the gradual degradation of Communist industrial sites over time, houses lightning with candles and people heating with burning woods due to electricity shortages. These memories have intrigued my curiosity to research and address the energy security challenges, while considering the impact on energy equity, environmental qualities, the local values and limitations of these former industrial sites and of a post-communist society. The Metropolitan Ecologies of Places fit perfectly with my interest and guided me through the complexity of energy transition within urban territorial transformation. It showed the importance of combining a systemic thinking and design approach while critically investigating the notions of energy, space, transition and local values of a specific place and society. I learnt that energy transition is not only about adapting the technology, processes and flows of energy system, but also about shaping spaces, urban forms, social norms and environmental qualities into a new paradigm of the energy-space nexus. While investigating the interplay of place-life-processes, I started thinking on how this energy-space nexus can shape the energy transition process in Albania, particularly in my hometown Elbasan. This city once stood as the primary industrial hub of Albania during the communist era, and it represents an opportunity to challenge the social memories	

	and norms that cast these places as unworthy repositories of unpleasant recollections of life during Communism.

Graduation project	
Title of the graduation project	Redefining energy scapes in Elbasan, Albania: Establishment of a synergy between communist industrial sites and residential areas in the context of energy transition.
Goal	
Location:	Elbasan, Albania
The posed problem,	Albania is among the most climate-vulnerable countries in Southeast Europe, facing changing weather patterns characterized by higher temperatures, decreased summer rainfall, and extreme flooding and drought events (World Bank, 2013). The country heavily relies on hydropower as its second main energy source, making it susceptible to the climatic challenges it has experienced in recent years (IRENA, 2021). For instance, in 2017, domestic electricity production from hydropower dropped to 63% due to extreme drought events, while energy demand for cooling significantly increased (IRENA, 2021). Therefore, ensuring energy security is a primary goal for Albania's energy system to meet future energy demands and reduce vulnerability to external climate changes. While aiming to achieve energy security, it is crucial to assess the social and environmental impacts of this transition in the specific context of Albania. This country is reflecting energy poverty, particularly affecting the elderly who struggle to afford electricity for heating and cooling to meet their energy needs (Heuvelmans, 2022). At the same time, the primary energy production in Albania heavily relies on fossil fuels, ranging from 46% to 68% over the last five years (IRENA, 2021). This dependence results in increased greenhouse gas emissions and air pollution issues. The impact of

	this pollution on the health of citizens and vulnerable groups has not been adequately assessed due to data limitations (UN, 2018). It is crucial to evaluate not only the social and environmental impacts of the current energy system, but also the impact of achieving energy security along these two perspectives. Within the challenge of reaching energy security and encore its environmental and social outcomes for a clean, affordable, and accessible energy system, the biggest uncertainty relies on the way energy shapes space and space energy. Energy system in Albania is shaped by uncertainties of energy-space nexus due to unpredictable impacts that energy has in spatial, social and environmental contexts. Starting with Communist period, drastic transformation in space were made to complete energy demand, where extensive oil and gas fields, mining villages, first hydropower plants and big industrial complexes were constructed by changing the landscapes from rural to industrial based area. During this period, 41 new urban centers were established as hubs for economic and industrial development, strategically linked to mineral and energy sources extractions and refineries. These 41 new urban centers create a Pattern of Production that consists of the residential area and industrial sites. This Pattern is identified in this project as a reflection of uncertainties of energy-space relation in Albania, which contain potentials to foster energy transition by redefining these spaces into a sustainable energy-space nexus relation. But are these uncertainties only a problem of the past? Energy-space uncertainties are not only recognized during Communist regime, but also today. Albania has a lot of potentials for solar

