The Rhine: From Europe's sewer to a clean and healthy river

IKSR
CIPR
ICBR

Internationale Kommission zum Schutz des Rheins

Commission Internationale pour la Protection du Rhin

Internationale Commissie ter Bescherming van de Rijn

International Commission for the Protection of the Rhine

Dr. Laura Gangi
International Commission for the Protection of the Rhine (ICPR)

Cauca River Restoration Forum August 24-25, 2017 Cali, Colombia

Outline

- The Rhine basin
- Pollution prevention and control in early days
- Pollution prevention and control after Sandoz 1986
- Water quality and ecosystem improvement
- Flood management
- Success factors for river restoration
- International Commission for the Protection of the Rhine (ICPR)
- Future challenges
- Conclusion

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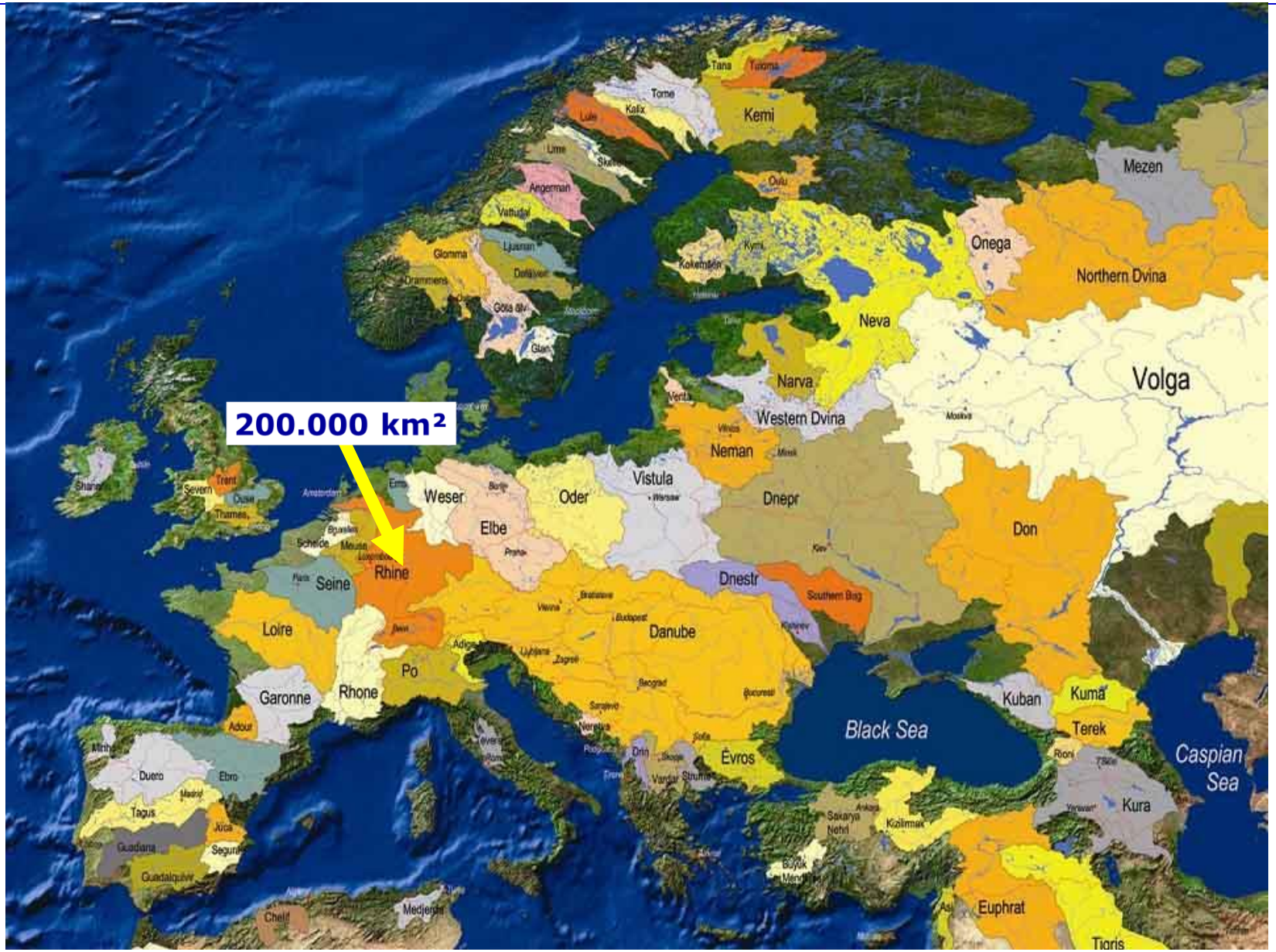
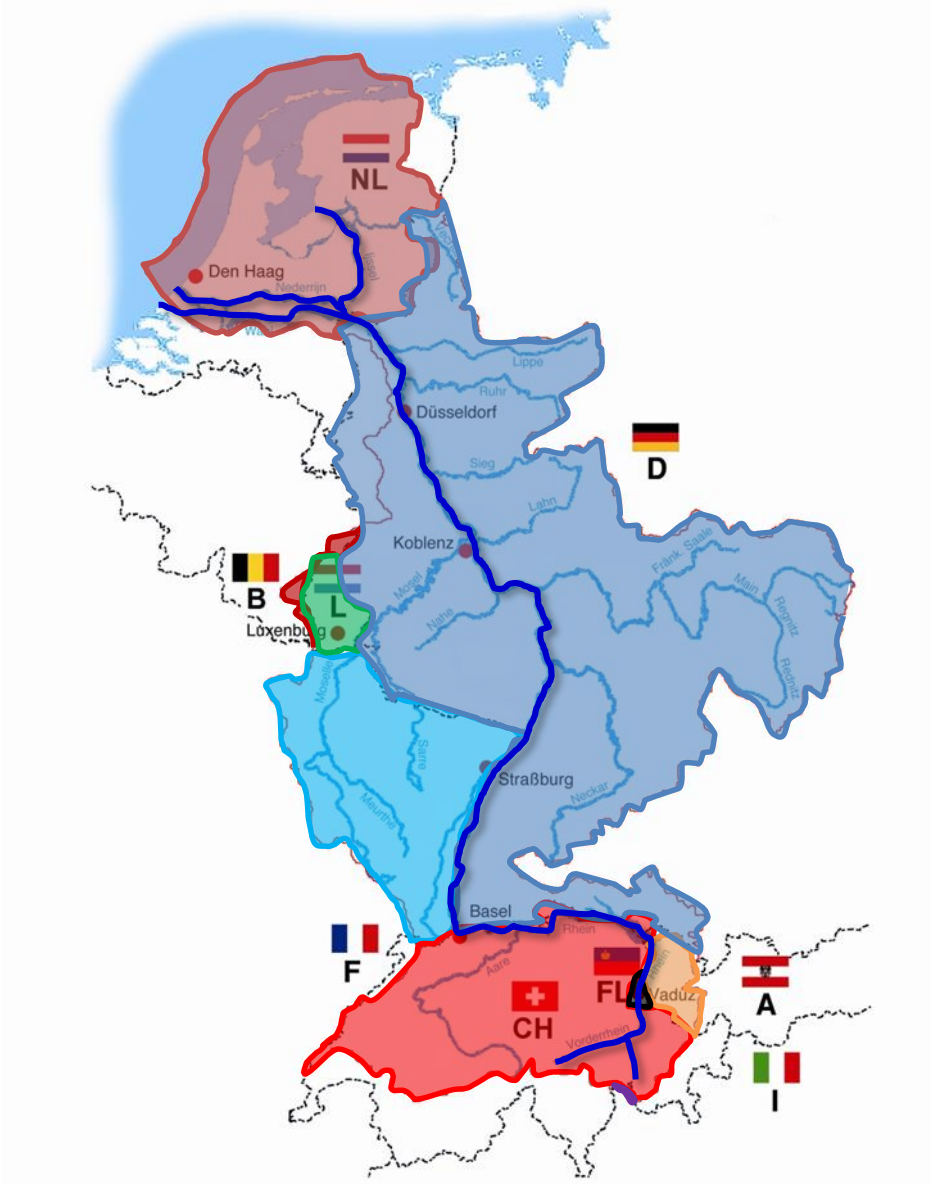
River Rhine: a European river



The Rhine and its catchment



The Netherlands
Germany
France
Luxembourg
Belgium/Wallonia
Switzerland
Austria
Liechtenstein
Italy

