

## Master's Thesis at the Chair of Ecological Systems Design

These guidelines are only complementary to the guidelines of the study program. For instance, the regulations for students following the Environmental Engineering study program can be found via: <https://baug.ethz.ch/en/studies/environmental-engineering/documents.html>

### Learning goals

With the master thesis, the candidate is expected to demonstrate that he or she is able to conduct relevant and up-to-date research in environmental engineering, within a subarea of the subject. Primarily, it should be demonstrated that scientific methods are well mastered. Furthermore, it is desirable that the candidate identifies further research needs in his/her area.

The learning goals and objectives of a master thesis comprise:

- Independent research on a scientific topic
- Independent writing of a scientific report
- Acquiring, adopting and, if within the scope of the thesis, developing methodological knowledge further
- Data interpretation and, where appropriate, elaboration of solutions

### Finding a theme

Open themes at the Chair of ESD are published on the ESD webpage<sup>1</sup>, but individual topics may also be customized to suit the students' specific interests. In the latter case, please contact Prof. Stefanie Hellweg or other group members and inquire about your topics of interest. It is also possible to propose an own theme, but this needs to be approved before the start of the thesis and a supervisor needs to be found. For this, please submit the title and project description to Mrs. Hellweg at least six weeks prior to the starting date.

### Supervision

Master theses are generally supervised by a senior researcher (Oberassistent/in) or a scientific assistant, in addition to the professor. External supervisors are also possible. Supervisors correct the report only once before submission, as the master thesis is considered as an independent work of the students. Students who like to take advantage of this offer (correction prior to the final submission), should discuss the timeline for this correction phase with the supervisors in advance (normally 2 weeks are needed). Supervision meetings for discussions with the supervisor should be

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<sup>1</sup> <https://esd.ifu.ethz.ch/studium/master-thesis.html>

scheduled regularly, e.g. once in a fortnight, but at minimum three times throughout the duration of the project. These meetings should follow the following format:

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1.	<i>Discussion of the research topic</i>
Date	Prior to the official starting date
Participant	Candidate, supervisor and/or Mrs. Hellweg
Content	Discussion of the project scope (goals, major hypothesis, theories, methods)
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2.	<i>Kickoff discussion</i>
Date	At the latest four weeks after project start
Participant	Candidate, supervisor and Mrs. Hellweg
Content	The student presents the research plan (see below)
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3.	<i>Intermediate discussion</i>
Date	Approximately after half of the time
Participant	Candidate, supervisor and Mrs. Hellweg
Content	Discussion of intermediate results (presentation to be prepared by student)
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4.	<i>Concluding discussion (optional)</i>
Date	After handing in the master thesis and after grading
Participant	Candidate, supervisor and Mrs. Hellweg
Content	Discussion of the evaluation
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### **Colloquium of the Master Thesis**

All master theses should be presented orally in a public colloquium towards the end of the thesis (minimum attendance is the supervisor and Mrs. Hellweg). Supervisors are responsible for communicating the date and title of the presentation to Barbara Dold ([barbara.dold@ifu.baug.ethz.ch](mailto:barbara.dold@ifu.baug.ethz.ch)) at the latest two weeks before the colloquium (Mrs. Dold will then invite all institute members to the colloquium). The presentation should last 25 minutes plus at least 10 minutes for discussion and questions.

## Structure of the research plan and thesis

During the first three weeks the student elaborates a research plan. This research plan should be two to four pages long and it contains the following chapters:

- A. Introduction (background information and description of the problem in theory/practice)
- B. Research objective
- C. Method and approach (including time schedule)
- D. Expected results

For the Master thesis report, please see the regulations of the study program and the annex to this document for a suggested structure.

## Literature search

Before writing a scientific report, it is indispensable to review the current state of the research in the according field. Scientific papers are accessible through: <https://eth.swisscovery.slsp.ch/>

Furthermore, there are abstract-services and online-databases that simplify the literature search. The most useful ones are:

- ISI Web of Knowledge (<http://apps.webofknowledge.com/>)
- Science Direct (<http://www.sciencedirect.com>)
- Scopus (<http://www.scopus.com/>)
- Google Scholar (<http://scholar.google.com/>)

## How to quote

A correct citation of sources is crucial. The annex to this document contains some basic principles and examples for a proper citation of references. All students are required to take notice and follow the guidelines “citation etiquette” which can be found at:

<https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrollen/plagiarism-citationetiquette.pdf>

## How to cite generative artificial intelligence technologies

You need to declare the use of generative AI and fill out the following form (to be integrated in the thesis at the beginning or end):

<https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrollen/declaration-originality.pdf>.