	energy and wind energy in the north and south of the country. It has also geothermal resources that could be used for heating. Nowadays, the government is prioritizing investment in renewable energy. The main policies show that diversification of clean energy sources, energy efficiency and technology advancement are main goals of energy transition in Albania. And still energy space nexus is missing. There are being constructed big solar energy prodution sites, transforming large hills landscape into sites of energy production, with a fossil fuel thinking mindset where energy production is priority, rather than the spatial, social and environmental imapcts that these sites will have in Albania. The same energy system thinking as during Communism, where space is not considered and social environmental impacts are neglected, is being followed even nowadays while Albania is aiming to foster energy transition. While zooming in at the city of Elbasan, a city situated at the nexus of the national energy infrastructure and housing one of these largest former communist industrial sites, there are many limitations, conflicts and potentials when considering to include this space in the energy transition process. In the past, there existed multiple connections linking the industrial sites with the city, ending up nowadays into an undesirable and neglected space. This complex background is manifested in space, life and urban characteristics of this city where the layers of historical phases coexist, either in harmony or as abandoned remnants of former communist industrial sites. To sum up, as energy security stands at the core of energy transition in Albania, with Elbasan as the case study, it is crucial to consider the social,

	environmental and other context-specific impacts of this process through the lens of energy-space nexus.
research questions and	**Main Research Question:** How can the establishment of an energy-space nexus in the Pattern of Production contribute to energy security for a social and environmental sensitive transition in Elbasan? **Research Sub questions:** • What are the main concepts and theories that define sustainable energy transition process? • What is the relation of energy and space in the Pattern of Production in Elbasan, considering social and environmental context? • What are the current policies and stakeholders that have an impact in the energy transition process? • How to design sustainable energy transition scenarios in Elbasan, considering existing and on-site observed patterns? • How to design strategies for the areas of transition in Elbasan to achieve the optimized vision of 2050? • What is the assessment of the new energy-space nexus in Elbasan in terms of completing the locals needs?
design assignment in which this result.	This project aims to follow these design steps in order to answer the questions listed above: • Build a strong theoretical foundation and conceptual framework that can guide the diagnosis and design chapters; • Identify the relation between energy and space in the case study of Elbasan, by analyzing the spatial characteristics of this Pattern of Production, the energy demand and supply, social-environmental context, policies and stakeholders;

	• Spatially design the optimized scenario in Elbasan for 2050 by combining the maximized scenarios of conceptual framework 3 pillars; • Define a project of interventions in the scales from MLP framework to design the strategies needed for this transition; • Create a comprehensive assessing framework of patterns that can be used in similar contexts and different scales.

Some of the images produced by the author to give a hint on how these design assignments will be illustrated:

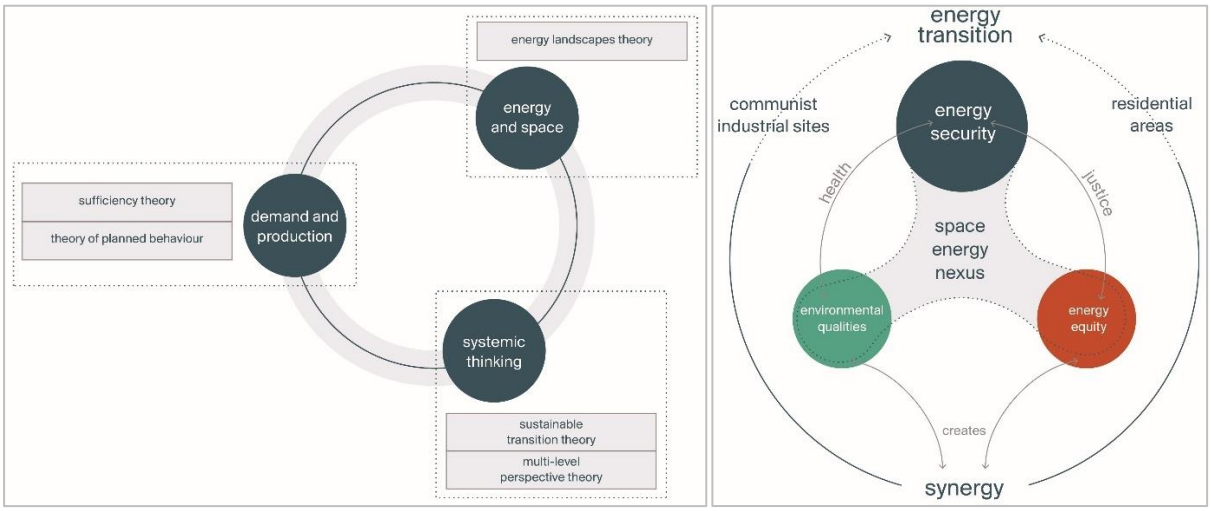

Figure 1: theoretical framework (left) and conceptual framework (right)

