DAKI-FWS

Daten- und **KI**-gestütztes **F**rüh**warns**ystem
zur Stabilisierung der deutschen Wirtschaft

Data and AI-supported early warning system
to stabilise the German economy

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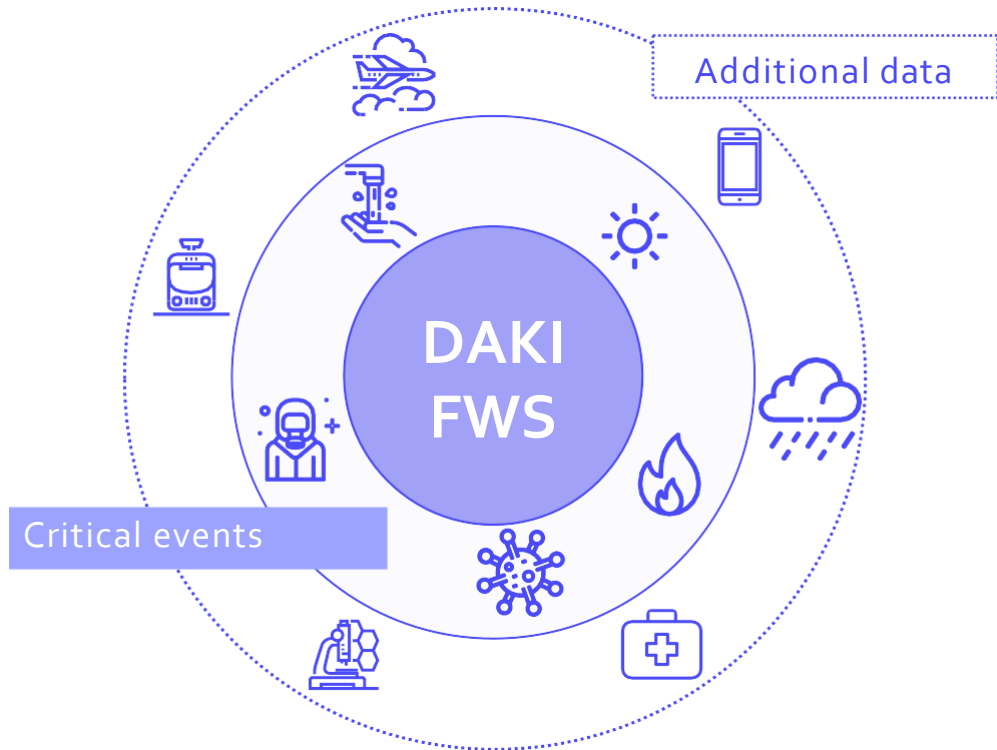
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Data and **AI-supported** early warning system

Establishment and development of a modular early warning system

DAKI FWS

Additional data

Critical events

> **Management tool, prior and during a crisis, for business, politics and society**
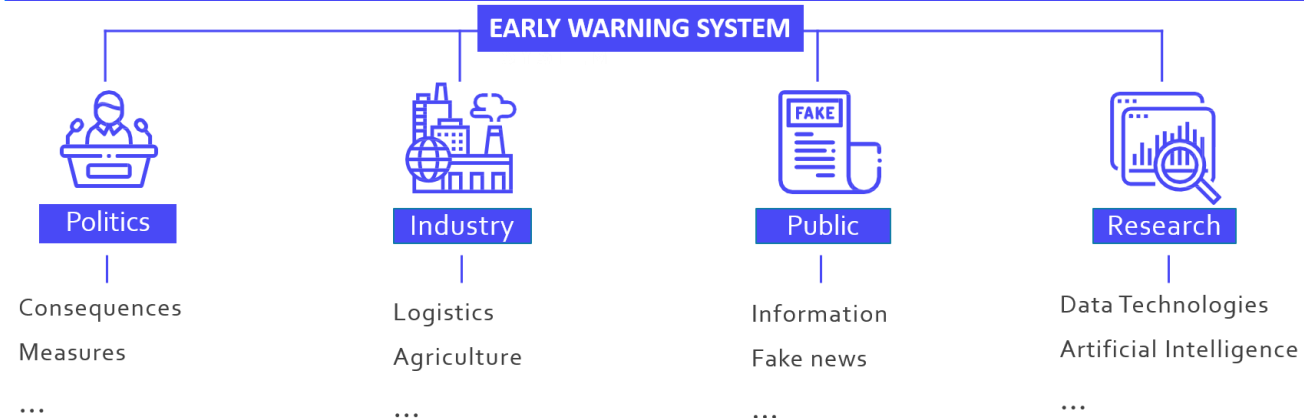
○ DAKI-FWS combines crisis-specific data with data from society to estimate and minimise economic damage

