

Experience builds confidence

For the successful implementation of wind energy projects comprehensive know-how and specialists with broad experience in numerous areas are required. GEO-NET is your reliable partner for the successful development, implementation and assessment of wind energy projects.

Our team of experts, such as geographers, meteorologists, renewable energy engineers and landscape ecologists, contributes with their expertise and knowledge to assure the efficient, reliable and economical realisation of your projects.

Our focus is on analysis of wind meteorology and energy yields, which are included in studies of wind potentials, bankable wind and energy yield assessments, and other studies. GEO-NET applies the validated air flow model FITNAH-3D to deliver a precise assessment, even for complex sites and at high hub heights.

We can design and implement bankable wind measurement campaigns for you worldwide. The wind measurement masts are equipped with the latest regulatory-compliant sensor technology. We also use remote sensing methods such as LiDAR measurements.

For reduced forecast uncertainty of the report, we will conduct wind measurements at the planned site to secure highest possible accuracy and the profitability of your project.

- + International market experience since 1995
- + Experience in more than ,000 wind energy projects in over 50 countries
- + Recognized by leading banks, financial investors, project developers, public institutions and authorities
- + Globally recognized accreditation (DAkKS, ILAC) and certification (ISO 9001)
- + Mesoscale model FITNAH-3D: reliable results even for forest sites and highly complex terrain
- + Subsidiaries in South Africa and the Ukraine

Our main services include:

- + Bankable wind and energy yield assessments
- + Wind potential studies
- + Site identification procedure for wind energy locations
- + Mast based wind measurements
- + LiDAR measurements and verification
- + Micrositing and optimisation of wind farm layout
- + Technical Due Diligence
- + Performance analysis and evaluation of long-term energy production of existing wind farms
- + Turbulence studies

Quality standards and technical competence

GEO-NET offers high quality and reliable expertise guaranteed by the accreditation according to **DIN EN ISO/IEC 17025:2018** (DAkKS*, ILAC**) and internal quality management (**DIN EN ISO 9001:2015** (TÜV Nord)). As certified and accredited laboratory, GEO-NET follows the national and international technical guidelines and standards for the wind industry. The accreditation by DAkKS covers the following procedures: wind measuring and wind data analysis, the determination of wind potential and energy yield of wind turbines, and the determination of reference yield of wind turbines.

GEO-NET is recognized by banks and public authorities worldwide, ensured via the ILAC Mutual Recognition Agreement.

GEO-NET is a member of the site review committee of the German Wind Energy Association (BWE, Bundesverband WindEnergie e.V.) and of the expert committee of the Federation of German Windpower (FGW, Fördergesellschaft Windenergie).

*DAkKS = Deutsche Akkreditierungsstelle (German Accreditation Body)

**ILAC = International Laboratory Accreditation Cooperation



GEO-NET
Umweltconsulting GmbH

Große Pfahlstraße 5a
30161 Hannover
Germany

Phone 0049 (0) 511 388 72 00
Fax 0049 (0) 511 388 72 01

info@geo-net.de
www.geo-net.de

CEO:
Dipl.-Geogr. Thorsten Frey
Dipl.-Geogr. Peter Trute

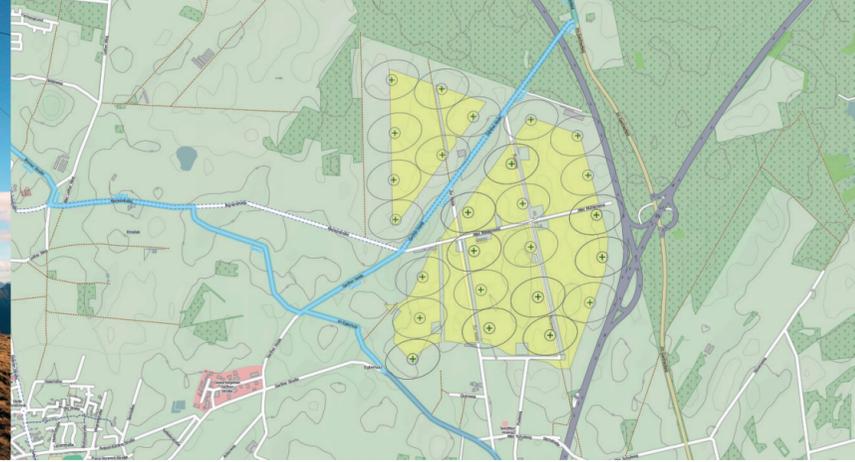
GEO-NET Wind is what drives us.

Efficient concepts for your wind energy project.



From idea to success

We will advise you and work on your projects from the initial idea to the completed wind farm. Where do you see yourself in our simplified project path? Please contact us at any time – we will accommodate your current situation, provide you with reliable advice and support and always find target-oriented solutions.



Idea!



Wind farm!

1 Identification of project areas

Are you searching for suitable project sites? Taking into account wind conditions, distance regulations, spatial conditions, grid connection conditions, and all other necessary criteria and requirements, we will find the optimum areas for your project. In smaller areas, or even within entire countries, we will quickly identify all areas which meet your requirements and are relevant for successful project development.