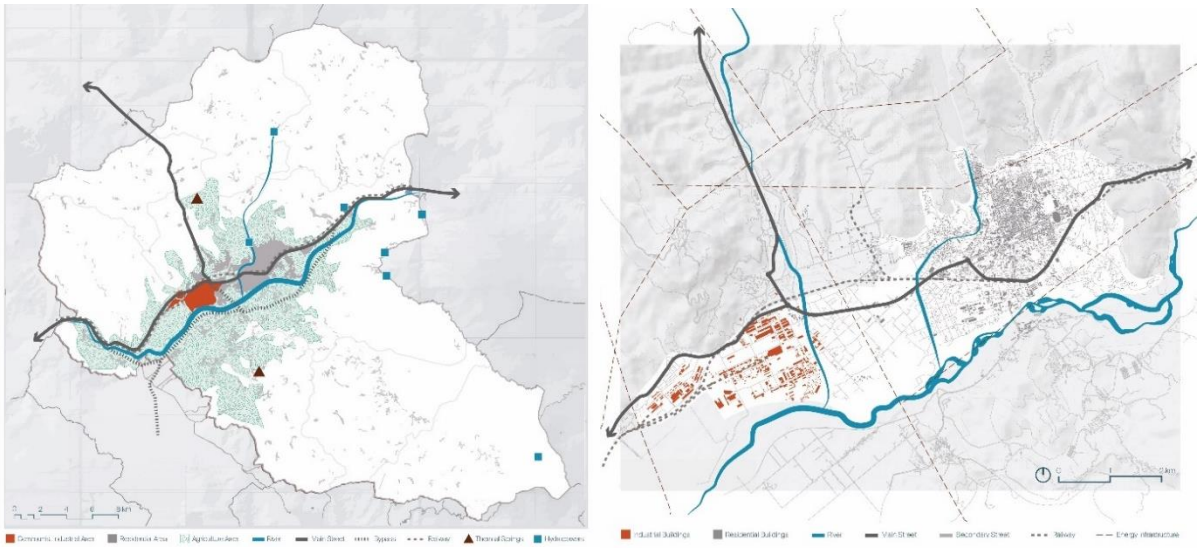

Figure 2: Spatial analysis of Elbasan municipality (left) and zoom in on the Pattern of Production (right)

