The graduate school "Environmental and Loss Prevention" is an association of the University of Stuttgart, the Technical University of Dresden and the Karlsruhe Institute of Technology (KIT). The aim of the graduate school is to promote young scientists in interdisciplinary topics such as geohazard research, climate impact research, risk sociology, research on risk management and the corresponding applications of supercomputers. The focus is on the promotion of knowledge and methods, especially with a view to avoiding environmental and social damage. In this context, the foundation also wants to be perceived as a think tank for new approaches in loss prevention. As part of the graduate school, the SV Sparkassen Versicherung Building and Insurance Foundation is advertising:

4 doctoral positions
(TV-L 13, 50%)

on the following topics:

Topic 1: Serial clustering of extreme weather events in Central Europe.

The aim of the project is to investigate how the probability of occurrence and the temporal sequence of different weather and climate extremes are determined by larger-scale processes of the climate system - for example by teleconnection patterns such as the North Atlantic Oscillation. Furthermore, it is investigated how the frequency and characteristics of such states are altered by climate change.

Supervisor: Prof. Dr. Michael Kunz, Karlsruhe Institute of Technology (KIT), Institute for Meteorology und climate research

Topic 2 Multiple risks to households, businesses and communities through sequential extreme weather events.

The aim of the dissertation is to assess the multiple risks of extreme weather events for households, companies and communities with their changes on the basis of data and projections. The hazard assessment take into account, as far as possible, heavy rainfall, floods and drought with their possible alterations due to climate change. The vulnerability assessment focus on spatial receptors such as buildings, infrastructure and land use, with - as far as known - also their possible changes due to societal change. In addition, the probabilities of occurrence as well as the uncertainties resulting from the climate projections and the models used should be specified in detail. The methodological approach is empirically tested in existing study sites.

Supervisor: Prof. Dr. Jochen Schanze, Technische Universität Dresden, Chair of Environmental Development and Risk Management.

Topic 3: Paths to resilience: How can state regulations and private-sector incentives increase the resilience of the economy and society?

The aim of the work is to develop a holistic approach of resilience that takes into account technology, forms of organization, regulatory requirements, but also economic incentives such as insurance and fund solutions. Resilient societies are able to minimize the human, economic and ecological damage caused by adverse events. They achieve this by using a combination of solutions that include the design of technologies, policy-making through economic incentives and regulation, and measures for education and dialogue with social groups or affected sections of the population. In simplified terms, resilience

means maintaining the function of a system even in the event of unexpected disruptions or returning it to a functional state as quickly as possible- The concept of resilience has become particularly important since the corona crisis that broke out in 2020.

Supervisors: Prof. Dr. Dr. h.c. Ortwin Renn, Universität Stuttgart, Institute for Social Sciences together with Prof. Dr. Dr. h.c. mult. Michael Resch, High performance Computer Center Stuttgart.

Topic 4: Potentials and limits of algorithmic systems for the control of complex social tasks.

The goal of his work is to,

- to empirically investigate human-machine interactions with existing algorithmic systems and
- To develop normative dimensions to make human-machine interaction intelligent.

Supervisor: Prof. Dr. Dr. h.c. mult. Michael Resch, High performance Computer Center Stuttgart together with Prof. Dr. Dr. h.c. Ortwin Renn, Universität Stuttgart, Institute for Social Sciences.

You can find detailed descriptions of the topics at www.stiftung-schadenvorsorge.de

The appointments will be made at the respective supervising universities. The doctoral positions are limited to max. three years. The scope of employment is 50%. The remuneration is based on the TV-L. The recruitment conditions are based on the respective specifications of the supervising universities. A prerequisite is a university degree (preferably Master) in one of the relevant subject areas and an excellent performance during the course of studies. It is expected that, in addition to their work on the doctorate, the candidates will actively participate in the activities of the graduate school "Environment and Loss Prevention".

