

Guidelines for final theses at the Chair of Computational Landscape Ecology

For Bachelor, Master and State Examination
("Staatsexamen") theses

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Preliminary remark: This guideline serves as a summary of the essential requirements for a final thesis, regarding both form and content. It is closely based on the guidelines of the Faculty of Environmental Sciences (<https://tud.link/utgc>, in German only) but contains some specifications for theses completed at our professorship.

Aim of the thesis

The final thesis should demonstrate that the student is able to work independently on problems of the field of study within a given time using adequate scientific methods. There are, of course, differences in the requirements between the respective degree programmes. For details, please refer to the respective examination regulations (§21).

Final theses supervised by the Chair of Computational Landscape Ecology will differ in terms of the methods applied, depending on the specific topic. This may include field work, interviews, (geo)statistical analysis, statistical and process-based modelling, analysis of remote sensing data, and others. We aim to offer topics which are embedded in our in-house or third party-funded research projects because we see this as a great opportunity for our students to directly learn about “science in practice” and also to contribute with their own analyses to larger research endeavours. The subjects addressed range from theoretical and basic research to applied questions (e.g. in the fields of biodiversity conservation, land use change or trade-offs).

We provide a list of currently offered topics on our website but are especially happy to hear about and discuss your own ideas and suggestions!

General procedure

These are the (general) steps and recommendations when writing your thesis at the Chair of Computational Landscape Ecology:

- **Finding a topic:** On the following websites you can either take a look at the topics currently offered (<https://tu-dresden.de/bu/umwelt/geo/geographie/landoeko/studium>) or fill out a form in which you briefly explain your own idea for your thesis (<https://mloek.geo.tu-dresden.de/index.php/studies/>). When you have decided on one of the topics offered, write to the appropriate contact person. When you have formulated your own idea in the form, send it via the button "Send mail" or send the compiled form to cle-info@tu-dresden.de.
- **Preliminary discussion:** First, there is usually an initial preliminary discussion in which ideas and suggestions for topics are discussed with the possible supervisor of the thesis.
- **Exposé:** Preferably within the first two weeks: Write a short exposé of ca. 3 pages which includes background/state-of-the-art, research questions, main methods (to be applied in the thesis), expected results, key references, and a time plan (Gantt chart, see below), in consultation with your supervisor(s). The goal of the exposé is

to ascertain yourself if you are really interested in the topic, to elaborate the research question and to illustrate, by developing a clear timeline, that the topic chosen can be adequately covered and implemented in the time frame of final thesis. The exposé is therefore not an additional amount of work since you will be able to re-use most of the content for the thesis. **If the exposé shows that the student does not have the skills to complete the tasks to finish the thesis, we reserve the right to withdraw from the supervision of the thesis.**

- **Register and start:** If the exposé is approved by your supervisor, find a second supervisor together with your first supervisor, submit the topic to the examination committee and wait for the approval. After that, you can officially start working on your thesis.
- **During the thesis project:** Make sure that you work on your thesis continuously and do not postpone writing until the end. There is always the opportunity to present the ongoing work in our working group (please get in touch regarding this with your supervisor). Sharing draft versions of the thesis with the supervisor(s) is strongly recommended.
- **Submission:** Submit the printed copies of your thesis to the examination office; please check regarding current guidelines: <https://tu-dresden.de/bu/umwelt/geo/ressourcen/dateien/pramt/studieng-geographie/Hinweis-Abschlussarbeiten.pdf>! In addition to the printed copies, you must submit your thesis in digital form. For this purpose, you can use a USB stick on which you save the PDF version of your thesis as well as all relevant data and scripts. The USB stick will be returned to you afterwards in agreement with your supervisor.
- **Defense** (if required according to your study program): Make an appointment to defend your work in front of the two supervisors. Please prepare a PowerPoint presentation (rule of thumb: 1 slide per minute) using the same structure as in the written work (introduction, methods, results, discussion, conclusion). The presentation should have a length of 20 min. This is followed by a discussion of 20-30 min. The invitation of fellow students is possible.

Time frame

We recommend setting up a schedule (Gantt chart, the same tool is used to manage larger research projects; Table 1) in the exposé at the beginning of your work together with your supervisor. Try to be as specific as possible (i.e. more specific than in the example below) and update continuously.

Table 1. Exemplary Gantt chart illustrating the different steps of working on a final thesis, here adapted to the length of a Bachelor's thesis.

Work steps	Time	1	2	3	4	5	6	7	8	9
General reading to get an overview of the topic	2 weeks									
Finalizing the research questions and methods. Writing the outline of the thesis	1 week									
Preparing data and finalizing the research design	2 weeks									
Conducting the research (field work, data analyses, programming, modeling, interviews, structured literature review, etc.)	4 weeks									
Preparing and interpreting figures and tables	3 weeks									
Writing and regularly consulting with the supervisor(s)	9 weeks									

Structure and content of the written thesis

We suggest the following structure for all final theses (see below). You can find more information about scientific writing on the pages of the Writing Center of the TU Dresden: <https://tu-dresden.de/karriere/weiterbildung/zentrum-fuer-weiterbildung/schreibzentrum>. We also strongly recommend participating in the course "Scientific work", which is jointly offered by several lecturers from the Institute of Geography.