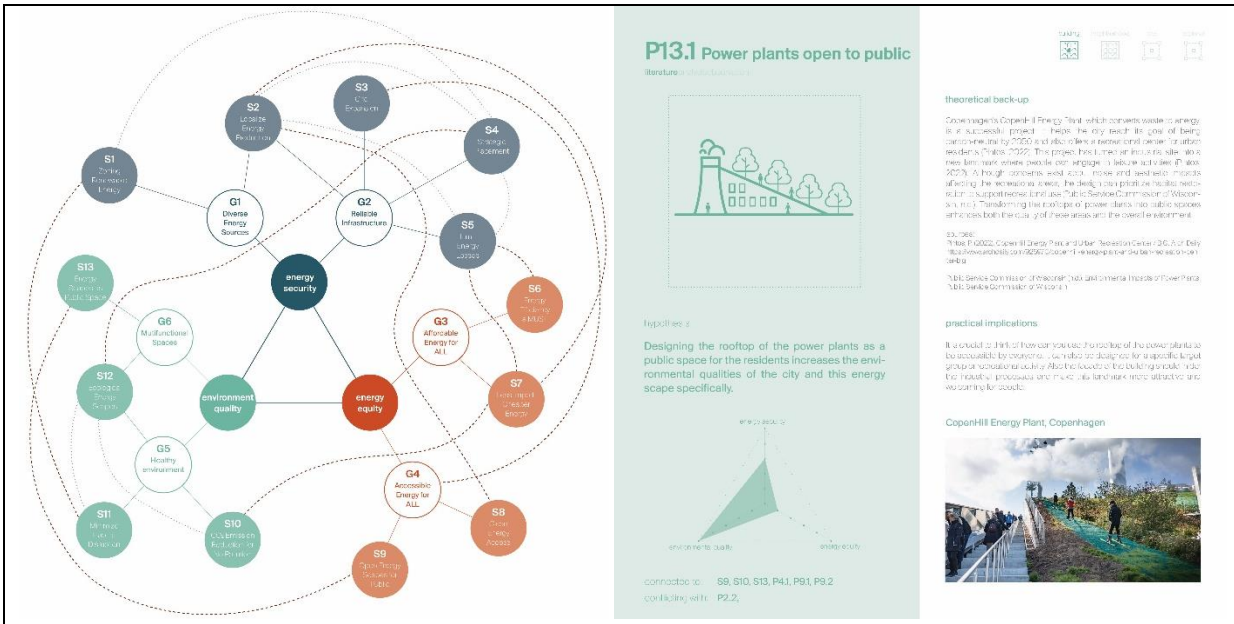

Figure 3: Pattern Field (left) and one Pattern (right) selected to visualize how will they be constructed

Process

Method description

The structure of this project follows the systemic design approach, where design and systemic thinking are both integrated within a 7-steps framework: (1) Framing the system, (2) Listening to the system, (3) Understanding the system, (4) Defining the desired future, (5) Exploring the possibility space, (6) Designing the intervention model, (7) Fostering the transition (Figure 4).

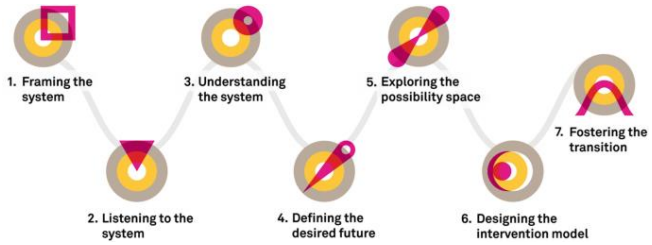

Figure 4: systemic design toolkit methodology (image by Namahn)

The methodology employed in this project consists of four phases aligned with the 7 steps of systemic design thinking (Figure 5). The first phase, Theoretical Underpinning, aims to (1) frame the system by properly defining sustainable energy transition process through a critical review of different literature and theories. A theoretical framework will be designed for a comprehensive understanding of the main theories that support the main research question. At the end, a conceptual framework will be constructed to guide the design of the project.