Some impressions

Hinterrhein

Some impressions

Alpine Rhine / Lake Constance

Some impressions

Rhine falls of Schaffhausen (CH)

Some impressions

High Rhine

Some impressions

Upper Rhine

Some impressions

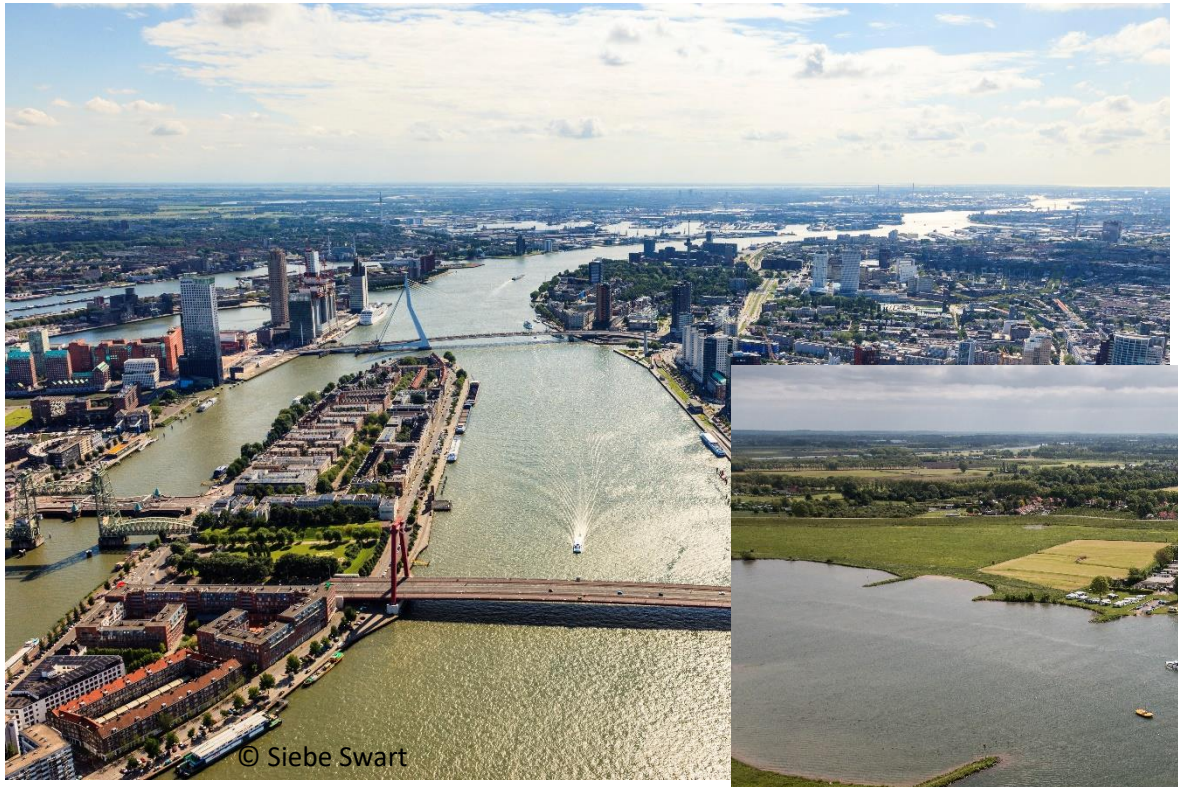
Middle Rhine

Some impressions

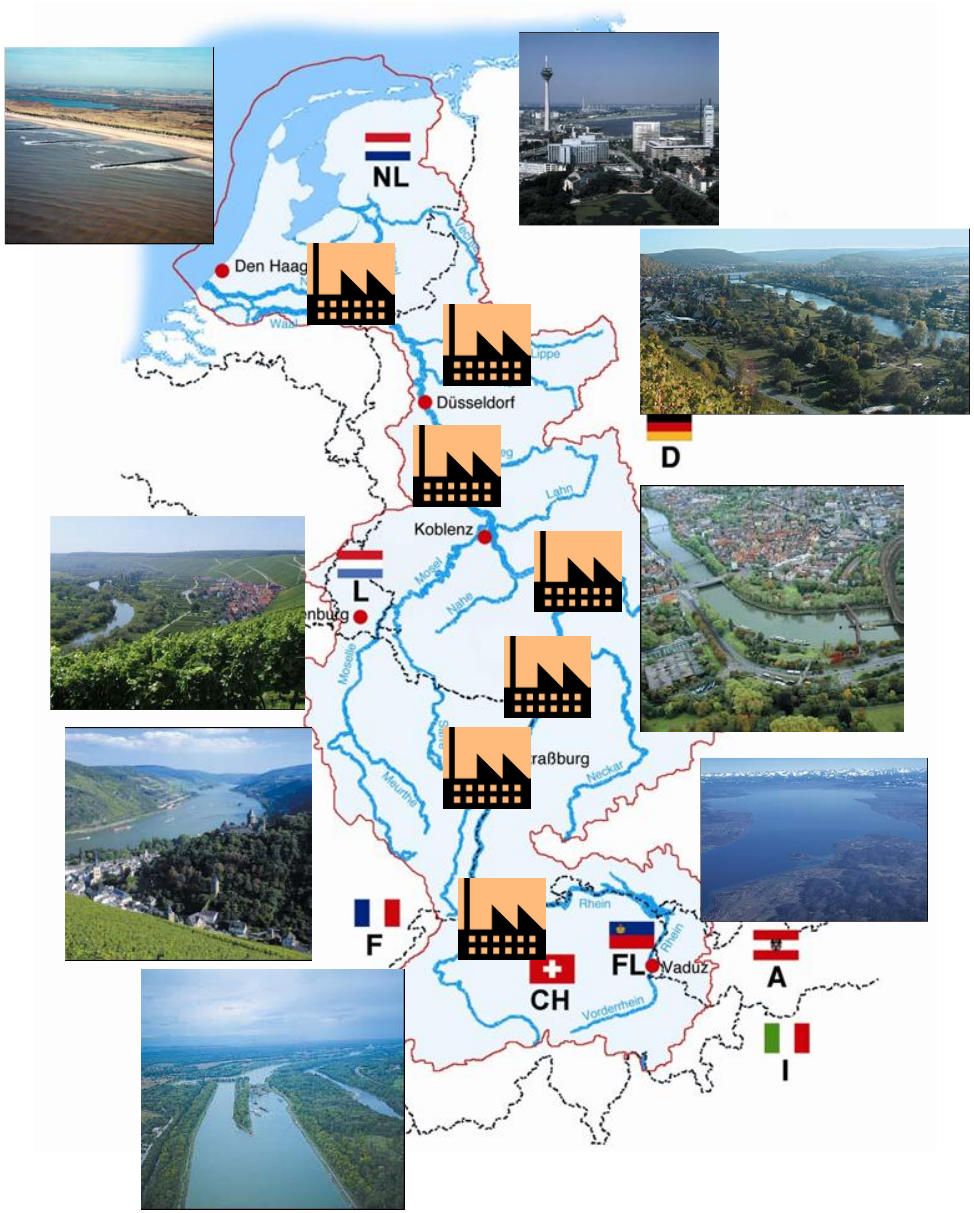
Lower Rhine

Some impressions

Delta Rhine



Rhine basin facts



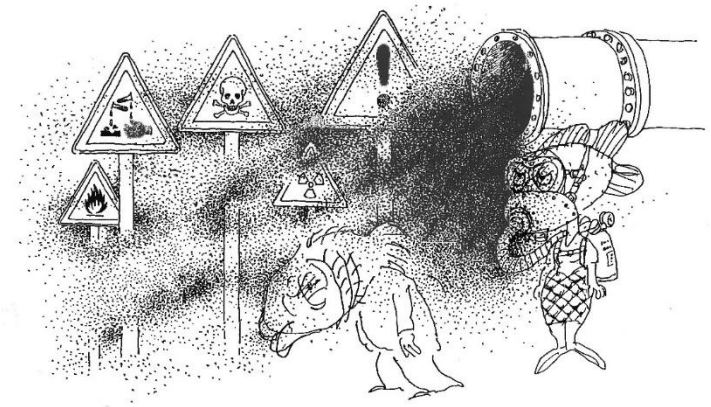
Main stream
Length: 1233 km

60 million inhabitants in 9 countries

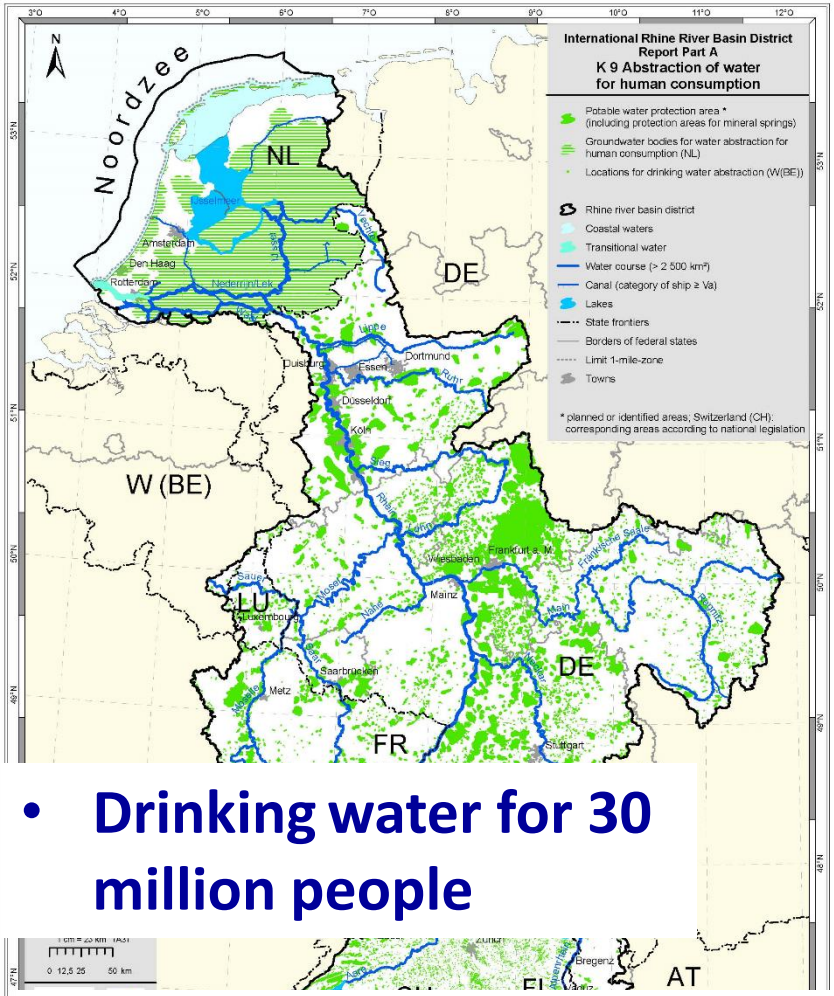
Drinking water supply for 30 million people

Europe's most important navigation route (825 km)

RIVER RHINE – 1970's SEWER OF EUROPE



RIVER RHINE - Today



- Drinking water for 30 million people

- Sensitive species are back

→ What happened in the meantime? How was restoration of water quality achieved?

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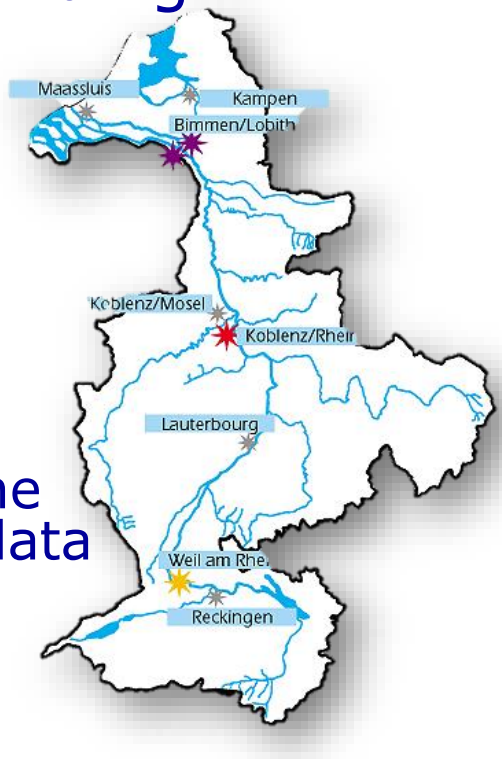
Pollution prevention and control in early days

- Start of informal common work of the ICPR in 1950
- Trust building among the countries
- Enhance mutual transboundary understanding
- End of 1950's: Chemical monitoring network for the main river
  - Monitoring stations e.g. at the CH-DE or DE-NL border
  - Measurement of some physico-chemical parameters, nutrients, heavy metals
  - First coordinated monitoring activities of the countries, first publications of monitoring data