Generally, if generative AI tools such as ChatGPT, Grammarly and DeepL are solely employed for language corrections and improvements, no explicit citation in the thesis is needed. However, if these tools are utilized for purposes beyond simple language improvements (e.g., GitHub Copilot for coding, DALL-E for images, ChatGPT for

literature reviews or text generation), it is necessary to cite the tools used in the thesis and additionally describe their application below the declaration form of originality (which is to be included either at the beginning or end of the thesis).

### **Confidentiality of data**

All the data that is used for the master thesis has to be published in the end. Therefore, it is not possible to classify data as confidential, e.g. data from enterprises. An exception can be made for data not essential for the results of the project. Under some circumstances such data can be published in a confidential appendix.

In any case the supervisor has to be informed when it comes to data confidentiality issues.

### **Disclaimer**

Students should insert the following disclaimer in the final version of the theses (1st page after front page):

“The following document contains the uncorrected version of a student thesis submitted for the degree of Master of Science in Environmental Engineering. The views expressed in this document do not necessarily represent the position or the views of either the academic supervisors or the Swiss Federal Institute of Technology Zurich (ETH Zurich).”

### **Grading**

For the evaluation criteria, see the regulations of the study program. For study programs other than Environmental Engineering (e.g. Environmental Sciences), typically only the written work is evaluated, but a good oral presentation can improve the grade by a maximum of 0.25 grade points.

The criteria are quoted separately by every supervisor (if possible) and the average is built along the criteria and then averaged to the final grade.

### **Submission of thesis report and poster**

Three bound hardcopies as well as an electronic version (including files with the calculations, raw data, presentations, computer implementations etc.) have to be handed over to the supervisor (or to another group member if the supervisor is absent) at the end of the thesis duration.

Each copy needs to contain a declaration of originality:

<https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrollen/declaration-originality.pdf>

In case of an industry collaboration, only corrected documents (if necessary) should be submitted to the industrial partner (except there are other agreements). The costs of these additional copies can be covered by the research group after an agreement with the supervisor. Environmental engineering students also need to submit a poster (see study program regulations).

Hints for the design of a poster can be found:

<https://ethz.ch/content/dam/ethz/special-interest/baug/ifu/eco-systems-design-dam/documents/master-thesis/Poster.Guide.pdf>

[https://ethz.ch/content/dam/ethz/main/eth-zurich/education/lehrentwicklung/files\\_EN/Anleitung\\_PowerfulPosters.pdf](https://ethz.ch/content/dam/ethz/main/eth-zurich/education/lehrentwicklung/files_EN/Anleitung_PowerfulPosters.pdf)

## **ANNEX: Structure of a scientific publication<sup>2</sup>**

### **Title page**

Including title, author (list), date of submission, institute, and list of supervisors.

**Abstract/Summary (in English;** additionally a German abstract if the thesis is written in German)

### **A. Introduction**

Move 1: Establishing a territory

- By showing that the general research area is important, central, interesting, problematic, or relevant in some way
- By introducing and reviewing items of previous research in the area

Move 2: Establishing a niche

- By indicating a gap in the previous research, raising a question about it, or extending previous knowledge in some way

### **B. Scope and Objective**

Occupying a niche

- By outlining purposes and goal of the study
- By outlining principal hypothesis

### **C. Materials and Methods**

- Description of methods applied
- Description of study area or general system

### **D. Results**

- Presentation of the results with tables, figures and text

### **E. Discussion (can also be combined with results)**

Move 1: Items that consolidate research space

This move is obligatory and usually quite extensive. It may include

- A reference to the main purpose or hypothesis of the study
- A discussion of the methodology
- A review of the most important results, whether or not they support the original hypothesis or agree with the results of other researchers
- Possible explanations for or speculations about the results
- Implications of the study

Move 2: Points to indicate the limitations of the study

- Discussion of reliability and validity
- Discussion of uncertainty

Move 3: Points to identify useful goals of further research

- This move is optional

### **F. Conclusion**

A statement of conclusion or recommendation

- Practical applications of the study findings
- Usefulness of the findings

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<sup>2</sup> Adapted by UNS from Swales 1994 Academic writing for graduate students, University of Michigan Press

## G. References

### Appendix

#### Literature

It is very important in all academic work to correctly cite information that has been obtained from various sources. Failure to correctly cite is a form of plagiarism. As a rule of thumb: “when in doubt whether or not to cite a source, do it” (Princeton University, Academic Integrity at Princeton University)<sup>3</sup>. A large number of literature sources exist in providing information on when and how to properly cite.