Critical events:
○ Epidemics
○ Weather extremes

Additional data:
○ Mobile phone data
○ Geo data
○ Traffic data
○ ...

EARLY WARNING SYSTEM

Politics	Industry	Public	Research
Consequences	Logistics	Information	Data Technologies
Measures	Agriculture	Fake news	Artificial Intelligence
...	...	...	...

Innovation Potential

> With **artificial intelligence** and new **data "treasures"** to gain data-driven insights

> ## Open modular construction kit
> Broad opportunities for deployment and further development beyond the project duration

> ## Unique data set
> Combination of subject-specific data (e.g. biomolecular structure of a virus) with other sources (e.g. weather data, mobility data, social media, ...)

> ## Complex data and AI methods for data management
> Innovative research is needed to achieve safe, reliable and transparent results.
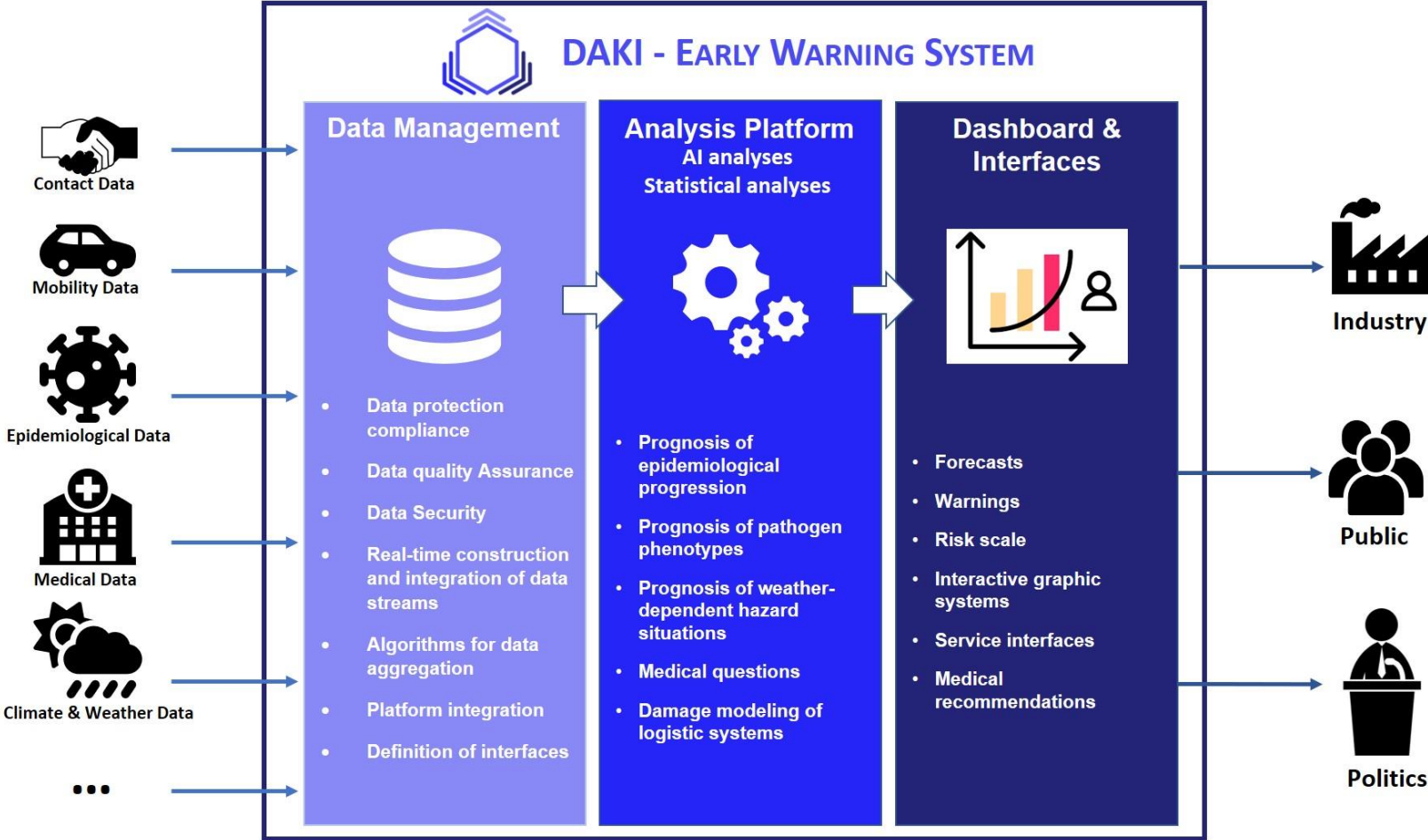
> ## Service interfaces for SMEs
> Involving SMEs and thereby supporting the digitalisation of German SMEs

