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:

<table>
<thead>
<tr>
<th>Personal information</th>
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<tbody>
<tr>
<td>Name</td>
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<tr>
<td>Student number</td>
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<td>Telephone number</td>
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<td>Private e-mail address</td>
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<tr>
<th>Studio</th>
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<tr>
<td>Name / Theme</td>
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<td>Teachers / tutors</td>
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Argumentation of choice of the studio

Planning Complex Cities: Inclusive Cities of the Global South:

The Complex Cities studio is fuelled by the expertise in regionalisation, spatial planning and territorial governance. Moreover, the geographical focus on cities of the global south, faced by disparities and conflicts in the distribution of spatial resources, rapid development and weak governance, brings my graduation (based on the state of Tamil Nadu, India) under the purview of the studio. That being said, I want to emphasise on two reasons for choosing this as the Graduation studio for my project:

1. Critical, objective questioning of the role of the planner:

The point of departure that sets apart the Complex Cities studio, is the fact that it critically questions the role of the planner or designer in increasingly complex spatial and societal conditions. This learning, un-learning and deconstruction of historic planning and spatial narratives is crucial to the development of my project. In the nascent stages, my project on energy transition, began with a question- How can energy transition be looked with a spatial lens? What then, would the role of the
designer/planner be, in navigating the complex technodominant field? The critical outlook in the Complex Cities studio towards the role (and need) of planning points towards a continuous process of self-introspection, which is relevant to my project.

2. Complex geographies, complex governance:

The state of Tamil Nadu has recently witnessed enormous political instability and social unrests over contested ecologies and cultural practises. The design for energy transition will have to consider the complexities due to weak governance and be sensitive to the local context. Therefore, my graduation project will focus on the institutional frameworks and spatial governance systems that are needed to enable an equitable and ‘just’ energy transition, along with flexibility in planning that is crucial for developing contexts. This resonates with the underlying theme of the Complex Cities studio that prioritises a ‘governance approach’ to planning for the Global South.

The inclination of my graduation project towards investigating the socio-spatial and political implications of energy transition in a complex, hyper-developing region, thus positions my project within the Complex Cities studio, where I can best develop my thesis.

<table>
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<tr>
<th>Graduation project</th>
<th>Geographies of Power: Spatial Strategies for a ‘socially just’ energy transition in Tamil Nadu</th>
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<tbody>
<tr>
<td><strong>Goal</strong></td>
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<tr>
<td>Location:</td>
<td>Tamil Nadu, India</td>
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<tr>
<td>The posed problem,</td>
<td>Energy is the only universal currency (Smil, 2017). All of the human race’s advancements from cultivating crops, forming human settlements with complex societies and specialization of work, to making scientific and societal innovations, has been possible through the consumption and exploitation of various forms of energy resources. In human history, energy transitions have underpinned broad social, economic and geographic change (Bridge, et. al., 2012). It was the transition from wood to</td>
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coal in the mid 19th century that fueled the industrial revolution, and the transition from coal to oil and gas that triggered the developments in the automobile and transportation industry. These historic precedents show that energy transitions influence the nature of industrialisation, urbanisation, the growth of consumer society, economic prosperity, geographic structure and international relations (Bridge et. al., 2012). Similarly, the current transition to renewable energy also has extensive impacts on geographies of power, economy, ecology, space and place.

Over the past decade, increasing attention has been drawn to the spatial dimension of energy transition. The human development of energy resources occurs at the intersection of energy and space, leaving distinct, permanent marks and spatial patterns on the land. The resulting landscapes of energy production, networks of distribution and territories of consumption together constitute 'energy-space'. This energy-space is under constant development, transformation and exponential expansion, due to the increasing global demand for energy and shifts in energy outlook. The projects begins with the premise that there is an urgent need to approach energy as a spatial phenomenon, to fully understand the conflicts and opportunities of energy-space. This is extremely important in the context of energy transition, since renewable sources of energy uses space and produces space in a different way- its altered spatial qualities have blurred the boundaries between technical space (shunned by planners) and 'non-technical' space (coveted by planners). The spatial dimension of energy transition was identified as the problem field of the project.

