



MSc thesis opportunities in projects on sustainable energy transitions in maritime shipping

Master thesis projects on sustainable energy transitions in maritime shipping are part of KTH's IRIS initiative on sustainable industry and society. The project aims to support Sweden's transition to fossil-free shipping by 2045. The project focuses on new fuels and technologies to decarbonise the maritime shipping industry, such as advanced biofuels, electro fuels, hydrogen-propulsion systems and electric ships.

The unit of [Sustainability, Industrial Dynamics and Entrepreneurship](#) at INDEK is looking for MSc students to engage in 30 ECTS thesis projects (January – June 2024). The thesis projects will directly contribute to the ongoing research of the IRIS's maritime shipping project with the possibility for future publication in academic journals and/or as policy briefs.

Proposed projects

We are looking for motivated MSc students with a range of disciplinary backgrounds, research interests and competences. The projects proposed are open to development by students in line with their own interests. As the projects will contribute to ongoing research at INDEK, there are opportunities for close collaboration with industrial actors and organisations involved in maritime shipping in Sweden (and beyond).

Projects proposed (and related research questions) include:

1. *Electrification of maritime shipping*

Possible methods: case studies, interviews, cost-benefit analysis, emission-energy-economy modelling

Electrification of maritime shipping means changes in vessels, port infrastructure, regulations, operation, scaling up electric generation capacity and more. What are these changes? What role do ports have in this transition, e.g. Ports of Stockholm?

2. *Hydrogen generation for maritime shipping*

Possible methods: case studies, interviews, cost-benefit analysis, emission-energy-economy modelling

Hydrogen-based maritime shipping means changes in vessels, port infrastructure, creating hydrogen production, storage and supply facilities, changes in regulations, operation, and more. What are these changes? What role do ports have in this transition, e.g. Ports of Stockholm or the Port of Gävle? What plans for hydrogen-based port facilities and shipping companies exist currently and how will they be developed, e.g. Gotlandsbolaget's hydrogen-based ferry?

3 *Advanced biofuel and electro-fuel generation for maritime shipping*



Possible methods: case studies, interviews, cost-benefit analysis, emission-energy-economy modelling

Advanced biofuels and electro-fuels for maritime shipping means changes for advanced biofuel production, storage and supply facilities, in some cases changes to vessels and ports, changes in regulations, operation, and more. What are these changes? What role do ports have in this transition? Where and how are bio-refineries operating? What plans for advanced biofuel port facilities and shipping companies exist currently and how will they be developed? What sector coupling is there between the forestry sector and the transport sector?

4 Price development for alternative fuels for maritime shipping

Possible methods: case studies, interviews, cost-benefit analysis, emission-energy-economy modelling

With fuel prices fluctuating, what will the future price of fuels and technologies be? How does pricing affect investment decisions of ports and shipping companies? What can be learned from historic price developments, technological learning curves, economies of scale and what does this indicate about future developments?

5. Comparative analysis of different regional dynamics for alternative fuels for maritime shipping

Possible methods: comparative case studies, interviews, surveys, cost-benefit analysis, emission-energy-economy modelling

The maritime shipping industry has a range of different segments, from local/regional (commuter) ferries (e.g. Waxholmbolaget in the archipelago) to global cruise ships, to international tankers and container ships. What are the differences in approaches towards sustainable energy transitions in these segments? Which ones are first-movers and which ones are laggards and why? What do customers expect (e.g. cruise ship tourists, local commuter ferry users, multinational retailers using container ships)? What role do international supply chains play? What role does local environmental awareness play?

Interested students should contact Frauke Urban (fraukeu@kth.se) and Fumi Harahap (harahap@kth.se) to discuss MSc thesis opportunities further. Students should indicate their research and methods of interest. All ideas for the development of thesis projects are encouraged and welcomed.

More information about the IRIS project and area 3 on sustainable energy can be found here: <https://www.kth.se/en/itm/forskning/iris/research-initiative-on-sustainable-industry-and-society-iris-1.1140756> and <https://www.kth.se/en/itm/forskning/iris/research/sustainable-energy-systems/area-3-sustainable-energy-systems-technology-and-business-perspectives-1.1140772>