Market & Application Potential

- DAKI-FWS starts with logistics

- All sectors of the German economy could benefit from this system

- Already many interested partners

- **Logistics sector** is one of the largest economic sectors in Germany - focus on SMEs

- DAKI-FWS and its subsystems also relevant for e.g. **production, transport services, insurance companies, ...**

- With the use of dashboards and various visualisations, subsystems of the EWS can be designed in a **targeted manner for politics and society**

- Other data sources such as air and shipping traffic, social media are desired in the future, which will also open up additional markets (especially for cross-border use).

- DAKI-FWS offers enormous potential for expansion, in particular international export and connection possibilities to other **data systems such as GAIA-X, international data space, ESAF,** etc.

Structure

Data and AI-supported early warning system

DAKI - EARLY WARNING SYSTEM

Contact Data

Mobility Data

Epidemiological Data

Medical Data

Climate & Weather Data

...

Data Management

- Data protection compliance
- Data quality Assurance
- Data Security
- Real-time construction and integration of data streams
- Algorithms for data aggregation
- Platform integration
- Definition of interfaces

Analysis Platform
AI analyses
Statistical analyses

- Prognosis of epidemiological progression
- Prognosis of pathogen phenotypes
- Prognosis of weather-dependent hazard situations
- Medical questions
- Damage modeling of logistic systems

Dashboard & Interfaces

- Forecasts
- Warnings
- Risk scale
- Interactive graphic systems
- Service interfaces
- Medical recommendations

Industry

Public

Politics

Seasonal EWS for weather extremes

An early warning system is a climate change adaptation measure that uses integrated communication systems to help communities prepare for dangerous climate-related events. A successful EWS saves **lives** and **jobs**, **land** and **infrastructure,** and supports long-term **sustainability**. An EWS helps public agencies and administrations plan, saves money in the long run and **protects the economy**.

United Nations

Weather and climate modules

- Adaptation to climate change
- Improving preparedness
- Promoting resilience of economic sectors
- Provide information on the probability of occurrence, intensity and spatial-temporal extent of extreme events.

Seasonal forecasts

Prediction systems

The centres currently providing forecasts to C3S are ECMWF, The Met Office, Météo-France, the German Weather Service (Deutscher Wetterdienst, DWD), the Euro-Mediterranean Center on Climate Change (Centro Euro-Mediterraneo sui Cambiamenti Climatici, CMCC), the US National Weather Service's NCEP (National Centers for Environmental Prediction, NCEP), Japan Meteorological Agency (JMA) and Environment and Climate Change Canada (ECCC).

