



International Commission for the Hydrology of the Rhine basin (CHR)

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History of CHR

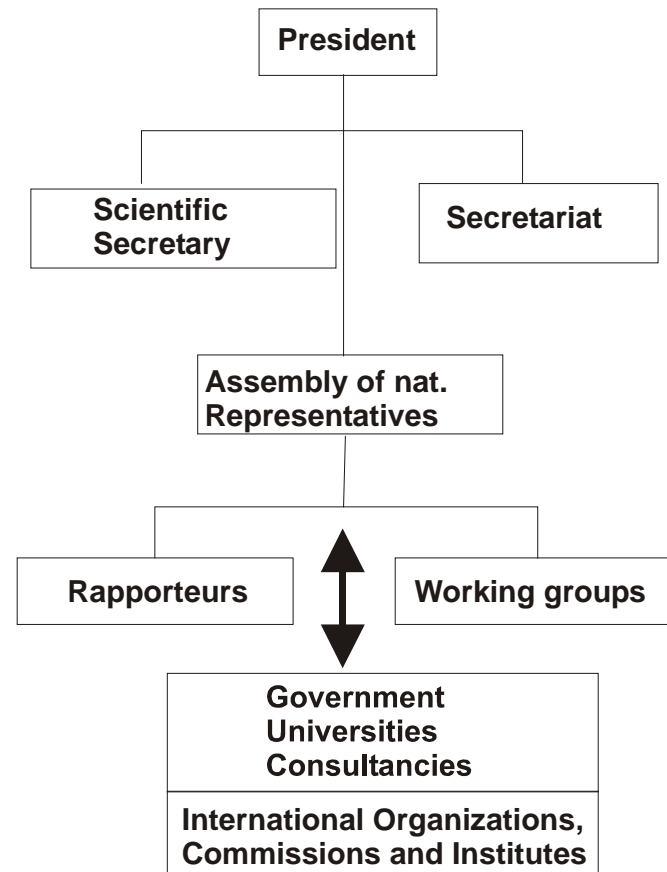
- Founded in 1970 the framework of the International Hydrological Decade of UNESCO
- Co-operation on the basis of an MoU between the Ministries of Foreign Affairs of the member states

Mission and tasks

- Extension of knowledge about the hydrology of the Rhine basin
- Contribution to solving cross-border hydrological problems
- CHR initiates and carries out hydrological studies for sustainable development of the Rhine basin and makes the results of these studies available to responsible authorities in the Rhine riparian states and to the EU.

Organization (1)

- CHR is a permanent, independent, international commission with the entire Rhine basin as study area
- CHR is a foundation, registered in The Netherlands



Organization (2)

- **Co-operating institutes**

- Switzerland
 - Federal Office for the Environment (FOEN), Berne
- Austria
 - Hydrological Bureau, Vienna
 - Hydrological Service of the federal state Vorarlberg, Bregenz
- Germany
 - Federal Institute of Hydrology (BfG), Koblenz
 - German National IHP/HWRP Committee, Koblenz
 - State Institute for Environment and Geology of the federal state Hessen, Wiesbaden
- France
 - IRSTEA, Paris
 - IFSTTAR, Nantes
- Luxembourg
 - National Water Management Service
- Netherlands
 - Rijkswaterstaat, Lelystad
 - Deltares, Delft

Completed projects (1)

- 1978: Monograph of the Rhine basin
 - Description of geography, geology, climatology, hydrological regime, extreme events, hydrological models
 - Book of tables with meteorological and hydrological time series
 - Maps (A2-format)

Completed projects (2)

After 1978: descriptive hydrological studies

- Quantitative precipitation analysis
- Quantitative discharge analysis
- Description of hydrological forecasting models
- **Compilation of a geographical information system for the Rhine basin**
- Probabilities of floods and droughts
- Survey of hydrological distribution functions
- Description of anthropogenic influences in the Rhine basin
- **Effects of climate change on the discharge regime**
- Effects of land use changes on the discharge regime
- Comparison of hydrological models for water balance simulation
- **Several projects concerning the Rhine Alarm Model**
- Description of existing flood warning systems
- Description of methods for the estimation of extreme discharges
- Development of methods for the analysis of effects of flood reduction measures

