

## **TDT50 IT for sustainable development Autumn 2022 - last update 14/09-2022**

Information system and software practitioners are part of the group of people who design the software systems that run our world. Sustainability is fundamental to our society. The current state of our world is unsustainable in more ways that we often recognize. Technology is part of the dilemma and part of possible responses. We often talk about the immediate impact of technology, but rarely acknowledge its indirect and systemic effects. These effects play out across all dimensions of sustainability over the short, medium and long term

Software and information systems in particular plays a central role in sustainability. It can push us towards growing consumption of resources, growing inequality in society, and lack of individual self-worth. But it can also create communities and enable thriving of individual freedom, democratic processes, and resource conservation. Designers of software technology are responsible for the long-term consequences of the designs.

This topic contains a selection of articles in the area of sustainable IT from an information systems and software engineering angle. The course will be held as a set of seminars where we will go through the paper of the curricula.

Four seminars are planned

- 1: Tuesday 13/9 12:15-14:00 1-3 Introduction and core concepts
- 2: Thursday 29/9 10:15-12:00 4-9 Sustainability in software engineering
- 3: Friday 21/10 10:15-12:00 10-13 Sustainability issues with AI, Cloud computing and Blockchain
- 4: Tuesday 08/11 14:15-16:00 14-17 + 2 Sustainable information systems

Evaluation will be based on a scientific essay: The overall topic is:

- “How do issues related to sustainability influence IT solutions in the area of XXX”

Curricula

1. Becker, C., Chitchyan, R., Duboc, L., Easterbrook, S., Mahaux, M., Penzenstadler, B., Rodríguez-Navas, G., Salinesi, C., Seyff, N., Venters, C.C., Calero, C., Akinli Koçak, S., Betz, S. (2014). The Karlskrona manifesto for sustainability design. arXiv preprint arXiv:1410.6968.

2. Hilty, L.M., Aebischer, B.: ICT for Sustainability: An Emerging Research Field. In: Hilty, L.M., Aebischer, B. (eds.) ICT Innovations for Sustainability. Advances in Intelligent Systems and Computing 310, Springer International Publishing (2015)
3. Freitag, C. et al The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations. Patterns September 2021
4. Mourao, B.C., Karita L., do Carmo Machado. I. Green and sustainable software engineering - a systematic mapping study SBQS: Proceedings of the 17th Brazilian Symposium on Software Quality October 2018
5. Christoph Becker, Stefanie Betz, Ruzanna Chitchyan, Leticia Duboc, Steve M. Easterbrook, Birgit Penzenstadler, Norbert Seyff, and Colin C. Venters. Requirements: The Key to Sustainability. IEEE Software Special Issue on the Future of Software Engineering, Volume 33, Issue 1, pages 56-65, January 2016. [preprint][link]
6. Penzenstadler, B., Duboc, L., Venters, C., Seyff, N., Wnuk, K., Chitchyan, R., Easterbrook, S., & Becker, C. Software engineering for sustainability: Find the leverage points! IEEE Software August 2017
7. Sustainability Quantification in Requirements Informing Design: Oyedeki, S. , Seffah, A. and Penzenstadler, B. 2017
8. Green IT and Green Software , Roberto Verdecchia, Patricia Lago, Christof Ebert, Carol De Vries IEEE Software 2021
9. Patricia Lago, Roberto Verdecchia, Nelly Condori-Fernandez, Eko Rahmadian, Janina Sturm, Thijmen van Nijnanten, Rex Bosma, Christophe Debuysscher, and Paulo Ricardo Designing for Sustainability: Lessons Learned from Four Industrial Projects 2020
10. Green AI : Roy Schwartz, Jesse Dodge, Noah A. Smith, Oren Etzioni Communications of the ACM, December 2020, Vol. 63 No. 12, Pages 54-63
11. Carbon Emissions and Large Neural Network Training David Patterson, Joseph Gonzalez , Quoc Le , Chen Liang, Lluís-Miquel Munguia, Daniel Rothchild, David So, Maud Texier, and Jeff Dean
12. Sukhpal Singh Gill and Rajkumar Buyya. 2018. A Taxonomy and Future Directions for Sustainable Cloud Computing: 360 Degree View. ACM Comput. Surv. 51, 5, Article 104 (January 2019)
13. Alexa Böckel, Anne-Katrin Nuzum, Ilka Weissbrod, Blockchain for the Circular Economy: Analysis of the Research-Practice Gap, Sustainable Production and Consumption, Volume 25, 2021
14. Dwivedi et al. Climate Change and COP26: Are digital technologies and information management part of the problem or the solution ? An editorial reflection and call to action. International Journal of Information Management 2022
15. Hilpert, D.-W.-I. H., Kranz, P. D. J., and Schumann, P. D. M. 2013. "Leveraging Green IS in Logistics," Business & Information Systems Engineering (5:5), pp. 315–325.
16. Roman Zeiß , Anne Ixmeier, Jan Recker, Johann Kranz. Mobilizing IS Scholarship for a Circular Economy: Review, Synthesis, and Directions for Future Research July 2020 Information Systems Journal
17. Loock, C.-M., Staake, T., and Thiesse, F. 2013. "Motivating Energy-Efficient Behavior with Green IS: An Investigation of Goal Setting and the Role of Defaults," Management Information Systems Quarterly (37:4), pp. 1313–1332

<https://www.sustainabilitydesign.org/publications/>

Presenters:

1. John Krogstie
2. Isabel
3. John Krogstie
4. John Krogstie
5. Stine
6. Thomas
7. Hallvard
8. Sverre
9. Kristin
10. Simen
11. Mathias
12. Mai
13. Solveig
14. Anchana
15. Aleksandra
16. Ragnhild
17. Hans Kristian