Shaping change: this is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association with some 7,600 employees, we conduct interdisciplinary research into a digitalized society, a climate-friendly energy system, and a sustainable economy. We focus on the natural, life, and engineering sciences in the fields of information, energy, and bioeconomy. We combine this with expertise in high-performance computing and artificial intelligence using unique scientific infrastructures.

The energy transition is one of the greatest challenges of the 21st century. At the Institute of Climate and Energy Systems – Jülich System Analysis (ICE-2), we develop strategies for renewable and cost-optimised energy systems of the future. In the first phase of the energy transition, research and production of the necessary technologies were initially still strongly anchored in Europe. Over the last 15 years, the photovoltaic industry has migrated from Europe to Asia, and a similar trend is currently evident in wind turbines and microchip and semiconductor technologies, threatening a further loss of industrial expertise and an intensification of technological dependence. At the same time, semiconductor production requires several critical raw materials (e.g. silicon and gallium), which are largely imported from countries outside Europe, further exacerbating the situation. This thesis therefore aims to examine the dependencies that exist and strategies that can help reduce these risks.

We offer you to the next possible date an exiting

Master Thesis - Analysis of global supply chains and dependencies on critical raw materials

Your Job:

The work will examine global supply chains for wind turbines, particularly offshore, or for microchip and semiconductor technologies, to identify bottlenecks, dependencies, and transformation paths. Based on a systematic literature review and trade data analysis, the first step will be to select the technologies to be considered (e.g., generator- and permanent magnet-based). A material flow-based database for the supply chain will then be established for these technologies, which will provide a basis for analyzing dependencies and the demand for (critical) raw materials. Specifically, you will work on the following tasks:

- Literature review on the global supply chain for wind turbines, including key production steps (raw materials – intermediate products – components – end products) and major production sites at the country level

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application via our **Online-Recruitment-System!**

Questions about the vacancy?

Get in touch with us by using **our contact form.**

Please note that for technical reasons we cannot accept applications via email.

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- Compile and assess key technologies, potential substitutes, emerging technological developments, and associated development potentials and risks
- Conduct literature research on critical materials and material substitutes, including LCA-based material overviews, criticality assessments (e.g., EU evaluations or global production capacities), and potential substitutes for current and future technologies
- Select relevant technologies/raw materials and create scenarios as a basis for a material flow analysis
- Perform import/export analysis of raw materials, intermediate products, and finished products based on, for example, historical trade data (https://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=37)
- Analysis of historical developments in material flows
- Develop a database on material flows, including key figures such as volumes, origins, and processing stages, and analyze the demand for relevant raw materials, intermediate products, and production inputs

The project offers the opportunity to deal intensively with the renewable energy value chain and to work out connections to critical raw materials. The project is supervised by the Chair of Energy Economics at TU Dresden in cooperation with the Resource Strategies Department of Jülich System Analysis at Forschungszentrum Jülich. This thesis aims to publish a research article in a renowned international journal (e.g., Energy Policy, Journal of Industrial Production).

Your Profile:

- Very good academic records in your master`s studies in the field of energy technologies, mechanical engineering, industrial engineering, physics, or a comparable field
- Knowledge of renewable energy technologies
- Experience with and/or interest in setting up a comprehensive database on material flows and their evaluation
- Knowledge of an object-oriented programming language (e.g., Python, Matlab) and MS Office
- Fluent language skills in written and spoken English or German

Our Offer:

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! We support you in your work with:

- MEANINGFUL TASKS: Your thesis deals with a future-oriented, socially relevant topic with direct practical relevance in an international environment
- PRACTICAL RELEVANCE: With us, you will gain valuable practical experience alongside your studies and actively participate in interdisciplinary projects
- SCIENTIFIC ENVIRONMENT: You can expect excellent scientific equipment, modern technologies, and qualified support from experienced colleagues
- INTERDISCIPLINARY COLLABORATION: You will have the opportunity to work with keen researchers from various scientific fields and be part of designing the future energy system
- PERSONAL RESPONSIBILITY: You organize your tasks independently—from preparation to implementation
- ONBOARDING & TEAMWORK: You can look forward to working in a dedicated, international, and collegial team. It is important to us that you quickly settle into the team and are given structured training for your tasks. We also support you from the very beginning and make your start easier with our Welcome Days and Welcome Guide: https://go.fzj.de/welcome
- WORK-LIFE BALANCE: We offer flexible working hours to help you balance your

professional and personal life. You also have the option of flexible working (in terms of location), which is generally possible after consultation and in line with upcoming tasks and (on-site) appointments
- FLEXIBILITY: Flexible working hours make it easier for you to balance work and study
- FIXED-TERM: The position is limited to 6 months
- PERSPECTIVE: If you have the appropriate qualifications and funding is available, the institute offers the opportunity to do your PhD after completing your master`s thesis
- FAIR REMUNERATION: We will pay you a reasonable remuneration for your thesis

In addition to exciting tasks and a collegial working environment, we offer you much more: https://go.fzj.de/benefits

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.

The following links provide further information on diversity and equal opportunities: https://go.fzj.de/equality and on specific support options: https://go.fzj.de/womens-job-journey