Some of the basic rules of citing include cases of direct quotation, paraphrasing, summarizing, using and stating facts, information and data from other sources<sup>1</sup>. For example, direct use of wording and text from another source must clearly be indicated. For a short text, this is normally indicated by placing the text in quotation marks followed by the reference.

Examples of poor citing:

- ❖ It is known that a link exists between morbidity and mortality and particulate matter concentrations in the air. (Statements as such, which may seem to be common knowledge, must be accompanied by references that have shown this to be true)
- ❖ The cement industry produces 5% of the total amount of global anthropogenic CO<sub>2</sub>. (The use specific facts must show where the information was obtained from)

Below are examples of how to properly cite various sources of information, such as books, reports, internet sources, etc. In the event that you are writing a scientific paper you should note that journals have their own specific format of citing and you must check and adhere to these rules.

#### Publications in scientific journals:

(Jolliet et al. 2003) Jolliet, O.; Margni, M.; Charles, R.; Humbert, S.; Payet, J.; Rebitzer, G.; Rosenbaum, R.: IMPACT 2002+: A New Life Cycle Impact Assessment Methodology. The International Journal of Life Cycle Assessment 8 (6), pp. 324-330, 2003.

  
volume      issue

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<sup>3</sup> Princeton University. Academic Integrity at Princeton University. Access Date: 15 March 2007. Available from: <http://www.princeton.edu/pr/pub/integrity/pages/citing.html>

### **Books:**

- (Bergman et al. 1986) Bergman, H. L.; Kimerle, R. A.; Maki, A. W.: Environmental hazard assessment of effluents. New York, USA: Pergamon Press, 1986
- (Guinée et al. 2002) Guinée, J. B.; Gorée, M.; Heijungs, R.; Huppes, G.; Kleijn, R.; de Koning, A.; van Oers, L.; Sleeswijk, A. W.; Suh, S.; Udo de Haes, H. A.: Handbook on Life Cycle Assessment - Operational Guide to the ISO Standard. Dordrecht, The Netherlands: Kluwer Academic, 2002.

### **Reports:**

- (BKH 2000) BKH Consulting Engineers: Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption – A preparation of a candidate list of substances on a basis for priority setting. Final report for the European Commission DG ENV. Report No. M0355008/1786Q/10/11/00. 10 November 2000. BKH Consulting Engineers in association with TNO Nutrition and Food Research, Zeist, The Netherlands. Delft, The Netherlands: 2000.
- (ECETOC 2004) European Centre for Ecotoxicology and Toxicology of Chemicals (ECETOC): Whole Effluent Assessment. Brussels, Belgium: ECETOC Technical Report No. 94, 2004.
- (Goedkoop & Spriensma 2000) Goedkoop, M.; Spriensma, R.: The Eco-indicator 99 - A damage oriented method for life cycle assessment - methodology report. 3rd edition, Amersfoort, The Netherlands: PRé Consultants, 2001.

### **Conference proceedings:**

- (Grothe et al. 1996) Grothe, D. R.; Dickson, K. L.; Reed-Judkins, D. K. (eds.): Whole effluent toxicity testing – an evaluation of methods and prediction of receiving system impacts. Proceedings of the Pellston Workshop on Whole Effluent Toxicity, Pensacola, USA: SETAC Press, 1996.

### **Regulations, directives:**

- (AbwV 2004) Verordnung über Anforderungen an das Einleiten von Abwasser in Gewässer AbwV – Abwasserverordnung vom 17. Juni 2004 (German Wastewater Directive). BGBl. I Nr. 28 of 22.6.2004. Anhang 22 Chemische Industrie.
- (EC 2000) European Commission: Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive). Official Journal of the European Communities L 327, 22/12/2000, pp. 1 – 72, 2000.
- (EC 2001) European Commission: Identification of priority hazardous substances. Modified procedure in accordance with Article 16 (3) of the Water Framework Directive. Working Document ENV/191000/01 final of the Commission Services. Brussels, Belgium: European Commission, DG Environment, 2001.



**Bachelor / Masters theses:**

(Blickensdorfer 1996) Blickensdorfer, C.: Ökobilanz der Nassoxidation der Ciba Grenzach. Diplomarbeit (Masters T-hesis), Eidgenössische Technische Hochschule Zürich, Laboratorium für Technische Chemie, 1996.

**ISO standards:**

(ISO 14040: 1997) International Standard ISO 14040: Environmental management - Life cycle assessment - Principles and framework. Geneva, Switzerland: International Organization for Standardization, 1997.

**Information from the internet:**

(OSPAR 2003) OSPAR Convention for the protection of the marine environment of the North-east Atlantic. Hazardous substances strategy. Available from: <http://www.ospar.org/eng/html/welcome.html>. Retrieved 25.10.2005.