→ No measures to reduce discharges/ Focus on <u>monitoring</u>

Pollution prevention and control in early days

- 1963 Convention of the International Commission for the protection of the Rhine against pollution
- Starting construction of urban wastewater treatment plants
- Awareness raising of the public concerning the danger of increasing water pollution
- Special ICPR Conventions on chemical pollution (not in force any longer) and on chlorides

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The wake-up call 1986: Fire at Sandoz, Basel (CH)

- 10-30 tons of highly toxic pesticides flowed into the river
- Death of all aquatic life for over 400 km downstream
- Stop of drinking water production

Pollution prevention and control: Action following Sandoz accident in 1986

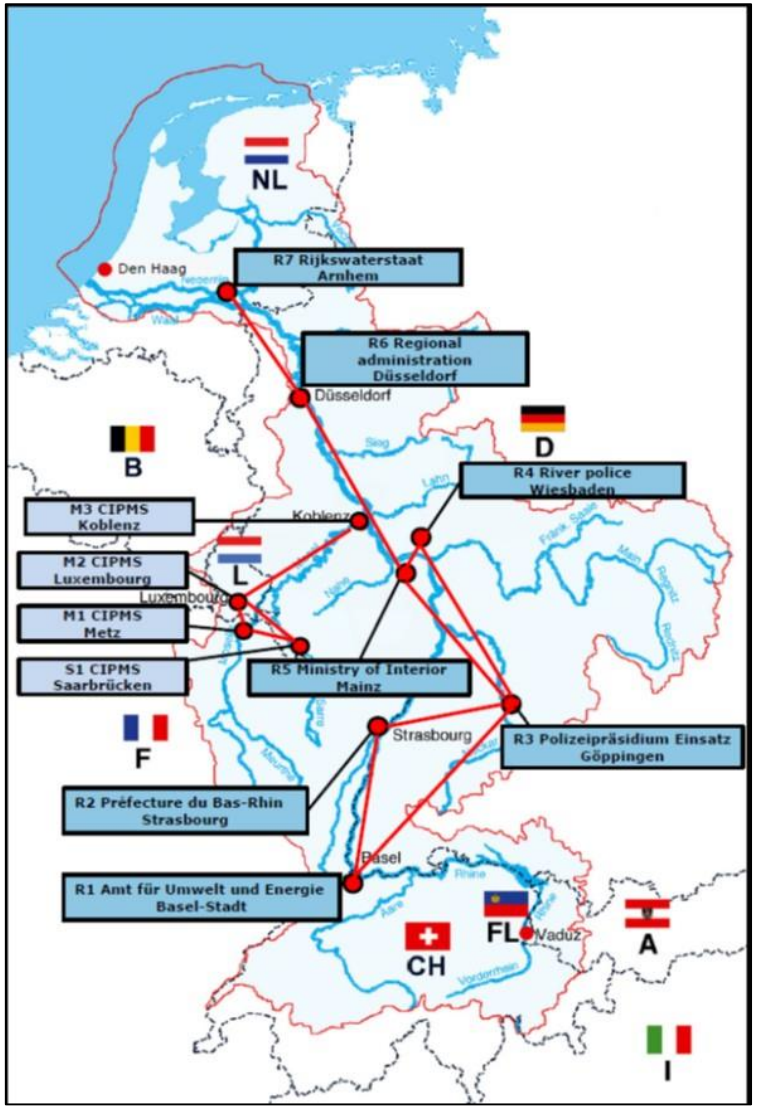
First Rhine Action Programme (after Sandoz: 1987-2000)

- Improved Monitoring network (CH -> NL)
- Reduction of discharges of toxic substances by 50 % - 70 % (1985 - 1995) (by constructing and improving wastewater treatment plants in municipalities and in industries or change of production procedures)
- ICPR developed "target values" for specific dangerous substances taking into account drinking water protection
- Improve warning and alert systems
- Improve ecosystem: Salmon as symbol for a healthy river

European Provisions, e.g.