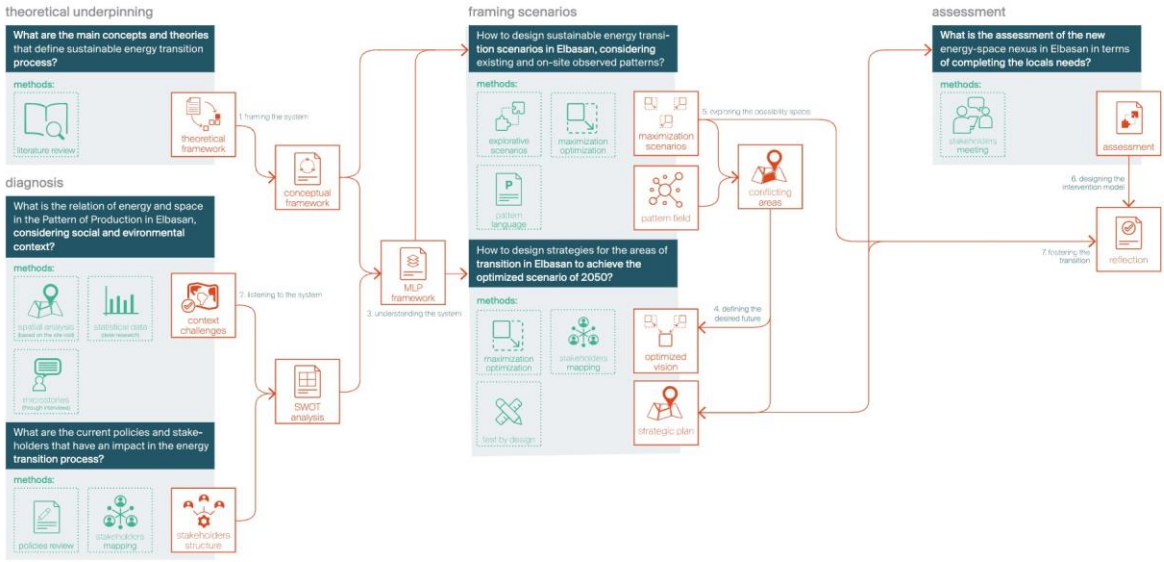

Figure 5: Research framework

The second phase, named Diagnosis, involves analyzing the current and future challenges of Elbasan by (2) listening and (3) understanding the energy system and its local identity (Figure 5). It consists of two primary sections: the connection between energy and space in the Pattern of Production along with the analysis of energy demand-supply and their social and environmental context; the review of policies and stakeholders' structure that impact energy transition. The first section will be using spatial data gathered by the site visit and statistical data from the official website of Institute of Statistics (INSTAT). Also, it will define microstories from the informal interviews with various stakeholders and citizens. These tools will be integrated with the review on policies and stakeholders' structure to identify potentials, conflicts and limitations. SWOT analysis will assess the findings and define criteria of transition.

The third phase will involve designing three explorative scenarios and one optimized scenario for 2050 using pattern language and maximization tools, specifically by (4) defining the desired future. The pattern language will be identified through on-site observation and an existing typology study of reference projects. Each scenario will depict spatial transformations while maximizing the three main pillars of the conceptual framework: energy security, energy equity, and environmental qualities of energy transition. The combination of these scenarios, where energy security is maximized and environmental-social impacts are optimized, will establish the vision for Elbasan in 2050. After establishing the 2050 vision, this project will be tested through design at neighborhood scales, aiming to (5) explore the possibility space of establishing the energy-space nexus within the Pattern of Production.

The findings of the design process will guide the assessment step, which is also the final phase of this project. In this phase the pattern field designed in the pattern language used for the definition of scenarios and strategies of the pilot project will be assessed to create a framework of guidelines that could serve as a blueprint for similar contexts on multiple scales. The aim is to design the intervention model for sustainable energy transition within

every Pattern of Production identified in Albania and other similar contexts, placing the energy-space nexus and context-specific characteristics at the core of the process. This assessment will be conducted by organizing a workshop with the stakeholders and using the criterias of the SWOT analysis for a comprehensive overview of the interventions.

In conclusion, after the completion of this study and design process, we can address the main research question regarding how energy-space nexus in the Pattern of Production of Elbasan can achieve energy security when considering its social and environmental impacts. While acknowledging the limitations of this project due to data constraints and identifying potential areas for future research, this thesis will establish a robust scientific foundation for guiding sustainable energy transition processes in developing countries with a Communist historical background.

Literature and general practical references

This project consists of three main overarching parts of researching: reading the context and the site, critically summarizing theories applicable to this project, and analyzing reference projects of existing interventions. Reading the context and the site will include a comprehensive understanding of the energy-space nexus and the status-quo of the current energy system in Albania and of the case study of Elbasan, by reviewing published articles, reports, official documents and the vision of this place for 2030. This will be followed by critically writing and summarizing the theories which can support the energy transition process for this context, more specifically theories on systemic thinking, energy and space nexus and demand-production concepts. Lastly, this project will critically analyze the existing interventions and reference projects for energy transition to create patterns of design that could be used in the context of Elbasan city. Below will be listed the bibliography gathered until now for this project in respective groups:

Bibliography of context and site specifics:

