Information products for climate adaptation of inland waterways - from science to service -

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Timeline
selected events and items

Low flow years
(Years with > 30 days below GIW at Kaub)


Research projects
(Climate change, hyd. extremes, IWT)

BMVBS-KLIWAS
BMDV-Network of Experts
CHR-Rheinblick EU-ECCONET EU-IMPREX EU-STARS4WATER

Information Services
(Monitoring, Forecasts, Climate Change)

CCNR Workshops
(Climate change & low flow)

2009 2019 2023
Time scales of forecasts and management/adaptation decisions

<table>
<thead>
<tr>
<th>Past</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Medium Term</td>
<td>Seasonal</td>
</tr>
<tr>
<td>1 Day</td>
<td>1 Week</td>
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<tr>
<td>1 Month</td>
<td>1 Year</td>
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<tr>
<td>10 Years</td>
<td>100 Years</td>
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</tbody>
</table>

- **Daily business, trip and stock planning**
- **Strategic planning, budgeting**

- **Maritime – IWT**
  - optimize load
  - transport management
  - plan transport cycles

- **economic outlook**
  - stock management
  - security energy supply
  - transport capacity planning
  - multi-modal split planning

- **future fleet planning**
  - investment stock facilities
  - alternative transport concepts
  - infrastructural waterway management

**Probabilistic Forecasts**

**Ensemble Projections**

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Jan. 18 2023
What is new since the start of "actNow!"?

1. Innovative forecasting services for IWT (since 2019/2022)

**14-day forecast of river flow and water levels**
- Probabilistic
- Rhine waterway, 7 gauges, hourly to daily resolution
- daily update
- access via [www.ELWIS.de](http://www.ELWIS.de)
- operational and online since July 2022 (precursor: 10-day forecast since 2019)
- for transport planning (load factors)

**6-week forecast of river flow and water levels**
- Probabilistic
- Rhine and Elbe waterways, 3 gauges each, weekly resolution
- bi-weekly update
- access via [www.ELWIS.de](http://www.ELWIS.de)
- operational and online since July 2022
- for logistics planning (stocks, capacity)
Future development options and targets

**Forecasting services**

**Lead times**
- Extending forecast lead-times to seasonal time-scales (up to 6 months)

**Coverage**
- Expanding extended-range forecasting services to further German waterways
- Linking of forecasting services along international waterway corridors

**Technology**
- Applying AI-methods to further improve forecast results
- Developing prognostic information dashboards allowing the user to customize extended-range forecast outputs
What is new since the start of actNow?

2. *Climate services for water(way)management (since 2020)*

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### 100-year projections of river flow, water levels, water temperatures

- part of the core service "climate and water" of the German adaptation strategy (DAS-Basisdienst "Klima und Wasser")
- based on current climate model ensembles (e.g. CORDEX)

- Rhine, Danube, Elbe, Weser, Ems, and coastal waterways, daily resolution
- updates and scenarios according to IPCC cycles and the "German adaptation strategy to climate change" (DAS)
- access via [ws-klimaportal.bafg.de](http://ws-klimaportal.bafg.de)
- operational and online since December 2020

- for strategic planning (transport concepts, infrastructure)
- for the workflow 'WSV-Climateproofing'
What is new since the start of actNow?

3. WSV-Climateproofing (since 2021)

New workflow of the German Waterways and Shipping Administration (WSV)
- to meet current legal requirements
- regarding the consideration of climate change
- in many new planning projects (construction, operation and maintenance)
- supported by the core service "climate and water" of the German adaptation strategy (DAS-Basisdienst "Klima und Wasser")
- accompanied by a user manual, training and a permanent advisory service
- introduced by official order in April 2021

Simple request form
- Sender
- Measure type
- Location

Semi-automated reports within hours/days:
- Brief Background info
- Data basis, model quality
- Predefined measure and location specific indicator set
Future development options and targets

**Climate services**

**Product portfolio**
- New indicators: sediment dynamics, flood plain ecology, water quality
- Weekly bulletin: Climatological evaluation of the hydrological system state
- Linking climate and socio-economic scenarios
- Update of scenarios (IPCC AR 6)

**Coverage**
- Expanding the services to the Odra waterway

**Technology**
- Improvement of the hydrological model system; e.g. additional water management measures, water demands by various sectors
- Improvement of web interface

**Coordination/Dialogue**
- Comparison and integration of scenarios with federal and riparian states
- Comparison and integration of scenarios with other sectors; environment, agriculture
Future development options and targets

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**Integration of different Rhine assessments 2022/2023**

**Matches and mismatches**

<table>
<thead>
<tr>
<th>ARS</th>
<th>CHR-Rhein242050</th>
<th>KMN056</th>
<th>CC-Hydro2013</th>
<th>DAS, KLIWA</th>
<th>KLEWA</th>
<th>EXPLORE2070</th>
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<tbody>
<tr>
<td>_scenario</td>
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<tr>
<td>Scenario 2</td>
<td>AdIF, BEMO</td>
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**Hydrology**
- HBV, HBV-light, HBV-light/PREVAIL, HBV-light/LARSIM, LARSIM, LARSIM, GR5O

**Reference**

**Future 1**
- 2031-2050, 2031-2050, 2031-2050, 2031-2050, 2031-2050, 2031-2050

**Future 2**
- 2071-2100, 2071-2100, 2071-2100, 2071-2100, 2071-2100
Prerequisites for activation of the new services

1. **Applied Research & Development** is crucial to provide up-to-date information products for the waterways.

2. **Operational services** are required to distribute information products reliably to the waterway users permanent staff.

3. **Expansion of operational services** (time scales, waterways, indicators) highly depends on the availability of additional permanent staff and the preparation by powerful R&D programmes.
Questions/Comments?

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