- European Urban Wastewater Directive (91/271/EEC)
- European Nitrates Directive (91/676/EEC)
- Not valid for Switzerland (cooperation in the basin on the basis of national regulations)

Warning and alert plan Rhine (WAP)



SOS-Rhein–SOS–Rhin–SOS–Rijn–SOS
eilt sehr - très urgent – zeer spoedeisend

Meldende Stelle – Service de déclaration – Meldende instantie

IHWZ/CPIA/IHWS:

Telefon – téléphone – telefoon: FAX:

☐ **Warnung** - **Avertissement** - **Waarschuwing**

☐ **Information** - **Information** - **Informatie**

☐ **Suchmeldung** - **Avis de recherche** - **Zoekactie**

☐ **Entwarnung - Levée d'avertissement - Einde van de waarschuwing**

☐ **Ende Suchmeldung - Fin de la recherche - Einde van de zoekactie**

	Erstmeldung Premier avis Eerste melding ☐	Folgemeldung Avis consécutif Vervolgmelding ☐
Datum/Date/Datum		**Anlagen/Annexes/Bijlagen:**
Meldende Person **Agent responsable du message** **Meldende persoon**		
Betreff/Objet/Betreft		
Bezug/Bearbeitungsnummer Référence/Numéro de dossier Referentie/Verwerkings-nummer		Anzahl Seiten (inkl. Deckblatt) Nombre des pages (avec page de garde) Aantal bladzijden (incl. voorblad)

Bitte sofort aushändigen !
A transmettre immédiatement !
Direct in handen !

INTERNATIONALES WARN- UND ALARMSYSTEM „RHEIN"
SYSTEME INTERNATIONAL D'AVERTISSEMENT ET D´ALERTE « RHIN »
INTERNATIONAAL WAARSCHUWINGS- EN ALARMSYSTEEM "RIJN"

Pollution prevention and control: Action following Sandoz accident in 1986

Updated Rhine convention 1999

- Pollution prevention and control is still an issue, but not the only one
- Sustainable development of the Rhine ecosystem by integrated water management - surface water and groundwater quality and quantity issues
- Integration of floods and droughts
- Strong participation of stakeholders (NGOs)
- Precautionary principle
- "Polluter pays" principle
- "No deterioration" principle

Pollution prevention and control: Action following Sandoz accident in 1986

Second ICPR Action Programme - Rhine 2020

- started 2000
- underpinned by European Union Water Framework Directive (2000)

Goals

- Further reduction of emissions/discharges
- Water quality is required to be such that simple near-nature treatment is sufficient for the production of drinking water
- Restoration of biotope network and ecological continuity

(New programme „Rhine 2040“ in preparation)

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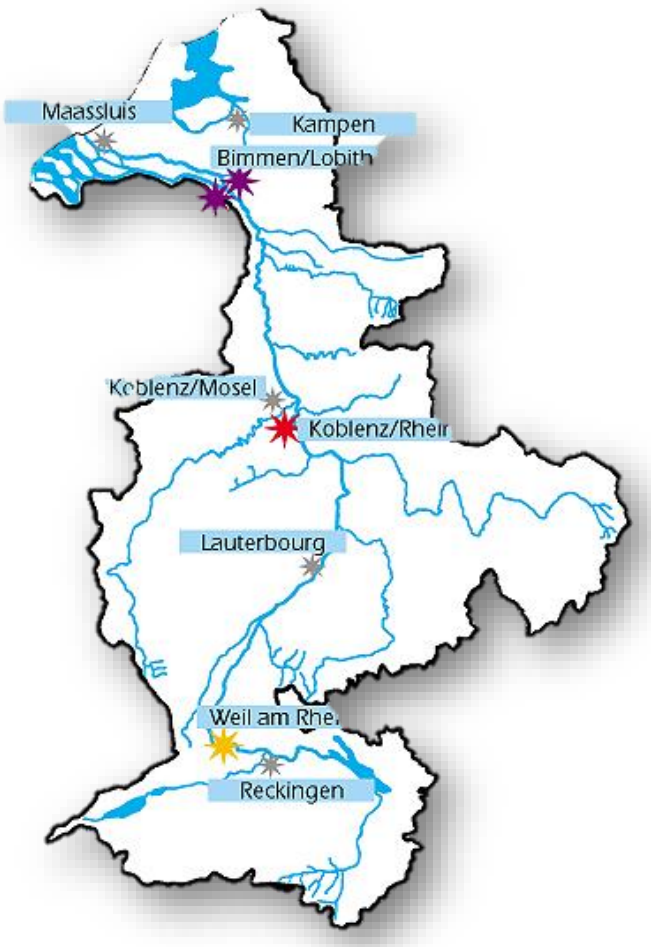
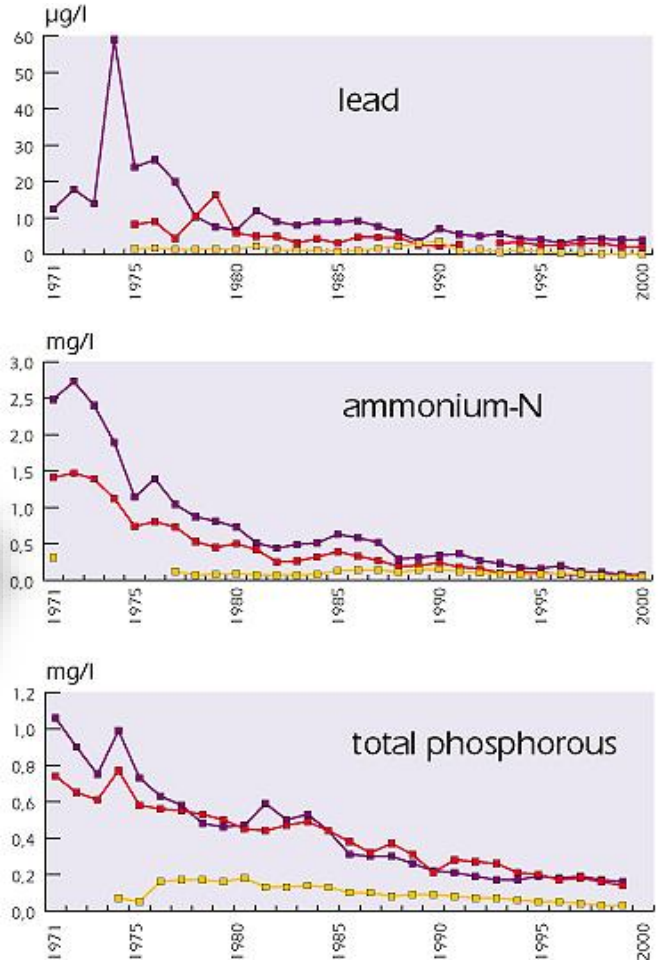
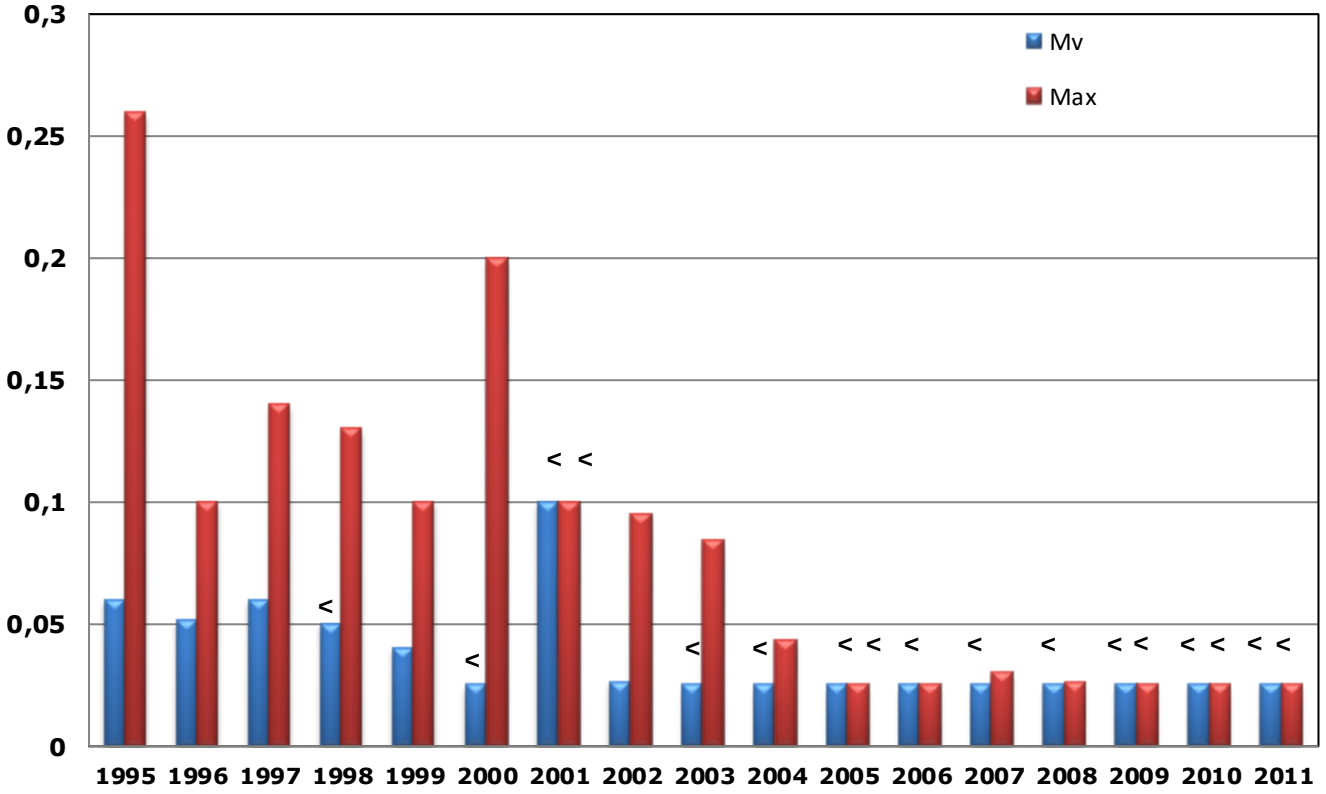
Improvements in water quality