A) Title page with the following content:

- TU Dresden logo
- Name of the faculty/institute/chair
- Type (Bachelor, Master, "Staatsexamen") and title of the thesis
- Name, date and place of birth, matriculation number, course of study
- Name and title of the first and second supervisor
- Place and date of delivery

B) Kurzfassung in German (obligatory) and **Abstract** in English (optional)

- Approx. ½ page in each case
- The abstract provides an overview of the complete work including the results, and must be able to stand alone.

C) Table of contents

D) List of abbreviations

E) Main text

1. Introduction

The introduction is one of the key sections of each thesis as it introduces the reader to the problem and/or research gap, provides the necessary background information, and summarizes which specific research questions will be addressed. It therefore typically: (i) contains background information to the study and summarizes the state-of-the-art (including references!), (ii) discusses the relevance of the topic to science, society or policy, (iii) contains a succinct description of the problem that the thesis wants to solve, and (iv) concludes with an outline of the research questions addressed. Usually, you would start with the general background and context and then focus on your specific research topic and question.

2. Data and Methods

This chapter is a description of the research methodology adopted in the thesis and touches on aspects such as the study area, data collection, research design as well as tools (e.g. software) and analytical techniques that are used. All methods that you chose must be justified, i.e. you must explain *why* a specific method is suitable to answer your research question – including references to the methods that you apply and to previous work. Likewise, it is important to explain not only *how* the data was collected or analyzed, but also *why* specific kinds of data were collected or analyzed. Background information about the study area or study system is typically presented in this chapter (but may also, depending on the length, be included in a separate chapter). Importantly, this chapter does not include any presentation of the results!

3. Results

This chapter is an objective presentation of the key results of the thesis with corresponding maps, figures, tables, and statistical tests. Please orientate yourself by the presentation of results in scientific publications and be thorough when preparing maps (e.g. legend, scale bar etc.), figures, and tables. The caption of each figure or table must be self-explanatory, so that the reader does not have to look for information in the main text to understand it. Ideally, you should consider how you would like to present the results in your thesis before you collect and analyze data. Very importantly, only present your results in this section, but do not discuss your results in this section! The detailed interpretation and discussion of the results as well as the comparison of your results to the current state of research will take place in the discussion section!

4. Discussion

A good discussion answers the questions asked in the introduction, relies directly on the results and relates your findings to other studies (remember to cite previous work!). Finally, you can use the discussion to establish a link to practice

(management/policy/nature conservation/land use etc.) or to derive options for further research, if this is relevant to the topic. You may also include a summary of the limitations of your study (e.g. missing data, potential transferability). Make sure that all the points you discuss are really closely linked to and based on the results of your thesis.

5. Conclusion (which may also be a section within the Discussion chapter)

Own conclusions, derived from own results, and comparison with the literature consulted (no more citations, only own conclusions). When reading only the introduction and the conclusion, the reader should be able to summarize the goal, key findings, and limitations of your study.

F) Bibliography/References

Please use a consistent citation style throughout your thesis (see below for more information).

G) List of figures (optional)

H) List of tables (optional)

I) Appendix (optional)

The Appendix includes tables, figures or any supplementary material which you compiled, but which are not directly required in the main text. Reference must be made to all appendices in the main text.

J) Declaration on the independent development of the thesis (including signature):

This declaration is required by the university. You sign with it that you have done the work independently. A Template of the declaration can be found here: <https://tu-dresden.de/bu/umwelt/geo/ressourcen/dateien/pramt/studieng-geographie/Hinweis-Abschlussarbeiten.pdf>

Format and length of the written thesis

Length: The main text (Introduction to Conclusion) of a Bachelor's thesis should be about 20 - 30 pages. The main text (Introduction to Conclusion) of a Master's thesis should be approx. 30 - 40 pages. State examination theses (Staatsexamensarbeiten") are usually about 50 pages long. The exact length can be defined in consultation with the respective supervisor(s).

Font: Continuous text in serif font (11pt), headlines in bold font (level 1: 14pt, level 1.1: 12pt, level 1.1.1: 11pt), line spacing: 1.15. These specifications are a recommendation. Alternative formatting can be used.

Figures: Insert labels including numbering **below** the figures. The text within the figures should be in sans-serif font.

Tables: Insert headings including numbering **above** the table.

All figures and tables must be mentioned in the text (in the order in which they appear, i.e. Figure 1 is mentioned before Figure 2).

Page numbers: Please use consecutive page numbering.