- ➢ 8 models

- ➢ with 5 up to >50 ensemble members

- ➢ spatial resolution: ~1° x 1°

- ➢ temporal range: 1-7 months
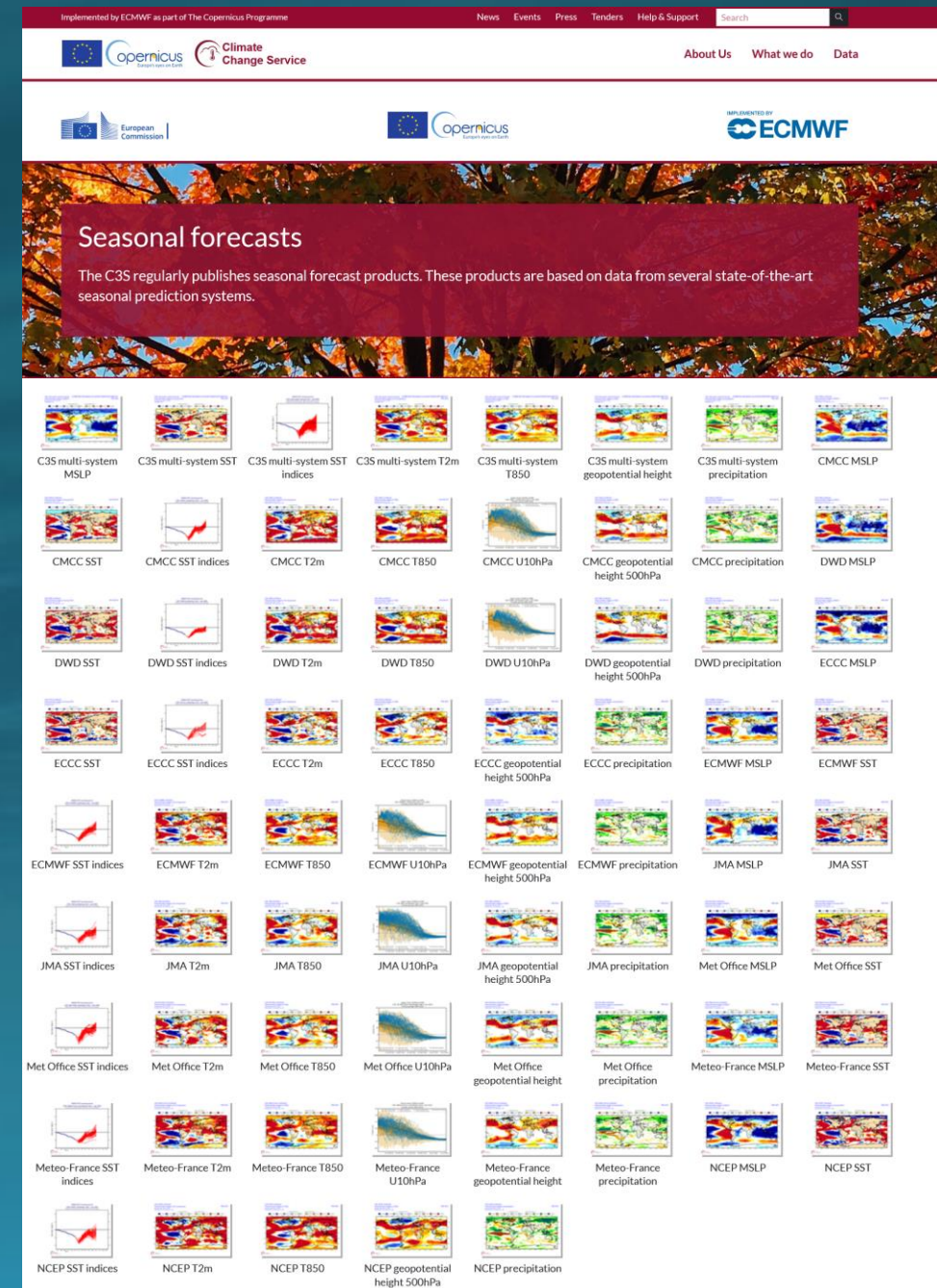
TRY-project, REGNIE/HYRAS, EFAS gridded datasets

- open raster data sets (Climate Data Center (CDC) of the DWD)
- spatial resolution: 1 km x 1 km, 1 arcmin
- temporal resolution: hourly, daily
- temperature, min, max
- wind fields
- precipitation
- radiation
- ...