Improvements in water quality: Atrazine

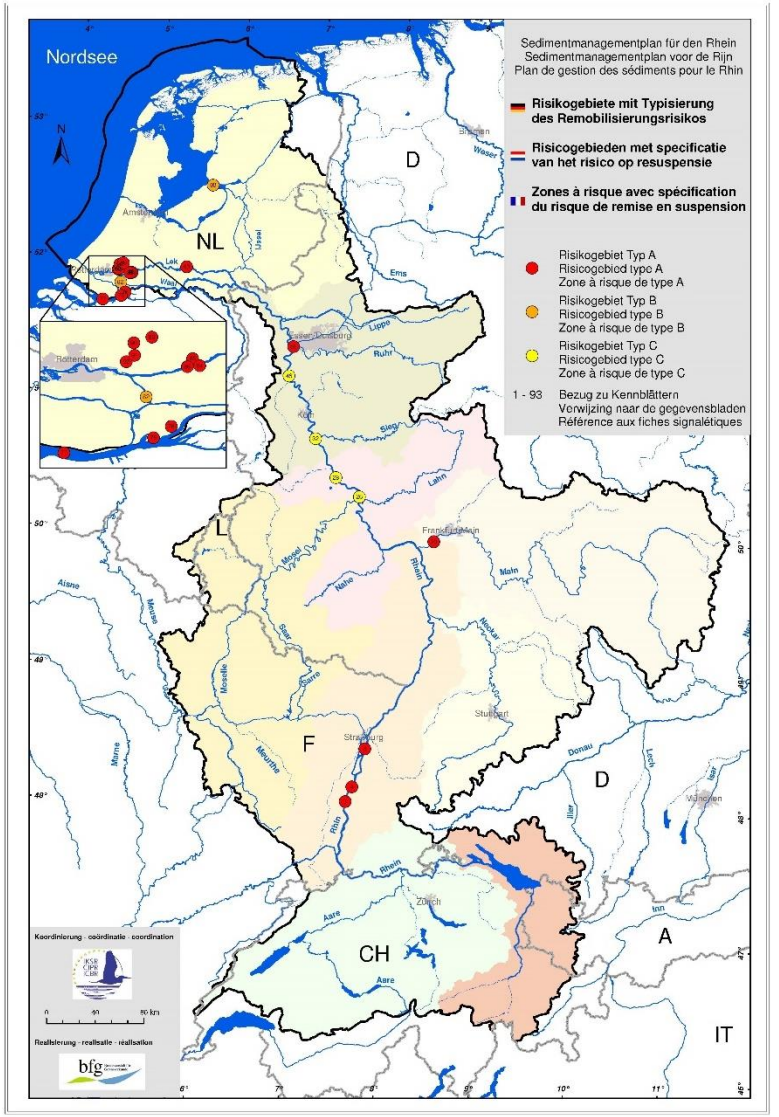
Atrazine annual mean and maximum concentrations (microgram/l) at Lower Rhine 1995-2011



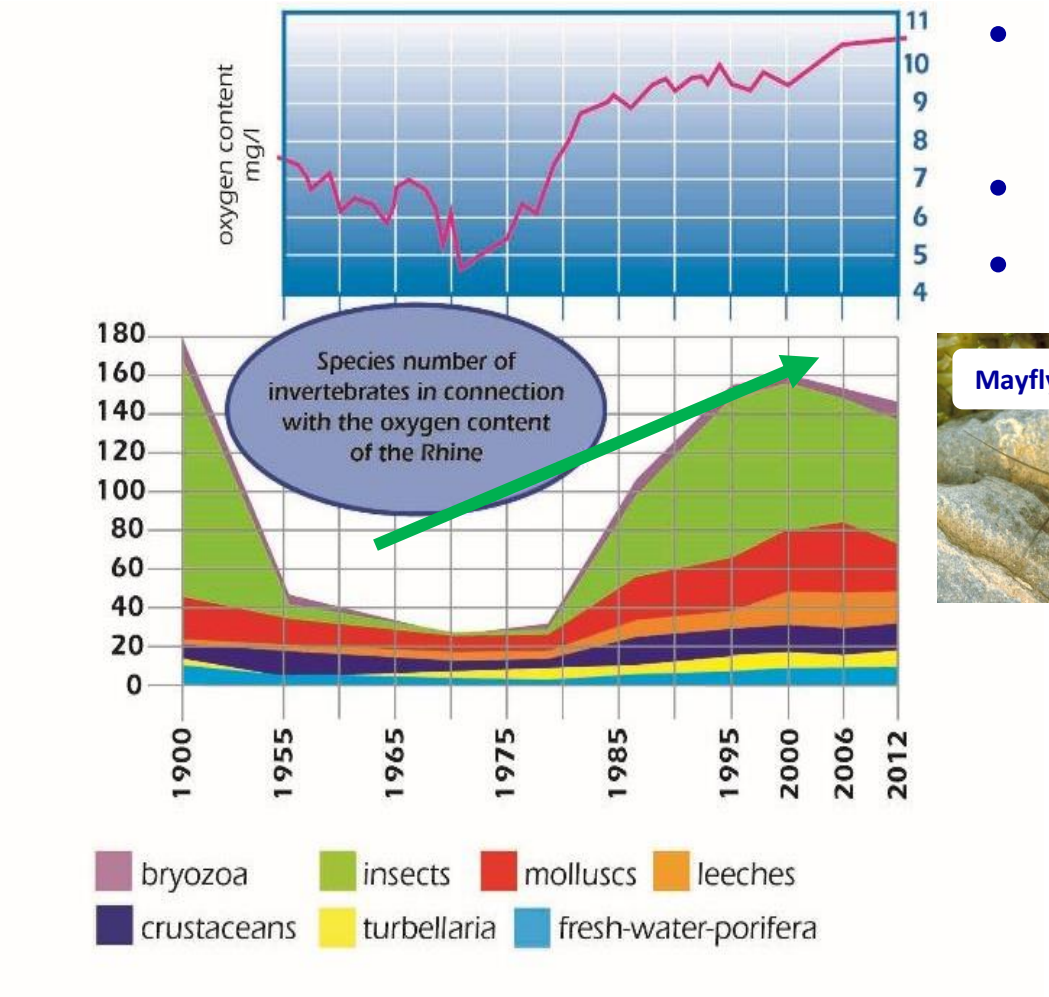
→ Reduction resulting from an EU prohibition in 2004, in Germany since 1991

Improvements in water quality

- Input of priority substances from point sources have been distinctly reduced
- Oxygen content increased
- Remediation of contaminated sediments (PCB, HCB)