3 Design of measurement concept

Do you need a reliable measurement campaign for a wind and energy yield report? Wind measurements can consume time and money. To enable you to effectively achieve your goals, we will provide a suitable measurement concept to you before starting the measurement. Here, we will consider met masts as well as remote sensing methodologies (e.g. LiDAR). We provide appraisals of uncertainty to offer you a reliable planning basis.

5 Bankable measurement report

Do you need a bankable summary and evaluation of your measurement data? All the data of the measurement campaign will be processed, analysed and presented in clearly arranged tables and graphs. After the end of the measurement campaign, you will receive a detailed measurement report including uncertainty analysis for the project financing at your bank.

7 Bankable wind and energy yield report

Do you need a reliable basis for the financing of your project? For the final assessment of your project, we will provide you with a reliable and bankable wind and energy yield report. Applying FITNAH-3D, we will calculate a wind field for the planned wind park site and verify it by using appropriate reference data. The wind field delivers its own wind statistic for every turbine in the wind park. Via this method, energy yield forecasts at the planned hub height will be available at the highest possible level of accuracy.

2 Preliminary assessment of wind energy potential

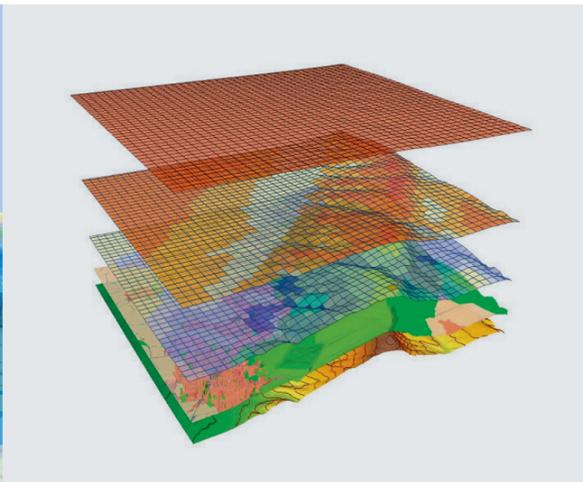
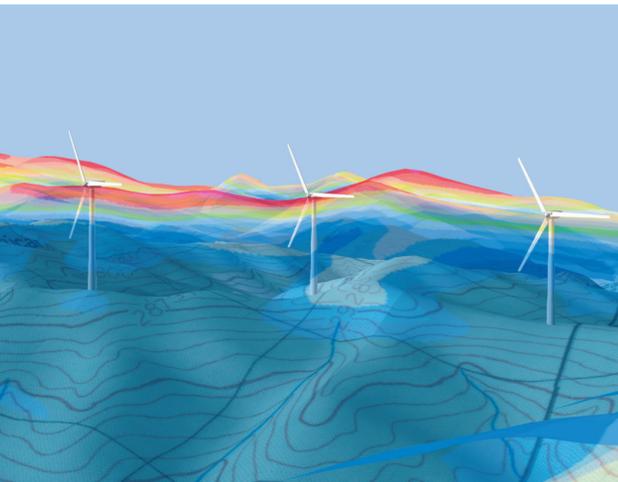
Are you searching for a quick appraisal of wind conditions and energy yield? Do you want to find the best location? For a first appraisal of the location, we will calculate wind conditions and energy yields independently of wind measurements and take into account the complexity of the area.

4 Performing and analysing measurements

Do you need a wind measurement or reliable evaluation of measurement data? To ensure that your wind measurement is time and cost effective, we can offer you mast based measurements in site-appropriate height, as well as remote sensing methodologies, at a package price. Your data will be controlled daily by our experienced staff who will provide you with fast solutions in case of any problems. We can provide a value for available wind measurement. We will support you from the measurement concept up to the analysis of measurement data or completely take care of these steps for you.

6 Final Micrositing

Do you need to be sure that your wind turbines will always be turning? We will prepare the park layout for you for optimum energy yield. To do this, the FITNAH-3D wind field will provide location specific information. Furthermore, shadowing is minimised by the best possible arrangement of the turbines. The wind park area will be used efficiently, taking into account the existing infrastructure and topography. Relevant approval criteria such as minimum distances will be taken into account as part of this process.



Wind field simulation with air flow model FITNAH-3D

FITNAH (Flow over Irregular Terrain with Natural and Anthropogenic Heat sources) is a three-dimensional non-hydrostatic mesoscale model for the determination of wind fields. It fulfils and exceeds minimum requirements for mesoscale models determined in the VDI guideline 3783 (1992). Since its development in the early nineteen-nineties, we have been continually expanding and adapting the model to current requirements and specifications in the field of wind energy.

Advantages of FITNAH-3D:

- + Realistic modelling of the impacts of relief situation and land utilisation on vertical and horizontal dispersion of the wind field, such as deceleration of the ground-level wind field in the vicinity of forests, increase of wind speed over mountain ridges, increase of turbulences over rough surfaces such as forests or houses.
- + Wind field simulations can be performed independently of wind measurements in good quality and thus provide a good basis for initial estimations of predominant wind conditions in the respective project area. The meteorological input data are based on up to date model data, e.g. ERA5.
- + Calculation of wind fields is conducted in every desired resolution and for areas of different sizes. It occurs with precise accuracy for every site at hub height.
- + Regional climatic phenomena such as regional winds (katabatic/anabatic winds, land sea breezes) can be simulated realistically.