Bibliography

All sources used must be cited in the text and listed in the bibliography. It is important that a consistent citation style is used (e.g. Harvard, APA). For further information, please refer to the citation guide for students, which the SLUB provides (<https://www.slub-dresden.de/service/schreiben-publizieren/zitieren/>).

We recommend the use of a citation software (Zotero, Citavi, Mendeley etc). Further information on literature research and management can be found under “Services for Writing and Publishing” of the SLUB, as well as in the following handout: Heike Marschner, Katrin Bicher, Marlies Krause, Manuela Queitsch, & Daniela Zabel (2018). Handout for scientific work. SLUB Dresden. Retrieved from <http://nbn-resolving.de/urn:nbn:de:bsz:14-qucosa2-171129>

Important: Relevant and current literature must be used to situate your work in the context of the current state of research. Use at least 5 (for Bachelor’s and State examination theses) / 15 (for Master’s thesis) English language scientific articles. Please contact your supervisor to discuss this.

Evaluation criteria

Several aspects of the thesis are evaluated independently by the first and second reviewer. In order to ensure comparability between evaluations within our chair, we evaluate all final theses according to the catalogue of criteria shown in Table 2 (which we also pass on to external supervisors). This results in two grades for the written thesis on a scale from 1.0 (very good) to 5.0 (insufficient). In addition, the oral defence of the paper is graded as well. To detect possible plagiarism, the reviewers reserve the right to use software for plagiarism checks.

Table 2. Evaluation criteria for final theses. More details about each criterion are given in the main text.

Evaluation criteria	++	+	0	-	--
Form					
Overall structure and problem definition					
Data and methods					
Results					

Maps, figures and tables					
Discussion					
Literature and source material					
Independence					
Field/laboratory work or modelling/programming tasks					

The following aspects are to be taken into account for each of our criteria:

Form

Ensure that your thesis contains all necessary sections, including cover sheet and declaration of independence. Pay attention to a precise and comprehensible writing, with correct spelling and grammar. Consider explaining technical terms and make sure they are used correctly. Pay close attention to appropriate and consistent formatting of the references.

Overall structure and problem definition

The overall structure should follow a logical and clear arc. The introduction needs to be a target-oriented funnel that guides the reader from the context, providing relevant background information, to subject-specific information, to the specific research questions and/or hypotheses of the thesis. The candidate needs to show that he/she is knowledgeable on the subject on each level of the thesis (i.e. background/context, subject-specific) and has a solid understanding of the research topic by formulating clear research questions.

Data and methods

The data and methods need to be documented to be reproducible for the reader. The candidate needs to show that the chosen methods are suitable to answer the research question. We also strongly encourage you to follow the open data and open code policies – if you have questions about this, please ask your supervisor.

Results

The results need to be clearly and correctly described and, whenever possible, statistically evaluated. The results should be bound to the research question and support the conclusions drawn in the thesis.

Maps, figures and tables

Illustrations and tables need to be self-explanatory, easily readable and appropriately labelled. They should be prioritized to support the most important findings of the thesis. Both elements should be complementary to the information provided in the main text,

meaning that they should avoid repeating what is already in the main text. The candidate needs to make sure that all elements enable the reader to quickly access the context and core findings of a thesis.

Discussion

The goal of the discussion is to put the findings in the general context of the thesis. Could the study questions be answered? Was the hypothesis confirmed or rejected? What does that mean for the general context of the study? Also, a critical view on the methodological performance is needed. Were the methods appropriate for the purpose? What other methods might expand the research topic in light of the results that have been gained? What other data might be sampled in order to follow up on this research in the future?

Literature and source material

The references should be timely and relevant, covering the general context of the study as well as the specific study system. Always make sure that the previous work you cite really supports your statements and avoid citing publications which are only loosely related to the point you want to make. Use at least 5 (for Bachelor's and State examination theses) or 15 (for Master's thesis) English language peer-reviewed scientific articles.

Independence

The ability of the candidate to work independently is highly important. That means that the candidate is able to implement the instructions of the supervisor in his/her research (e.g. for the use of technical equipment, design and conducting experiments). We will take into account aspects such as: Is the student able to plan his/her research independently after the starting phase? Is the candidate able to think solution-oriented in order to make justified suggestions for improvements or modifications of the methodological aspects of the work? The candidate is also expected to be proactive in his/her research as well as in the communication with his/her supervisor(s).

Field-/Lab-/Coding-Work

The candidate needs to show his/her ability to efficiently execute the research and to independently train relevant skills in their field. This includes aspects such as: Can potential sources of error be identified and adequately addressed? Also, the candidate needs to show his/her ability to document the research in a comprehensible manner.

Further considerations

The candidates are expected to develop and execute their research in a realistic scientific context. That means not only that their research should be of high quality so that it is potentially publishable and forms a solid basis for future work, but also that the candidate develops (towards) a scientific mind-set so that he/she contributes their own ideas to the development of the thesis topic.