Krähenmann et al. 2016;
DWD 2017; Rauthe et al. 2013

Weather and climate data, extreme events

- Downscale to ~1 km^2 (for Germany)
- Bias correction, focusing on weather and climate extremes
- Detection of heat waves, windstorms and droughts

➢ Based on hybrid or exclusively AI/ML approaches

LISFLOOD - spatially resolved hydrological model EC-JRC

hydrological rainfall-runoff model for the simulation of the most important hydrological processes occurring in a catchment area

calibration of the open source hydrological runoff model LISFLOOD

LISFLOOD- EFAS v5.0 - 1 arcmin

Meißner et al. 2017

EC-JRC
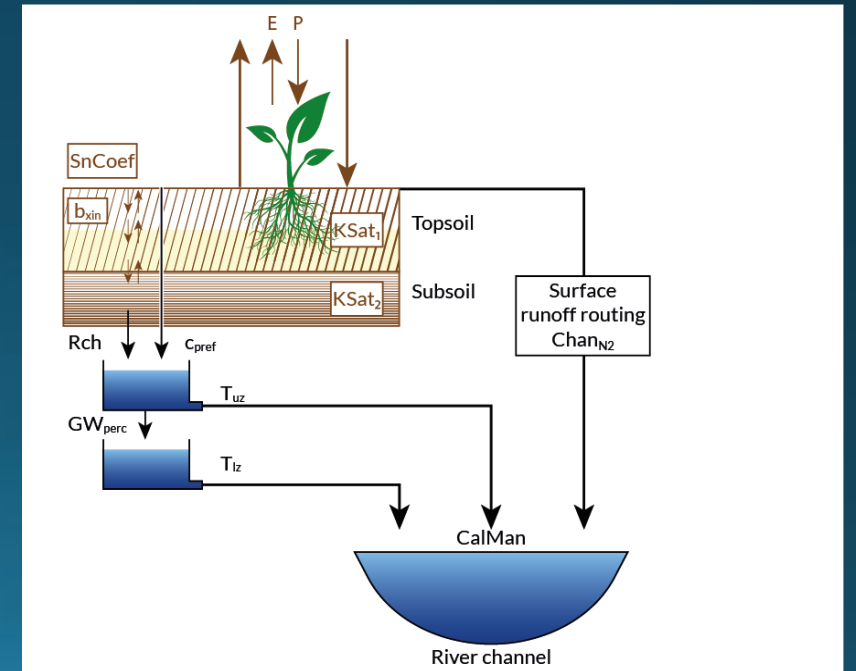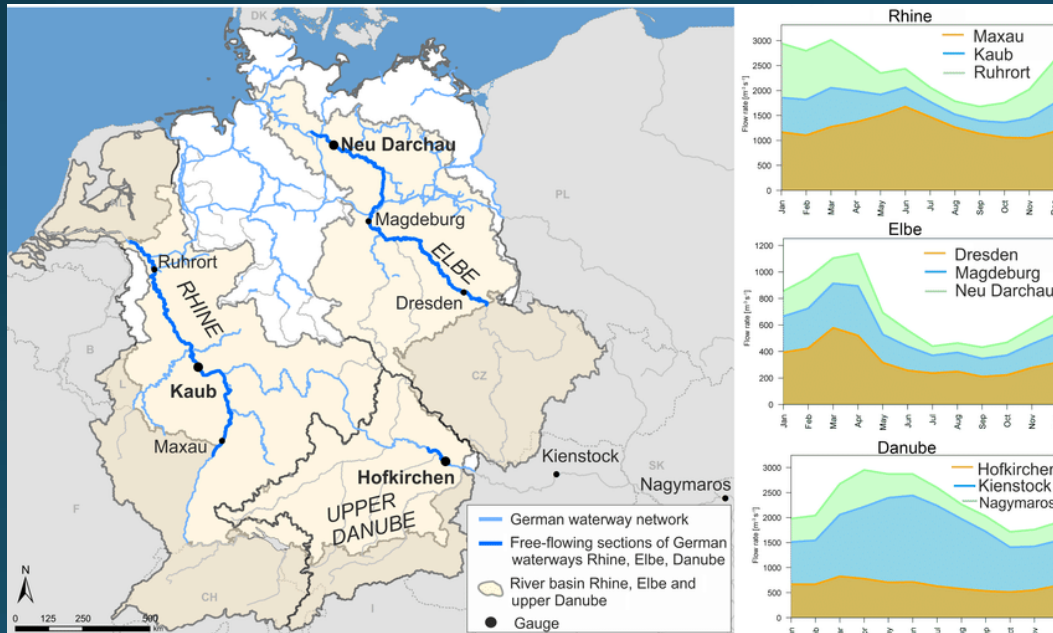
Flooding detection

