

Faculty of Science and Engineering

Profile report: Food-Energy-Water Nexus (Interactie Voedsel-water-energie)

- Discipline: Environmental Science; Ecology; Ecological Economics
- Level: Assistant professor
- Fte: Full time (1,0)

1. Scientific discipline

The scientific discipline is positioned at the intersection of food, energy and water systems. The position will concentrate on integrating land-based energy production with other ecosystem services and societal aspects of these services.

2. Vacancy

This position is opened by the Board of the Faculty. The position is created in the context of the sector plan Earth and Environmental Sciences. It will be embedded in the Energy and Sustainability Research Institute Groningen (ESRIG), basic unit Integrated Research on Energy, Environment and Society (IREES). The position is created within the framework of 'Career Paths in Science 4' ('Bèta's in Banen 4'). Please see link for [criteria and conditions](#).

3. Selection Committee (BAC)

Prof. dr. N. (Nasser) Kalantar-Nayestanaki, director of ESRIG (chair)
Prof. dr. K. (Klaus) Hubacek, IREES, chairman board of ESRIG, director of IREES
Prof. dr. L.G. (Ina) Horlings, Full Professor in Socio-Spatial Planning
Prof. dr. E.J. (Eize) Stamhuis, Associate Professor of Marine Zoology & Biomimetics, Director of Education of ESRIG
Prof. dr. S. (Sanderine) Nonhebel, Associate Professor of Environmental Sciences
Prof. dr. B. Wicke, Full Professor on Land, Climate and Sustainability at Radboud University

Student tbc
Dorien Smit, HR advisor

4. Area of expertise

For a sustainable future, an adequate supply of energy, water, and food for the global population is essential. Often, the supply of these resources and the environmental impacts are studied in silos. In the Water-Energy-Food nexus (WEF-nexus) research the interaction between these three resources is studied. This area of research investigates solutions and pathways for a sustainable energy future without causing devastating impacts on the supply of food and water and other ecosystem services. Research in this field addresses a wide range of topics such as options to produce renewable energy on farms; carbon, water, and land footprints of changing diets; impacts of global food trade on the use of natural resources; and water use in energy supply systems. To appropriately address these questions, novel combinations of existing tools (e.g. global value chain analysis tools, LCA, global agroecological zones model, InVEST) and new approaches are needed. In the envisioned post, the focus should be placed on analyzing nexus

problems and thus contribute to one or more of the global discourses on biodiversity loss (e.g. the Convention on Biological Diversity), climate change (e.g. the UNFCCC and IPCC), UN Sustainable Development Goals (SDGs) and the energy transition (e.g. EU's Green Deal) as well as to local issues such as, for example, the recent Council of State ruling on the government's strategy for reducing excess nitrogen or the land requirements for EU's hydrogen strategy.

Although the WEF nexus research at ESRIG has been going on for more than 20 years, the importance of connecting these research lines was only recognized internationally in 2011, when the German Federal Government organized the international conference "The Water, Energy and Food Security Nexus—Solutions for the Green Economy" to contribute to the United Nations Conference on Sustainable Development. Since then, research in this field is booming and a number of new scientific journals on this topic have emerged. In addition, research programs specifically on the WEF nexus have been developed and energy programs also increasingly require a wider view of energy systems (including the trade-offs to other environmental and socio-economic issues). At the moment, ESRIG and IREES, in particular, have an advantage in comparison with other energy-related institutes as a well-developed Water-Energy-Food-nexus research line already exists and expertise in this subject is also present but needs strengthening. Both for research and for education, it is essential that we replace the person who has developed this research line at IREES, and is going to retire in the near future.

5. Embedding: institute (and base unit)

Energy and climate change, sustainable society, artificial intelligence, and healthy aging are the key focuses of the University of Groningen and are the main topics of the newly established Schools within the University. Within the Faculty of Science and Engineering, the Energy and Sustainability Research Institute (ESRIG) covers Energy and Climate Change and wider Sustainability themes. The position will therefore be embedded in ESRIG. This institute is comprised of six base units, that all contribute to the MSc Programme on Energy & Environmental Sciences (EES) and also contribute to Science & Society-related education in other degree programs. Within ESRIG, the Integrated Research on Energy, Environment & Society base unit (IREES) focuses on the key challenge to address the energy transition that requires a substantial transformation of the economy and society and thus shifts towards a (more) sustainable society. IREES will be the host of this position within the research line on the 'Food-Energy-Water Systems (FEWS) Nexus'. IREES offers the opportunity to perform independent research on one of the themes mentioned or on topics where these meet, as well as intensive collaboration with colleagues working on similar topics. The new assistant professor is essential for the continuation and expansion of the current Food-Energy-Water research as well as research and education on the circular economy within the faculty and beyond.