This problem field was further investigated in the context of Tamil Nadu, India. Here, the lack of integration between the fields of energy studies and spatial planning has resulted in negligence of the spatial component of energy transition when planning for it. In addition to the spatial perspective, the relationship between the spatial dimension and the social, political, economic dimensions of energy transition is particularly significant in a developing country like India, where systemic deficiencies in governance and socio-spatial inequalities in the access to energy are major barriers in transition. The analysis of the problem field, combined with study of the context gave rise to the ‘problem focus’ of the project.
To sum up, the problem statement of the project is this: "**Energy Transition in Tamil Nadu is predominantly a technical transition, whose spatial dimension is not considered in urban and regional planning. As a result, the systemic problems related to governance structures and inequalities in the access to energy that characterised conventional energy systems continue to disrupt the emerging geographies of energy transition in the region.**"

The project hypothesises that only through a regional design of energy geographies in relation to various socio-political structures can a humanised, socially just energy transition in Tamil Nadu.

<table>
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<tr>
<th>research questions and design assignment in which these result.</th>
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<tr>
<td><strong>Main research question:</strong> How can regional design of new geographies of energy create a framework for a 'socially just' energy transition in Tamil Nadu?</td>
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<tr>
<td><strong>Sub research questions:</strong></td>
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<tr>
<td>1. What are the spatial implications of energy transition on urban and regional landscapes?</td>
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<td>2. What are the systemic deficiencies in energy distribution and governance that create barriers for equitable access to energy?</td>
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<tr>
<td>3. How can regional design enable the territorial transformation of energy geographies into resilient infrastructural systems?</td>
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<tr>
<td>4. How can collaborative governance structures bridge the gap between top down and bottom up initiatives in energy transition?</td>
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<tr>
<td>5. What are the spatial strategies and design principles that can create conditions for energy justice, while offering higher economic and ecological returns?</td>
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The project proposes a **seven-step design process** to facilitate a spatial energy transition in Tamil Nadu.

1. Manifesto for the Design of Energy Geographies
2. Scenarios Planning and development
3. Energy Vision for Tamil Nadu 2050
The design phase begins with a declaration- a **Manifesto for the Design of Energy Geographies** that defines what ‘good’ energy geographies should be like and acts as the theoretical underpinning of the design process. The manifesto is a call for an integrated geographic approach to energy production and consumption, within the paradigm of energy transition. This was developed by collating ideas and spatial concepts from various theories in spatial planning, infrastructure management, political ecology, critical geography and energy studies. Thus, the manifesto is essentially an aggregation of concepts, intentions and arguments to provide a theoretical normative direction for the project.

Informed by this theoretical standpoint, the conclusions from the multidimensional analysis are taken forward to develop **energy scenarios** for Tamil Nadu in the year 2050. The scenarios reimagine different possibilities for the state’s energy future, and the spatial impact of each scenario is mapped and analysed. This step is crucial, especially in an infrastructure development project like energy transition, to create flexible, long term plans. The spatial implications of the preferred scenario is visualized through maps and impressions that imagine that possible futures. The conditions for the realization for the preferred scenario for energy transition in Tamil Nadu provide a contextual normative direction for the project in its design stage.

The contextual insights from this stage, combined with the principles of the manifesto lead to the creation of an **Energy Vision for Tamil Nadu 2050**. The vision projects a spatial energy transition in Tamil Nadu, where emerging energy geographies are resilient, sustainable and equitable. These energy geographies will tap the potential of decentralised renewable energy sources to enhance the quality of energy access in the state.

To achieve this vision, the project evolved a **toolkit**, or set of spatial strategies, societal and political actions that translate the goal of the vision into tangible codes for development. These rules are broadly categorized based on the three branches of research (energy-space, energy-
governance, and energy-society). The guidelines are codified, based on the scale of operation, type of rule, nature of actors involved and context of application.

These rules are then tested through the assemblage of design interventions at three geographic scales: an overall regional design for Tamil Nadu, self-sufficient energy plan for the metropolitan area of Coimbature and its rural hinderlands, and strategic zoom-ins to show the manifestation of regional design in different neighbourhood typologies. The assemblage of design interventions together create the conditions for a humanized socio-technical transition in Tamil Nadu.

As a penultimate step, indicators for impact assessment are created to measure the progress of development.

In addition to this process, the project proposes the development of an online prototype or webtool, that collates the spatial guidelines in an online platform. This prototype will contribute to making the concept of spatial energy transition more transparent and accessible to designers and planners across the world. The prototype will be additional contribution of the project, even though it falls outside the scope of the graduation thesis.

### Process

**Method description**

Choosing the appropriate methods for research and design was a challenge, due to limited scholarly exploration in the intersection of energy studies and spatial planning. These methods are applied in different stages of the project, separately and together, often to investigate themes or topics that need multiple lines/methods of enquiry.