AI-enhancement of the prediction system and detection of floods
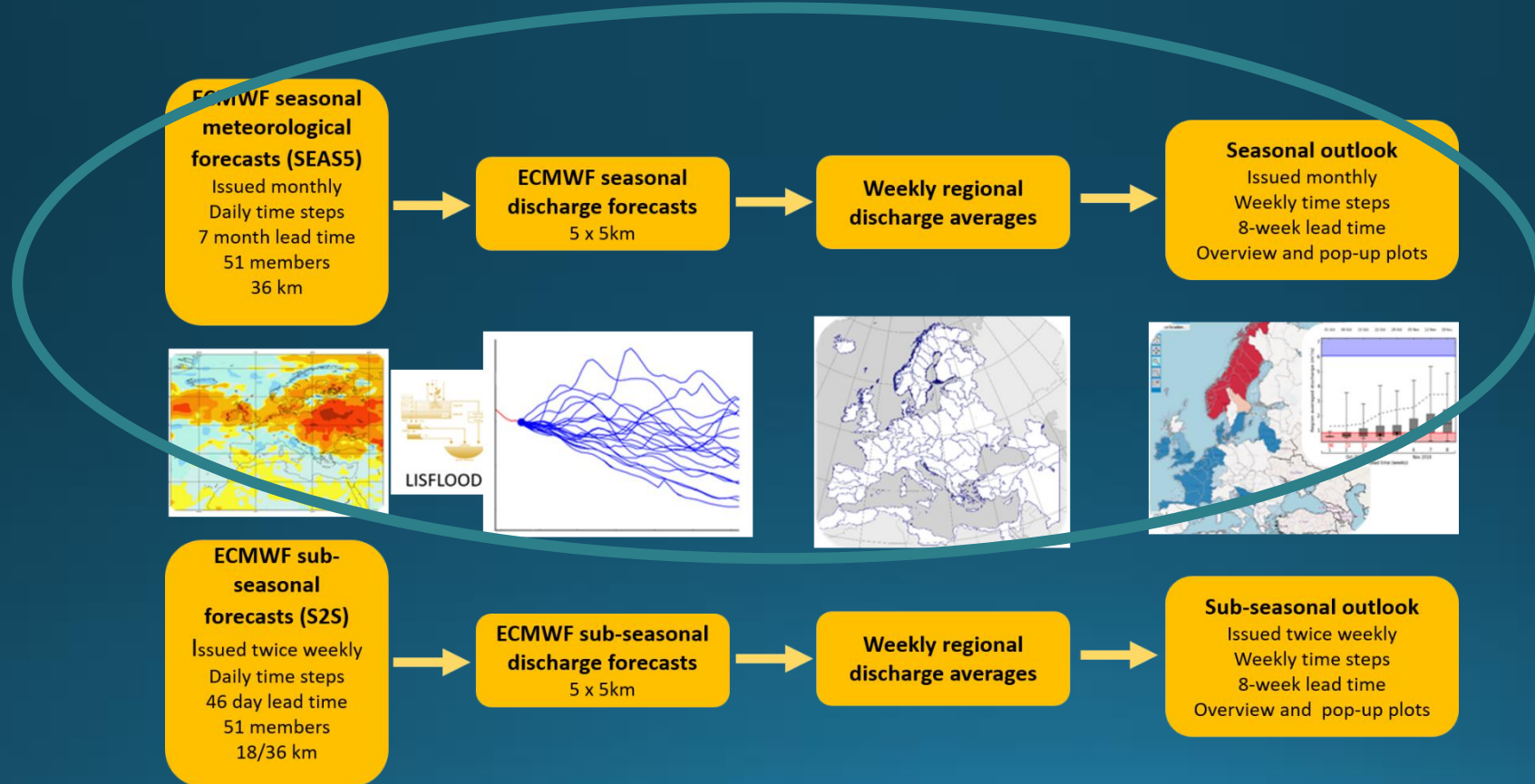
Output