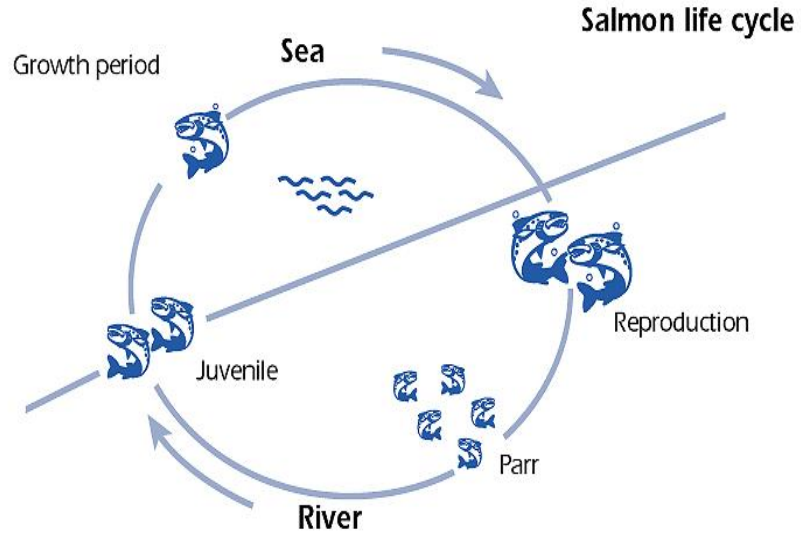
Better water quality = more diversity



Long-term trends

- Increased diversity of invertebrates
- 44 macrophyte species
- 64 fish species

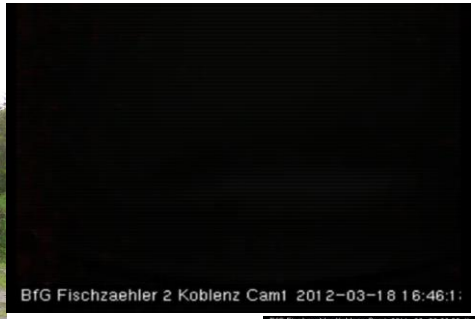
Reintroducing an extinct species in the Rhine: An ambitious goal since 1987

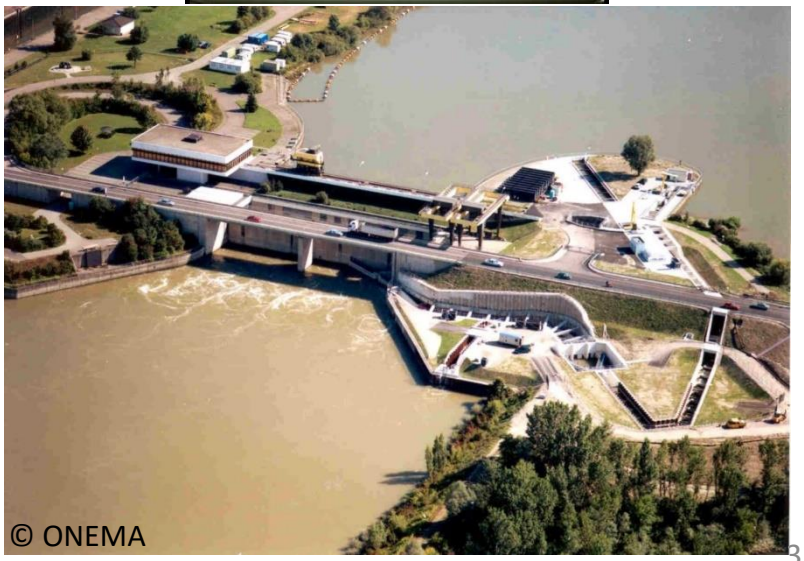


- **Reintroduction of an extinct and historically important species**
- **Symbol for clean water, natural river beds and habitat connectivity**

- **Program Rhine 2000 / Salmon 2000**
- **Program Rhine 2020 / Salmon 2020**
- **Masterplan Migratory Fish Rhine (2009)**

Salmon reintroduction: River continuity

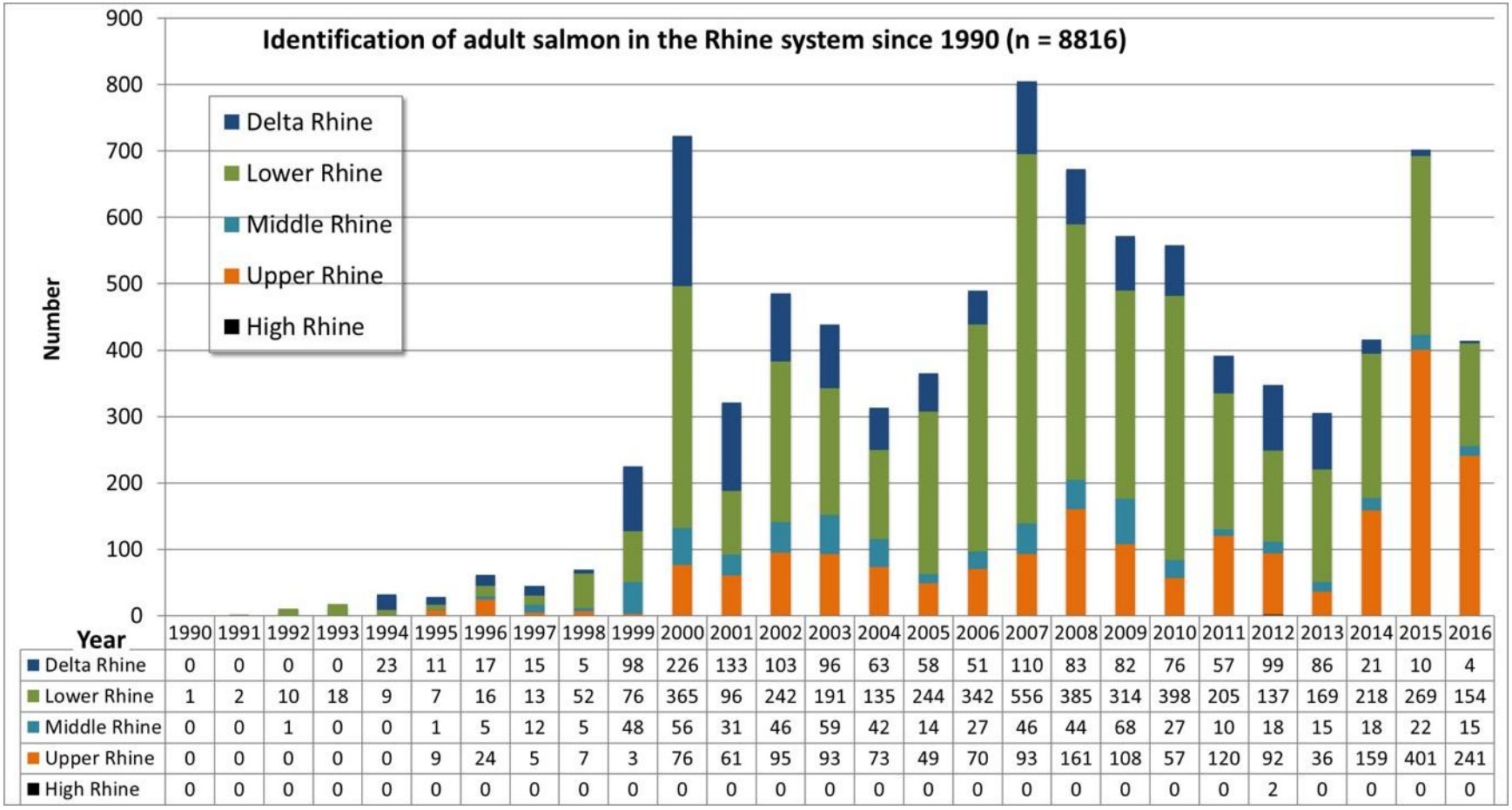




© ONEMA

Salmon is back in the Rhine!

- Since 1990 almost 9000 salmon have been identified in the Rhine system!
- Salmon as symbol … but other migratory fish (allis shad, houting) are on the rise as well



Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Delta Rhine	0	0	0	0	23	11	17	15	5	98	226	133	103	96	63	58	51	110	83	82	76	57	99	86	21	10	4
Lower Rhine	1	2	10	18	9	7	16	13	52	76	365	96	242	191	135	244	342	556	385	314	398	205	137	169	218	269	154
Middle Rhine	0	0	1	0	0	1	5	12	5	48	56	31	46	59	42	14	27	46	44	68	27	10	18	15	18	22	15
Upper Rhine	0	0	0	0	0	9	24	5	7	3	76	61	95	93	73	49	70	93	161	108	57	120	92	36	159	401	241
High Rhine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0

Salmon Reintroduction: Success factors

- **Water: clean enough**
- **Restoration of habitats is ongoing, has to be intensified**
- **Restoration of river continuity**
- **Restocking with small salmons (with support of volunteers)**

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Transboundary flood management: Why?