The project primarily utilizes eight methods in the development of research and analysis of the context, which are listed below (in no particular order):

1. Literature review
2. Documentary research
3. Field work
4. Reference case study
5. Transcalar mapping
6. Energy Scenario Potential calculations
7. Policy analysis
8. Stakeholder analysis
The theoretical foundation of the project was developed from a careful assessment of literature precedents and literature reviews of key works in each branch of research. This was conducted in parallel to documentary research (governmental and non-governmental reports, publications, websites and newspapers) to understand the problem field of energy transition and its implications on space and socio-political structures, on three geopolitical scales- global, national and state of Tamil Nadu. The thematic knowledge gained from documentary research and theoretical understanding gained from literature reviews were supplemented by empirical knowledge gained from intensive field work spanning three weeks in the months of January-February 2019. Three reference case studies from different parts of the world were selected to gain an insight into real-world application of research and design related to spatial energy transition.

As described in earlier sections, the project’s cardinal aim is to facilitate a ‘humanised’, socio-technical energy transition, by considering its spatial and socio-political implications. The purpose of the analysis phase of the project was to extract the contextual conditions that contribute to, or cause barriers to achieving this aim. A combination of several analytical methods like transcalar mapping across global, national and federal geopolitical scales, documentary research on the context, policy analysis and stakeholder analysis to understand governance structures, and
empirical field work was applied to understand the spatial and socio-political implications of energy transition in Tamil Nadu, India.

The inferences from the analysis (See Chapter 6) formed the preliminary parameters for formulating the future scenarios for spatial energy transition in Tamil Nadu. Scenario planning is a crucial step in design development for the project, for which the IESS 2047 (India Energy Security Scenarios, 2047), an energy scenario building webtool launched by the Planning Commission of India (now NITI Aayog) was taken as the base model for calculations. Using the assumptions, development models, projected energy targets of the IESS 2047, the project evolved three scenarios for Tamil Nadu’s energy future. The development of energy scenarios was a crucial step in highlighting the spatial and socio-political implications of each scenario, so that the optimum (preferred) scenario could be identified. The development of design follows the conditions set by the preferred scenario.

**Literature and general practical preference**

Over the past decade, increasing attention has been drawn to the spatial dimension of energy transition. The project argues that there is an urgent need to approach energy as a spatial phenomenon in relation to the inherent socio-political structures, which is outlined in this chapter by reviewing precedents in literature. The literature review was streamlined through the three branches of research (energy-space, energy-society and energy-governance) to derive a normative direction for analysis and design. Through the literature reviews a theoretical understanding of what constitutes ‘good’ energy geographies was gained. Some of the important literature consulted in the project is given below:


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 diverse palate of research groups offered by the Urbanism department at TU Delft, and the Graduation Orientation programme provide a unique opportunity to systematically assess and arrive at a conclusion on the most suitable studio for a graduation project. For me, this studio is the Complex Cities studio, which emphasis on the role of governance in spatial planning. The ‘Dutch approach’ to urbanism is the backbone to all research studios and has filtered down to the projects we engaged with in all quarters of the first year as well. This Dutch approach to energy transition is specific segment in the discourse that I wish to apply to the context that I hail from- a developing region in the global south. While the Complex Cities studio is the best fit for my project, it will also be greatly benefited by the expertise from the Urban Metabolism studio, or the Landscape Architecture section. Throughout this project, I will aim to engage with multi-disciplinary experts to gain diverse perspectives on this complex topic.

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

   This project will add to the body of knowledge on spatial energy transition, and the proposed geographic approach has the potential to bridge the gap between energy studies and spatial planning. Although notable literature has emerged in the field of energy geographies in the past decade, the research is predominantly limited to European or North American contexts. Moreover, the current literature on energy studies in Tamil Nadu limits itself to descriptive studies on energy status and energy potential calculations; and shies away from delving deeper into the spatial consequences of energy transition and its impacts on the socio-political economy. This project on spatial energy transition in Tamil Nadu, will thus **contribute both to the theoretical knowledge gap and context-specific knowledge gap in this field.**

   Moreover, the Dutch approach to spatial energy transition is a phenomenon that can have world-wide applications, if adapted to the local context. The potential **transferability of the concepts, research methodology and design process** for use in developing countries that face the challenge of spatial energy transition highlights the scientific and societal relevance of the project.

   Additionally, the contribution of energy transition to the **UN Sustainability Development Goals (UN SDGs)** is an important marker of the societal relevance of this project (Fig 5.19). The strong focus of the project on socio-political relationships with energy and the notion of spatial energy justice is an asset to furthering the debate and discussion on ‘equality’ in society.