Rhine Alarm Model

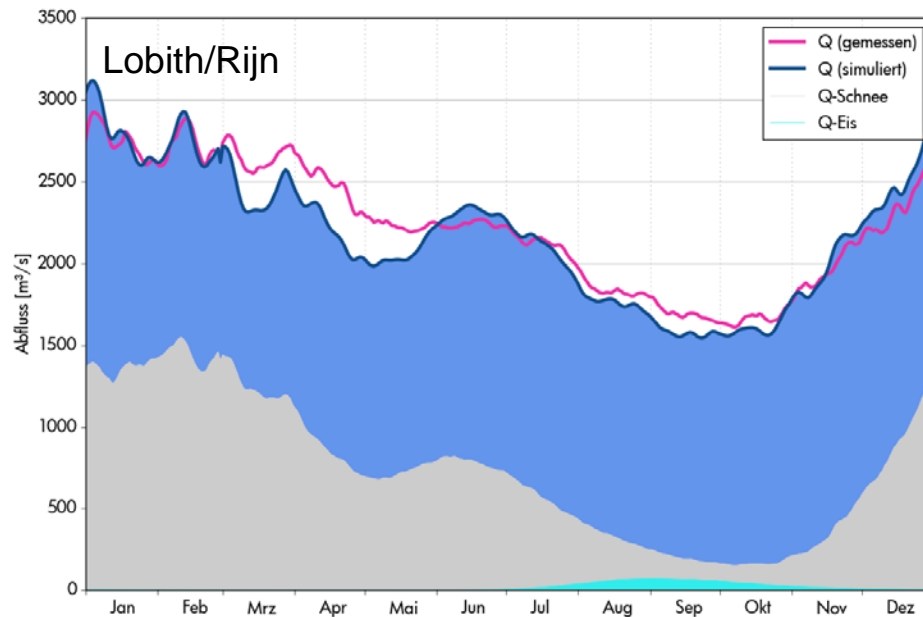
- Example of cooperation with ICPR
- As a result of the fire in the Sandoz chemical factory in 1986
- Assignment of the Minister Conference of the Rhine riparian states to ICPR and CHR to develop a model for the estimation of concentration development and transportation time of accidental spills
- Working group of national institutes and universities
- Present: version 3 of the model operational at all river centers and at several drinking water companies
- Approach also applied for Rivers Meuse and Danube

Current projects

- From the source to the mouth – Compilation of a sediment balance from the source of the Rhine to the mouth in the North Sea. Cooperation project between research institutes in the Rhine basin.
- ASG-Rhine – Influence of snow and glacier melt on the discharge of the River Rhine
- Lake Constance as flood and drought retention basin – a literature study
- Socio-economic impacts on the discharge regime of the Rhine

ASG-Rhine – Impact of snow and glacier melt on the discharge of the Rhine (1)

Discharge regime 1901-2006 [m^3/s]



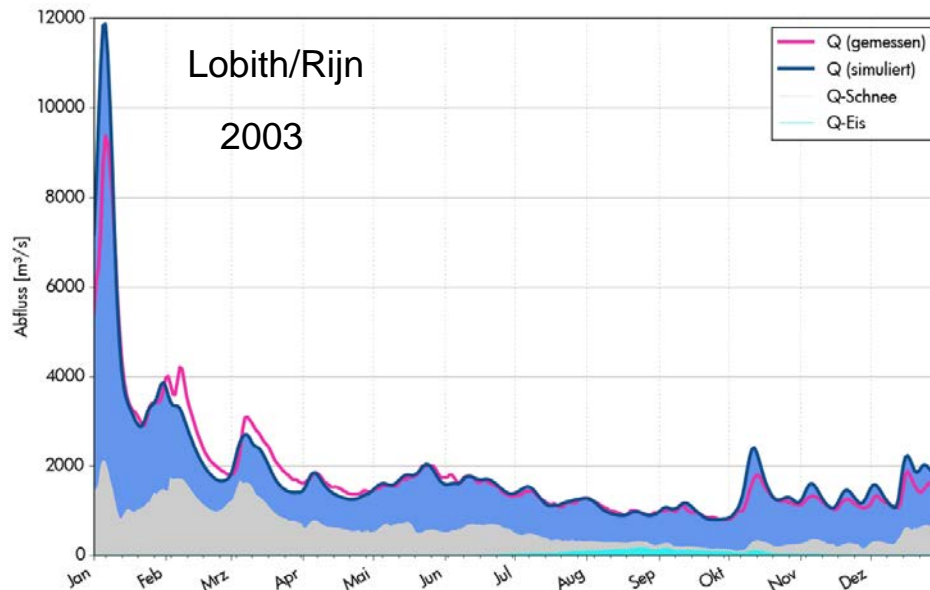
MQ: 2171 m^3/s

Q_{snow} : 31,2 %

Q_{ice} : 1,3 %

ASG-Rhine – Impact of snow and glacier melt on the discharge of the Rhine (2)