- Albania. (2021). ALBANIA REVISED NDC. UNDP.
- Ban M., Brajković J., Buzarovski S. (2021). Study on Addressing Energy Poverty in the Energy Community Contracting Parties. Zagreb: Energy Community.
- Bici, R. (2007). The Industrial “Booming” Or Industrial Booming Of A City During Communism. Elbasan: Aleksander Xhuvani University.
- Boardman, B. (1991). Fuel Poverty: From Cold Homes to Affordable Warmth. Belhaven Press.
- CAIT. (2020). Country Greenhouse Gas Emissions Data. World Resources Institute.
- Deutsche Energie-Agentur GmbH . (2021). Factsheet: Renewable Energy in Albania. United Nations Economic Commission for Europe.
- Ebinger, J. (2010). Albania’s Energy Sector: Vulnerable to Climate Change. The World Bank.
- Manahasa, E., Manahasa, O. (2020). Defining urban iden-tity in a post-socialist turbulent context: The role of HousingTypologies and urban layers in Tirana. Habitat International,102. doi:10.1016/j.habitatint.2020.102202
- EU COM. (2018b). A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. Brussels: European Commission. Retrieved from https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf
- Antonovska, F., Berishaj, V. (2022). Intergated Energy and Climate Planning in the Western Balkans. Climate Action Network Europe.

- Fleck, A. (2022). Energy Poverty in Europe. statista.
- Islami, Gj., Veizaj, D., Verdiani, G. (2018). The morphosis of the Albanian socialist cityscape. A reaction to buildings with high-energy consumption. Firenze University Press. doi:10.13128/RV-24894
- Heuvelmans, R. (2022). Gender Equality and Energy Poverty in Albania. WECF.
- INSTAT. (2015). Population Ageing: Situation of Elderly People in Albania. Tirana: INSTAT.
- INSTAT. (2024). Consumer Price Index. Tirana: Institute of Statistics.
- International Monetary Fund. (2022). Albania, selected issue. Washington, D.C.: International Monetary Fund.
- IRENA. (2021). Renewables Readiness Assessment: Albania,. Abu Dhabi: International Renewable Energy Agency.
- MIE. (2017). Renewable Energy Resources and Energy Efficient. Tirana: Ministry of Infrastructure and Energy of Albania.
- MIE. (2019). Renewable energy sources in Albania. Tirana: Ministry of Infrastructure and Energy.
- MIE. (2021). National Energy and Climate Plan. Tirana: Ministry of Infrastructure and Energy of Albania.
- National Agency of Energy. (2003). The National Strategy of Energy and Plan of Action. Tirana: United Nations Framework Convention on Climate Change.
- National Agency of Natural Resources . (2023). Energy consumption by branches 2017-2022. INSTAT.
- On Power Sector. (2015). No. 43/2015. Retrieved from https://ere.gov.al/doc/Law_no.43-2015_On_Power_Sector.pdf
- Rugg, D. S. (1994, January). Communist Legacies in the Albanian Landscape. Geographical Review, 84, 59-73. Retrieved from https://www.jstor.org/stable/215781
- Top Channel,. (2022). E moshuara vdes nga i ftohti/ Fier, nuk kishte drita se ishte debitore. Top Channel.
- UN. (2018). Envrionmental Performace Review Albania. New York and Geneva: United Nations Economic Commision for Europe.
- UNDP. (2017). The Country Programme of Albania under the Global Solar Water Heating Market Transformation and Strengthening Initiative. Tirana: United Nations Development Programme Albania.
- UNEP. (2000). Post-Conflict Environmental Assessment Albania. Nairobi: United Nations Environment Programme.
- USAID. (2018). Energy strategy for Albania: Enhancing Capacity for Low Emission Development Strategies (EC-LEDS). United States Agency for International Development.
- Vrusho, B. (2017). Urban regeneration of underused industrial sites in Albania. Tirana: Epoka University.
- WeBalkans. (2023). Shedding light on environmental impacts in Albania's energy and extractive industries. WeBalkans.
- World Bank Group. (2020a). Albania. Retrieved from Climate Change Knowledge Portal: https://climateknowledgeportal.worldbank.org/country/albania/climate-data-projections
- World Bank Group. (2021). Climate risk country profile: Albania. Washington, DC: World Bank Group.
- Yale University. (2022). Greenhouse gas intensity growth rate. Environmental Performance Index.