Application documents (only pdf-files) with a clear reference to the topic (name and number), copies of university degrees and other accomplishments, application / motivation letter, short scientific essay about how the topic will be handled and a list of potential experts willing to write references should be sent to:

Stiftung Umwelt und Schadenvorsorge
c/o High Performance Computer Center Stuttgart
Agnes Lampke
Nobelstraße 19
70569 Stuttgart
The application deadline is August, 21, 2020

If you wish to submit your application online, please send it to buero@stiftung-schadenvorsorge.de. Please send your documents summarized in a pdf-file. Unfortunately, we cannot consider applications in other formats.

The Foundation Umwelt und Schadenvorsorge set itself the goal of increasing the proportion of women in research and teaching, and accordingly encourages qualified female scientists to apply in particular. Severely disabled people are given priority if they are equally qualified.

Further information and information on the handling of applicant data in accordance with Art. 13 DS-GVO can be found at: www.stiftung-schadenvorsorge.de

Topic 1: Prof. Dr. Michael Kunz

Serial clustering of high-impact weather events in central Europe

The frequency and intensity of high-impact weather events such as winter storms, flood-relevant heavy precipitation, thunderstorms, or heat waves are determined to a certain extent by the location and magnitude of large-scale circulation patterns in the atmosphere (teleconnections). Positive phases of the North Atlantic Oscillation (NAO) during the winter months, for example, are associated with a higher number of windstorms in Central and Western Europe (Donat et al., 2010). In contrast, negative phases in the summer lead to increased thunderstorm activity (Piper and Kunz, 2017). Furthermore, if certain circulation or flow patterns persist over periods of several days to weeks, this can cause a large number of high-impact weather events (serial clustering; Vitolo et al., 2009). For instance, both the storm series of the years 1990 (Daria, Vivian, Wiebke) and 1999 (Lothar, Anatol, Martin) and the thunderstorm episodes of the years 2016 (including flash floods in Braunsbach and Simbach) and 2018 were related to such serial clustering. When certain flow or teleconnection patterns are more frequent in one year, different weather extremes can also occur in succession with corresponding effects on society and the environment - as for example in the year of 2013 with the temporal succession of a pronounced heat wave, flooding at the rivers Elbe and Danube and severe hailstorms (Andreas). So far, however, little is known how certain flow or teleconnection patterns affect the combined frequency of different weather extremes in the course of a year, and how climate change alters the probability of such situations.

The aim of the project is to investigate serial clustering of different high-impact weather extremes, which is highly relevant for society and insurance companies. First, an event catalogue containing the most damaging extremes during the past 30 to 50 years in Germany and central Europe will be compiled. Using data from climate models (re-analyses), appropriate severe weather proxies will be created (based on, e.g., vorticity maximum, statistical dispersion, thermal stability, weather conditions). The relationship between the proxies and the characteristics of the flow/teleconnection patterns are then analyzed (different types of blocking, NAO, East Atlantic pattern, Scandinavian pattern) - both for the individual weather extremes and their serial combination. Afterwards, the temporal variability (variance and trends) of the extreme weather proxies and the flow patterns / teleconnections is examined. Finally, the methods are transferred to an ensemble of climate models to examine how climate change is expected to alter the temporal succession of large-scale patterns associated with severe weather.

Piper, D. und M. Kunz, 2017: Spatio-temporal variability of lightning activity in Europe and the relation to the North Atlantic Oscillation teleconnection pattern. Nat. Hazards Earth Syst. Sci., 17, 1319-1336.

Donat, M. G., G.C. Leckebusch, J.G. Pinto und U. Ulbrich, 2010: Examination of wind storms over Central Europe with respect to circulation weather types and NAO phases. Int. J. Climatol., 30, 1289-1300.

Vitolo, R., D.B. Stephenson, I.M. Cook and K. Mitchell-Wallace, 2009: Serial clustering of intense European storms. Meteor. Z., 18, 411-424.