December **1993**

- Cities flooded: Germany, The Netherlands

Jan./Feb. **1995**

- Cities flooded: Germany,

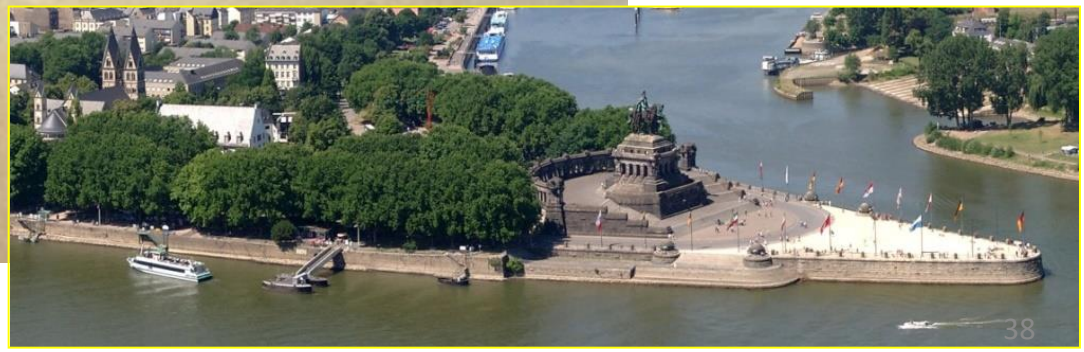
The Netherlands,

two hundred thousand people had to be evacuated

Cologne 1993/1995

Transboundary flood management: Why?

Koblenz – Deutsches Eck - Situation 1993/1995



Action Plan on Floods: Targets

ICPR-Action Plan on Floods launched in 1998

1. **Reduce damage risks**
   2005: 10%, 2020: 25%

2. **Reduce flood levels**
   2005: by 30 cm, 2020: by 70 cm

3. **Increase awareness of floods**
   risk maps & internet

4. **Improvement of flood forecasting**
   2020: increasing time span by 100%

Action Plan on Floods: Why?

Costs of the Action Plan:
12,3 billion €

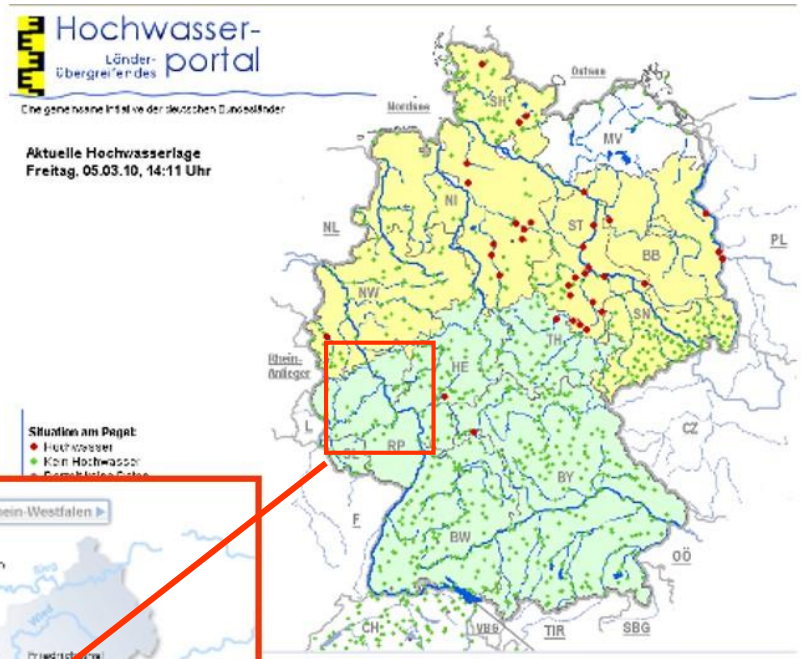
Potential damage along the River Rhine:
~ 200 billion €

Action
=> an economic imperative!

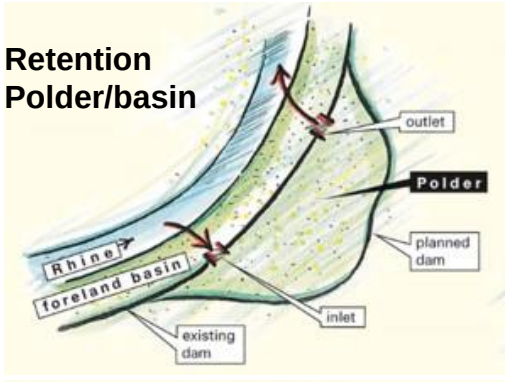
10,7 million people
are concerned by flood in flood risk areas

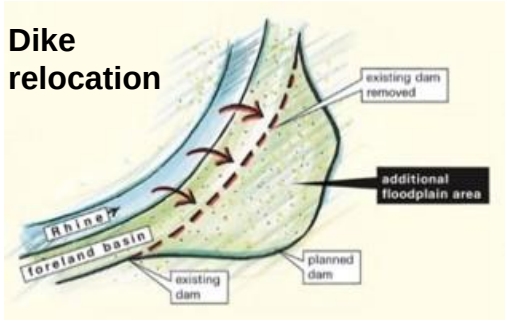
The lives of 5,5 million people
are at risk during floods with a depth of water above 2 m