Bibliography of theories of:

1. **Systemic thinking**

- Geels, F., Schot. J. (2010). The Dynamics of Transitions: A Socio-Technical Perspective. London: Routledge.

- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Research Policy, 31, 1257-1274.
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. Environmental Innovation and Societal Transitions, 24-40.
- Geels, F. W. (2019). Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective. Current Opinion in Environmental Sustainability, 39, 187–201. https://doi.org/10.1016/j.cosust.2019.06.009
- Markard, J., Raven, R., Truffer. B. (2012). Sustainability transitions: An emerging field of research and its prospects. Research Policy, 41, 955-967. https://doi.org/10.1016/j.respol.2012.02.013.
- Kanger, L. (2021). Rethinking the Multi-level Perspective for energy transitions: From regime life-cycle to explanatory typology of transition pathways. Energy Research and Social Science, 71. https://doi.org/10.1016/j.erss.2020.101829
- Coenena, L., Benneworth, P., Truffer, B. (2012). Toward a spatial perspective on sustainability transitions. Research Policy, 41, 968-979.
- Li, L. (2020). The Governance of Low-Carbon Transitions in a Multilevel Perspective Framework: How Does the Concept of 'System Transformation' Work? Enenrgy Research, 11, 45-53. doi:10.3844/erjsp.2020.45.53

2. Energy and space nexus

- Crowe, S. (1958). The Landscape of Power. London: The Architectural Press.
- Jong, D. J., Stremke, S. (2020). Evolution of Energy Landscapes: A Regional Case Study in the Western Netherlands. Sustainability, 12. https://doi.org/10.3390/su12114554
- Pasqualetti, M., Stremke, S. (2018). Energy landscapes in a crowded world: A first typology of origins and expressions. Energy Research and Social Science, 36, 94-105. http://dx.doi.org/10.1016/j.erss.2017.09.030
- Sijmons, D. (2014). Landscape and Energy: Designing Transition. nai010.
- Stremke, S. (2010). Designing Sustainable Energy Landscapes. Wageningen: Wageningen University.
- Stremke, S. (2013). Energy-landscape nexus: Advancing a conceptual framework for the design of sustainable energy landscapes. ECLAS conference (pp. 392-397). Hamburg: Jovis.
- Stremke, S., Oudes, D., Picchi, P. (2023). Revealing the Power of Landscape in Mitigating the Climate Crisis. Digital Landscape Architecture, 8, 2-12. doi:10.14627/537740001
- Blaschke, T., Biberacher, M., Gadocha, S., Schardinger, I. (2012). 'Energy landscapes': Meeting energy demands and human aspirations. Biomass and Bioenergy, 55, 3-16. https://doi.org/10.1016/j.biombioe.2012.11.022.

3. Energy demand and production

- Ajzen, I., (1991) The theory of planned behaviour. Organisational Behaviour and Human Decision Processes, 50(2): 179-211.
- Darby, S., Fawcett, T. (2018). Energy sufficiency – an introduction: A concept paper for ECEEE. 10.13140/RG.2.2.31198.08006.
- Spangenberg, H. J., Lorek, S. (2019). Sufficiency and consumer behaviour: From theory to policy. Energy Policy 129. pg. 1070-1079. https://doi.org/10.1016/j.enpol.2019.03.013.
- Sorrell, S., Gatersleben, B., Druckman, A. (2020). The limits of energy sufficiency: A review of the evidence for rebound effects and negative spillovers from behavioural change. Energy Research & Social Science 64. https://doi.org/10.1016/j.erss.2020.101439.
- Burke, J. M. (2020). "Energy-Sufficiency for a Just Transition: A Systematic Review" Energies 13, no. 10: 2444. https://doi.org/10.3390/en13102444

Bibliography of reference projects (up to now):

1. **Centralized energy projects:**
- The wind energy landscape near Palm Springs, USA, 1980
- Solar energy landscape in Sierra Nevada, Spain

