

# PRESS RELEASE

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Fraunhofer ITWM vs. Corona: With Mathematics Against the Crisis

## Project EpiDeMSE Supports Local Decision Makers in Planning Actions in the Corona Crisis

**Especially when an infectious disease is new, mathematical models help to answer the two most important questions: How will the infection spread and what actions are appropriate and effective to contain it? In order to support local decision makers (health authorities, hospitals and especially municipalities) in planning their actions, researchers of the Fraunhofer ITWM are working on the epidemiological modeling, simulation and decision support of Covid-19 within the framework of the Fraunhofer Society's Anti-Corona Program (project name EpiDeMSE).**

The EpiDeMSE project started in mid-April 2020 and even before the project started, the classical models for the spread of infectious diseases, so-called SIR or SEIR models, were extended by a team of the Fraunhofer ITWM in order to better predict the spread of Covid-19 infection. This model uses time-dependent model parameters, which are estimated from the case numbers collected and compared with additional statistical data. Thus, the effect of actions on the infection rate can be evaluated.

### Temporal and Regional Simulation

The aim of the EpiDeMSE project is to simulate the spread of Covid-19 infection with this extended model in order to support local decision makers (health authorities, hospitals and municipalities) in their decisions. For this purpose, the extended model for the spread of infectious diseases will be implemented in the first project phase. It is important to prepare and simulate statistical data and spread forecasts for those regions for which the local decision makers are responsible. For this reason, the analyses in the EpiDeMSE project will be broken down in terms of time and, above all, locally - from the whole of Germany and the federal states to the individual districts and cities. Furthermore, the extended EpiDeMSE model includes people in different age groups and their interaction, which is usually not taken into account by the classical models.

In addition to the statistical analysis and the prediction of the further epidemic progress, the analysis features of the EpiDeMSE tool will be continuously refined in the following project phases. In addition to the area-resolved analyses, visualizations of the regional age structure and estimates of the number of unreported cases will be added. Thus, EpiDeMSE will not only predict the development of infections and deaths, but also provide decision-makers with a data-based assessment of the minimum and maximum case numbers to be expected. In addition, the EpiDeMSE tool visualizes how changes in

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infection rates affect the local situation in order to better evaluate the influence of actions. Finally, the tool also addresses the development of test strategies so that the planning of lockdown or exit strategies is supported even without statistical knowledge.

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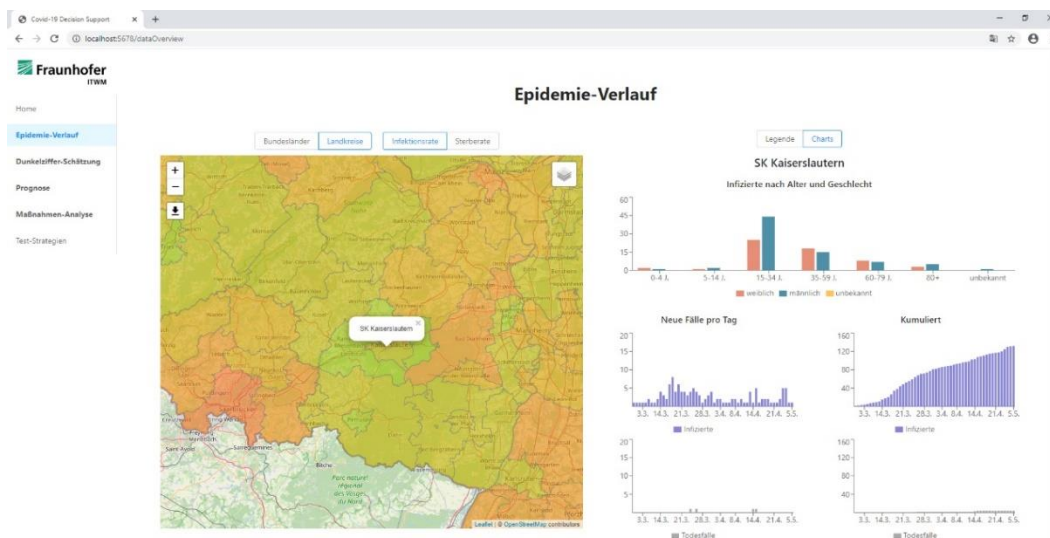
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**Concentrated Expertise From the Fraunhofer ITWM**