6. Local and (inter)national position

Sustainability and Energy are two of the main themes at the UG. In addition, Innovation, Responsibility, and Interdisciplinarity are recognized as key themes for UG. IREES through its two former sub-groups (Science and Society group or SSG and the Center for Energy and Environmental Sciences or IVEM) has a long and fruitful tradition in cooperation with groups from other Faculties, such as Spatial Sciences, Law, Economics and Business, Philosophy, Arts, and Behavioural and Social Sciences, and has a unique position because of its focus on human-environment and science-society interactions. Since Energy and Sustainability have been selected as focus areas, cooperation in research and teaching with other research groups at FSE and within the UG has been intensified. The candidate will further represent IREES and try to acquire a prominent position for IREES in these areas as far as interactions concerning science, technology, and human-environment interactions are involved.

On the national level, IREES is a member of the national research school WTMC (The Netherlands Graduate Research School of Science, Technology and Modern Culture) along with related groups from other universities as well as a member of the Research School for Socio-Economic and Natural Sciences of the Environment (SENSE). Connections exist between the Athena institute (VU), Copernicus Institute (Utrecht University), and similar groups in Nijmegen and Wageningen universities. However, compared to most other Dutch groups working in the field of Science, Technology, and Society research, IREES has a stronger embedment in the natural sciences. Globally, IREES has strong research ties with groups in Europe, the US, China, and other Asian countries and Africa, which has led to joining research projects and proposals and the exchange of researchers in both directions. For example, we have a joint virtual research center with the University of Maryland in the US and Shandong University in China with funded joint research projects, publications, joint students, and faculty exchange. In addition, IREES successfully collaborated on a teaming proposal with 15 million Euro EU and 25 million Euro co-funding to set up a joint energy research center at the University of Cyprus and the Technical University of Denmark (DTU). In all of these collaborations, land-based renewable energy production and the FEWS nexus are of growing importance. In this context, IREES strives to attain and maintain a substantial role in developing interdisciplinary approaches to informing the energy transition.

7. Expected contributions to research

The candidate is expected to have a broad overview of concepts and methodologies within the fields related to FEWS nexus research and Sustainability Science more generally and will focus on sustainability, energy systems, and natural resources.

Such an approach requires thorough and constructive analyses of existing and proposed knowledge systems, including developing frameworks for understanding and improving science-society interactions. The candidate helps to initiate and develop an internationally competitive research program, based to a large extent on extramural funding, addressing new roles of natural sciences concerning understanding and improving science-mediated human-nature relationships. The candidate's research program should include a strategy to build up and strengthen multidisciplinary contacts within and outside the university. Alignment of the program with the other research groups in ESRIG, other faculties of the UG, and the new schools within UG will be key to growth and international reputation.

8. Expected contributions to teaching

These wide-ranging contributions of land-based energy production and its trade-offs to research and society are reflected in our teaching program with contributions to courses across the University (e.g. recent FSE-initiated honors course) as well as specialist courses within the Energy and Environmental Sciences MSc program such as the course on Sustainable Use of Ecosystems. The candidate will teach in the educational programs within the faculty (Bachelor-, Master, and Ph.D. levels). The candidate will contribute to the EES Master's degree program in terms of teaching and student supervision, and to the faculty-wide education with substantial energy, natural resources, and sustainability-related elements (e.g. the SEPA courses). The candidate will contribute to the development of educational programs, in particular with respect to sustainability, the energy transition, and natural resource management. The candidate will also supervise Ph.D. students.

9. Expected contributions to the organization

The candidate is expected to have an active interest in and to provide a positive contribution to the management and organizational tasks of the institute and faculty, for example by participating in working groups and committees on teaching, research, and management. The candidate will participate in relevant national and international research organizations. Furthermore, a prominent role by initiating and leading new initiatives is expected in the university-wide schools on energy ([Wubbo Ockels School for Energy and Climate](#)) and sustainable society ([The Rudolf Agricola School for Sustainable Development](#)) and inter-university collaborations such as [SENSE](#). As outreach is increasingly important, the candidate will be involved in outreach and engagement activities of FSE, such as supporting FEWS nexus research components in grant proposals and stimulating cooperation between partners from science, industry, and society.