2. **Local energy projects:**
- Solarfeld Gänsdorf in Germany
- Kwekerij in Bronckhorst/The Netherlands

3. **Multifunctional energy landscapes:**
- CopenHill power plant in Copenhagen, Denmark
- Colorado 'solar garden', a farm under solar panels

4. **Clean Energy in heritage sites:**
- solar panels in Ancient Pompeii imitate Roman terracotta tiles
- Solar Power at the Acropolis Museum, Athens

5. **Futuristic visions of energy and space**
- The Blue Heart project by Changsoon Choi, the coast of North Holland
- Eco-park, FABRIcations, the Netherlands
- Energy Duck project in Copenhagen, Den

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)?**

This project put energy-space nexus at the core of energy transition in Albania, a context where this concept is neglected and energy is perceived only as a technical challenge. While aiming to face the challenge of energy security for Elbasan, Albania and encounter its social and environmental impacts, I find it crucial to not just tackle energy transition process from a planning and design perspectives but also acknowledge the local limitations, potentials, conflicts and values as guidelines for a more sustainable transition. As a student in the MSc AUBS program, my goal is to foster a synergy between different perspectives and challenges in Albania. By harnessing the power of design, I aim to inform and motivate various stakeholders to view energy transition and local contexts through a sustainable and spatial lens, translating strategies into a trans-scalar spatial approach. The topic of this project is in line with the Metropolitan Ecologies of Places too, where the focus is on finding spatial solutions to environmental challenges of climate change crisis by following the context-specific findings.

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

Social Relevance

This project directly explores the dynamic interaction between energy and space, embedded within the context of local values and challenges a post-communist society. Placing people's stories and needs as one of the main pillars of this project, highlights the intricacies and complexities of the energy transition process dictated by political, social, and spatial considerations. The project seeks to redefine the narrative surrounding communist industrial sites and their relationship with the local population, by designing a new perspective for these areas, emphasizing their potential qualities and impacts at local and national levels.

Moreover, this project prompts a fundamental point by proving that energy security alone is not sufficient to address the challenge of energy transition. It brings attention to the pressing issues of energy poverty and environmental quality when fostering a transition. The incorporation of energy equity concept within the design of energy transition in Albania, strives to ensure that no one is left behind and the environment qualities are maximized.

Professional Relevance

This project presents an approach for fostering energy transition in areas characterized by a lack of data and a sensitive historical context. This proposed method shows the power of design to shift the local perspectives of specific sites, from areas of conflicts and limitations to areas of potentials. It underscores the pivotal role of urban planners in the energy transition process, emphasizing that energy is not merely a technical challenge but also a spatial one with direct implications for the spatial, social, and environmental qualities of an area.

Scientific Relevance

The scientific relevance of this project is profoundly demonstrated through the translation of energy transition into the spatial context of Albania, a post-Communist country that reflect climate vulnerability, energy poverty and environmental issues of the current energy system. It involves the transformation of current energy challenges by aligning them within the local limitations and values of a specific case study, particularly in Elbasan, where scientific research in this topic is relatively limited. This project acts as a bridge that fills the knowledge gap in Albania, enabling a deeper comprehension of energy as a spatial concern, and effectively translating this understanding into tangible solutions that act as blueprint strategies for similar global contexts.

Moreover, the research offers a fresh perspective on the layers of Communist Industrial sites left behind, presenting them as potential areas for energy transition. This approach addresses the current energy challenge of energy security within its social and environmental impacts, by identifying limitations and opportunities within the historical context that paves the way of energy transition process.

Lastly, this study makes a valuable contribution by consolidating critical data and a systemic design framework for Albania, a region relatively lacking in European datasets. It creates a methodology that could serve as a valuable tool for decision-makers, local authorities and other researchers, by showing the importance of site visits, microstories and design to empower the energy transition process through informed, data-driven and context specific decisions. This framework formulates effective strategies to align the steps of Elbasan and Albanian Government within the European goal of achieving climate neutrality by 2050.