Discharge low flow year 2003 [m^3/s]



Q_{snow} : 32,7 %

Q_{ice} : 2,9 %

$Q_{\text{ice August}}$: 13,7 %

$Q_{\text{ice September}}$: 11,3 %

$Q_{\text{ice October}}$: 3,9 %

$Q_{\text{ice daily max}}$: 28 %

Q without ice Lobith

Decrease lowest

discharges with 20%

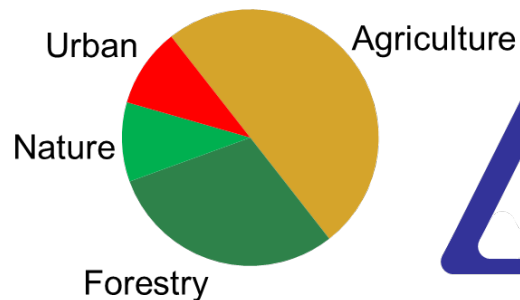
Socio economic developments: Water availability

Socio-economics in hydrology Rhine basin

IV. Impact assessment

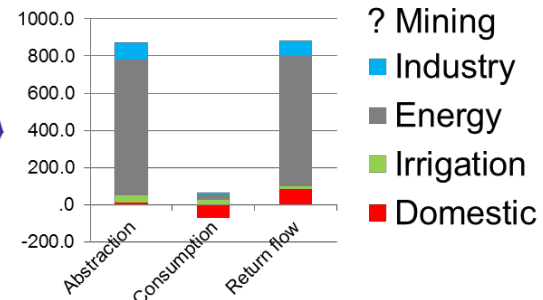
- Navigation
- Hydro power
- Drinking water
- Ecology
- Flushing / Level control

II. Landuse > Evaporation



Erik Ruijgh, 75th CHR-meeting Lyon 26-27 March, 2015

III. Abstraction > Returnflow



I. Climate

- Rainfall – Runoff
- Snowmelt
- Extremes
- Variability
- Baseflow

Socio economic impacts: Ambition

The overarching ambition of the new project includes three main items:

1. to integrate the available national information on present and future water use by various socio-economic sectors and generate an overview up to the level of the Rhine river basin,
2. to compare the possible effects of socio-economic changes on the discharge of the Rhine with the effects of climate changes as studied in Rheinblick 2050 and ASG, and
3. to elaborate concepts for impact assessment and feedback mechanisms between hydrology and socio-economic developments.

Future projects within CHR

- ASG Rhine Phase 2: Contribution of snow and glacier melt to the discharge of the Rhine based on climate change scenarios for 2050 and 2100
- Compilation of a common hydrological database
- Continuation of investigations into the impact of climate change on the discharge of the Rhine:
Based on new climate scenarios that become available in different countries, investigations must be carried out, whether these scenarios provide a better understanding of the effects on future discharges of the Rhine. These investigations should concentrate in floods, low flows, water temperature and morphology.

CHR as organizer of scientific events

- 2003: Workshop on climate change and the effects on hydrology and water management in the Rhine basin
- 2005: Workshop estimation of extreme discharges
- 2006: Workshop ensemble predictions and uncertainty in flood forecasting
- 2007: Workshop morphology
- 2007: Workshop low flows and droughts
- 2008: Workshop erosion, transport and deposition of sediment
- 2010: Workshop advances in flood forecasting and the implications for risk management
- 2010: RheinBlick 2050 Final Colloquium
- 2011: Workshop inter-comparison of flood forecasting models
- 2014: Seminar socio-economic influences on the discharge of the Rhine
- 2015: 'From the source to the mouth – a sediment balance of the Rhine' Final Colloquium
- 2016: Symposium human observations of singular hydrological events
- 2017: Seminar on low flows and droughts (preferably organized in cooperation with ICPR and CCR)

**Thank you for your
attention.....**

**More information on
www.chr-khr.org**