- Open source, high-resolution, probabilistic seasonal forecast hazard maps (heat waves, windstorms, droughts, floods)
  - Analysis of relevant processes and mechanisms of the climate system
  - Warnings release
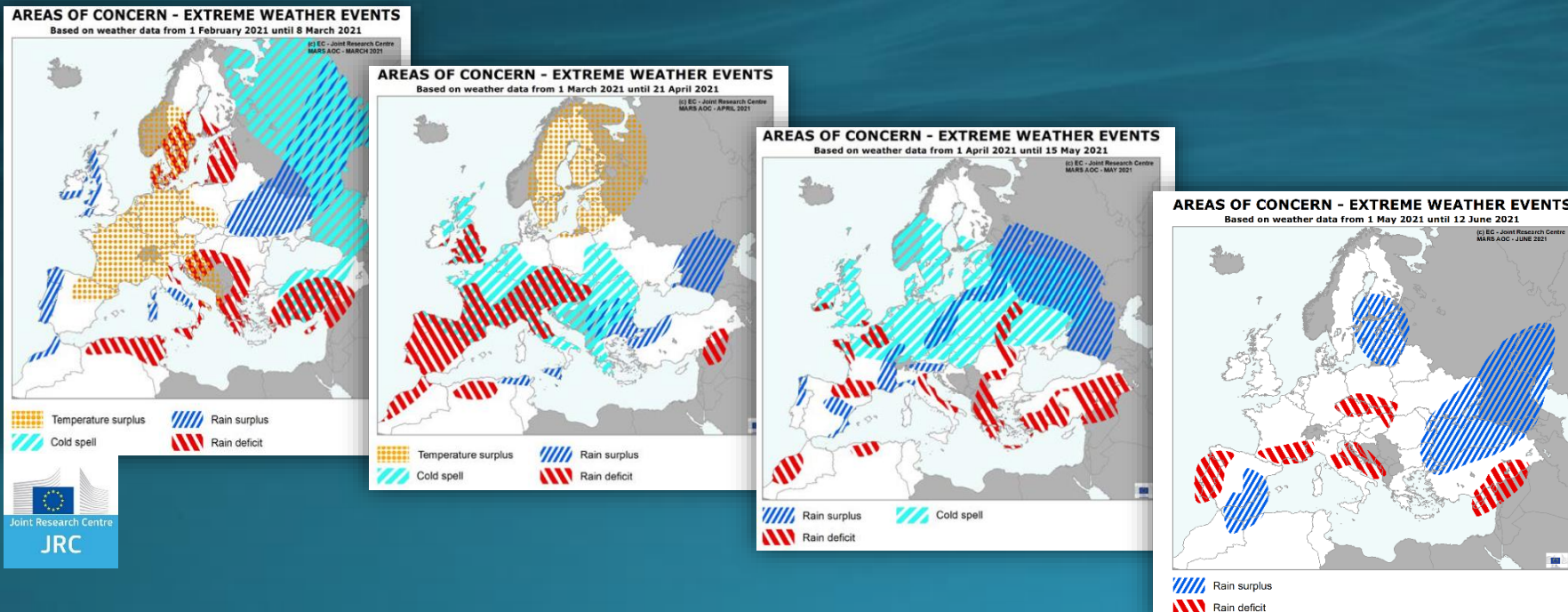
Application & Extension

- Suitability of habitats for vectors of tropical and sub-tropical diseases after floods

- Compound Events and Impacts - Agriculture

- Applicability of the climate module of the Early Warning System over the European area

Challenges

- Data availability and data usage
  - Data sharing, restrictions, ethics
- Gridded, high resolution, high quality meteorological data
- Discharge data covering the cross-border catchments
- Vector data
- Types of warnings
- After the EWS development?

KI für Katastrophen-Frühwarnsysteme

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DAKI-FWS:

Daten- und KI-gestütztes Frühwarnsystem zur Stabilisierung der deutschen Wirtschaft

https://daki-fws.de/

THANK YOU

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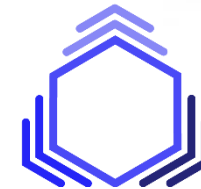Associated partners: | DIHK Deutscher Industrie- und Handelskammertag | DWD Deutscher Wetterdienst Wetter und Klima aus einer Hand | here | MiProbes | SCHOEN BORNER Armaturen GmbH | HLNUG Für eine lebenswerte Zukunft

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