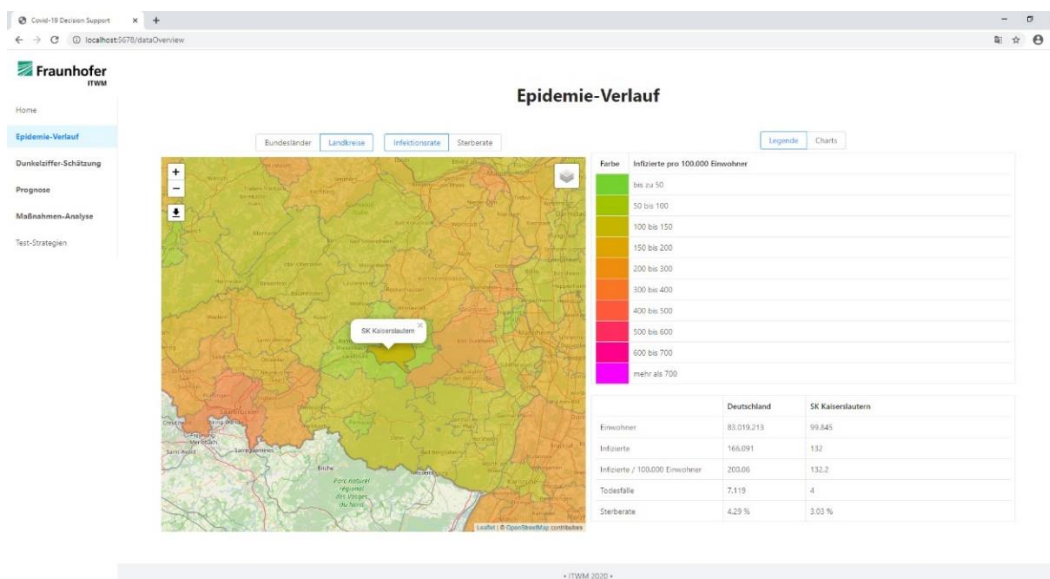
In order to successfully implement the ambitious project plan within the next six months, three departments of the Fraunhofer ITWM will contribute their expertise: The department "Transport Processes" is responsible for the further development and implementation of the systemic disease models. The department "Dynamics, Loads and Environmental Data" develops the statistical analyses and parameter identifications, estimates of the number of unreported cases and the geo-referenced spread prediction. These research activities are integrated together with the planning of test strategies in the decision support tool, which is the responsibility of the department "Optimization - Operations Research".

The project is funded within the framework of the internal programs of the Fraunhofer-Gesellschaft, under the funding number Anti-Corona 088-600034 and will run for six months.

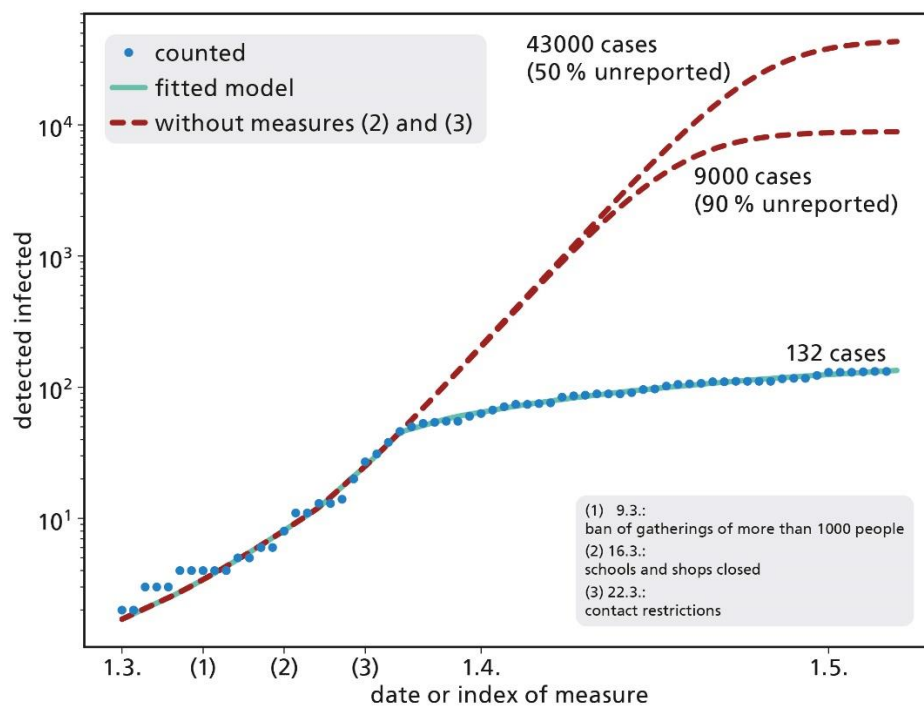
**Pictures**



**Screenshot: Course of the Covid-19 Epidemic at the Kaiserslautern Location Example. Infected Persons by Age and Sex. © Fraunhofer ITWM**



**Course of the Covid-19 Epidemic at the Kaiserslautern Location Example, Explanation of the Legend. © Fraunhofer ITWM**



Effect of Anti-Corona Actions: Estimation for the Location Example Kaiserslautern. ©Fraunhofer ITWM

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**The Fraunhofer Institute for Industrial Mathematics ITWM**

The Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern is one of the largest research institutes for applied mathematics worldwide. We see it as our task to further develop mathematics as a key technology and provide innovative impulses. Our focus is on the implementation of mathematical methods and technology in application projects and their further development in research projects. The close cooperation with partners from industry guarantees the high practical relevance of our work.

Its integral components are consulting, implementation and support in the application of high-performance computer technology and the provision of tailor-made software solutions. Our various competences address a broad spectrum of customers: automotive industry, mechanical engineering, textile industry, energy and finance. These customers also benefit from our excellent networking, for example in the Simulation and Software-based Innovation Service Centre.

**The Fraunhofer-Gesellschaft**

The Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 72 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of more than 26,600, who work with an annual research budget totaling 2.6 billion euros. Of this sum, 2.2 billion euros is generated through contract research. Around 70 percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. International collaborations with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.