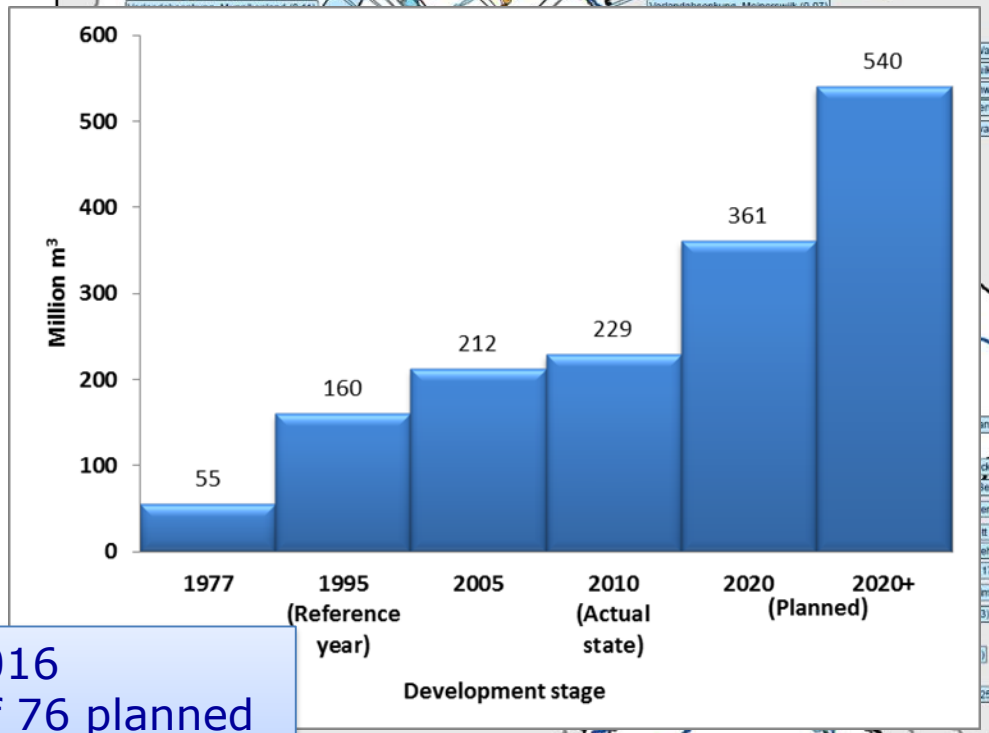
Flood Announcement and Forecast



Realization of water level reduction measures



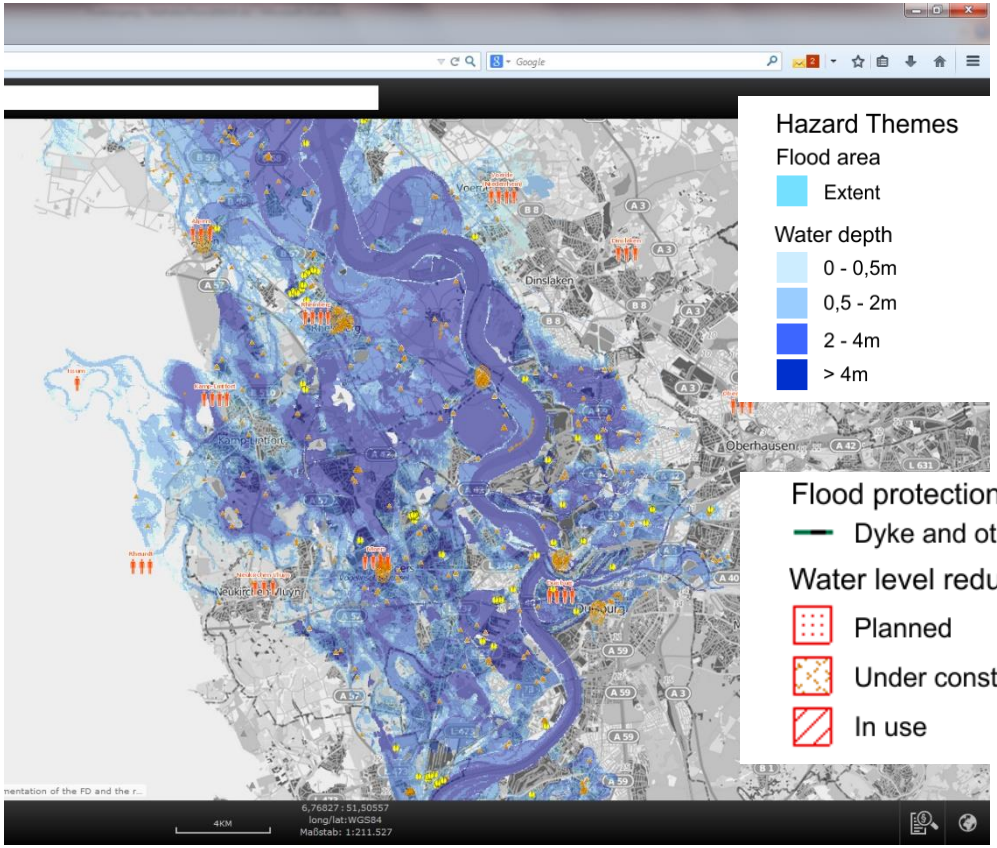




In 2016
32 of 76 planned measures are accomplished

Flood risk awareness

ICPR Flood risk atlas



[Available on www.iksr.org](http://www.iksr.org)

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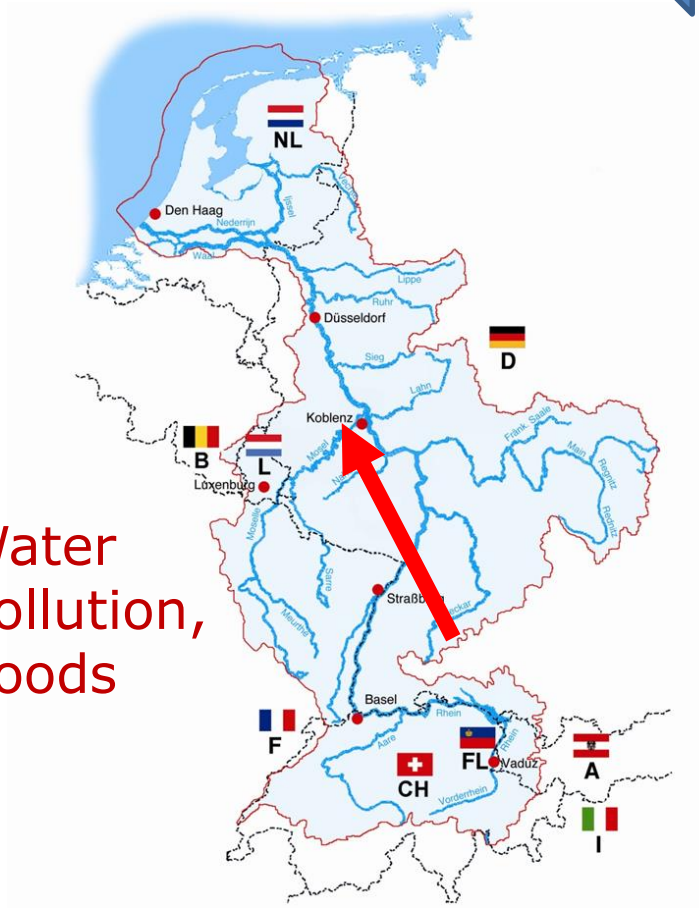
Improvement of water quality in the Rhine basin: Why has it worked?

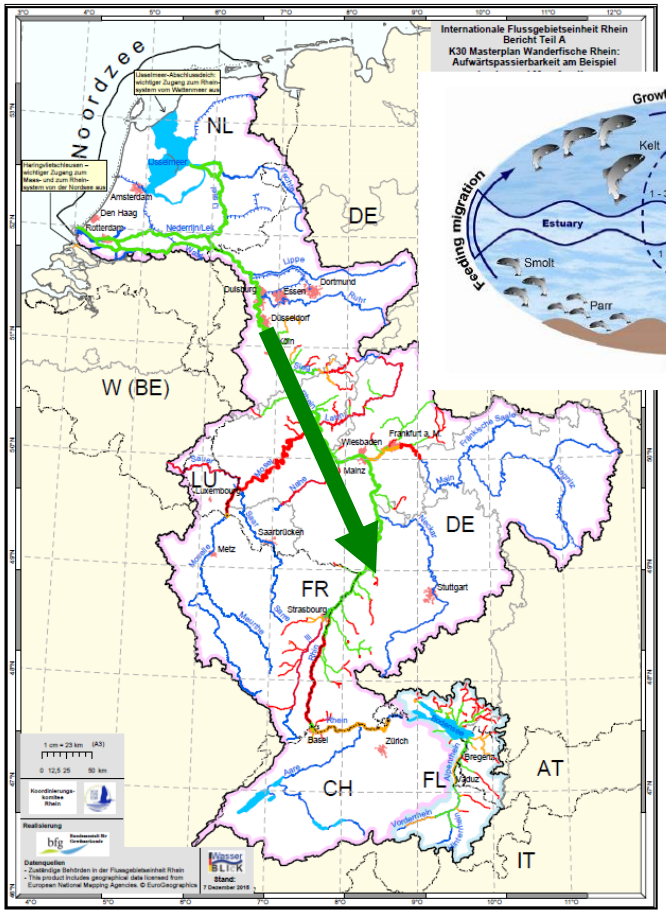
- Long-term calendar with clear milestones
- Good Governance and joint efforts
  - At national level: Governments, Municipalities
  - At international level: ***ICPR*** and EU
  - Participation of all stakeholders: Industry, Public, NGOs, etc
- Good and clear communication about advantages of common solutions developed through a *bottom-up* approach involving *all stakeholders*.
- Heavy investments in wastewater treatment plants: € 80 bn. since 1980 (96 % of the population connected to wastewater treatment plants!)
- Good and adaptive legislation on all levels

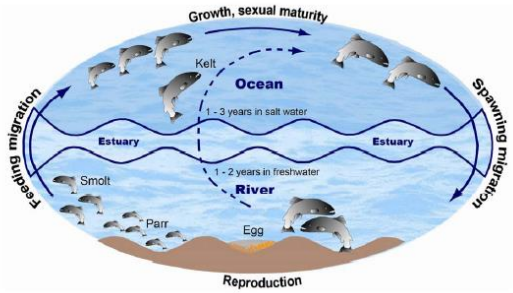
The principle of solidarity

Downstream ⟺ Upstream



Water pollution, floods





Long-distance migratory fish

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International commission for the protection of the Rhine (ICPR)

- **Members** (~200 people)

Switzerland, France, Germany, Luxemburg, the Netherlands, European Community

- **Observers**

States: Austria, Liechtenstein, Belgium/Wallonia, Italy

Intergovernmental Organisations: River Commissions ...

Non-Governmental Organisations (16)

ICPR: How does cooperation work?

- **intergovernmental de-centralized organization**
- **cooperation based on legally binding conventions**
- **Delegations**
  - work with a political mandate
  - do have the technical know how
  - provide the common budget

  (1.2 Mio €/a for secretariat only)

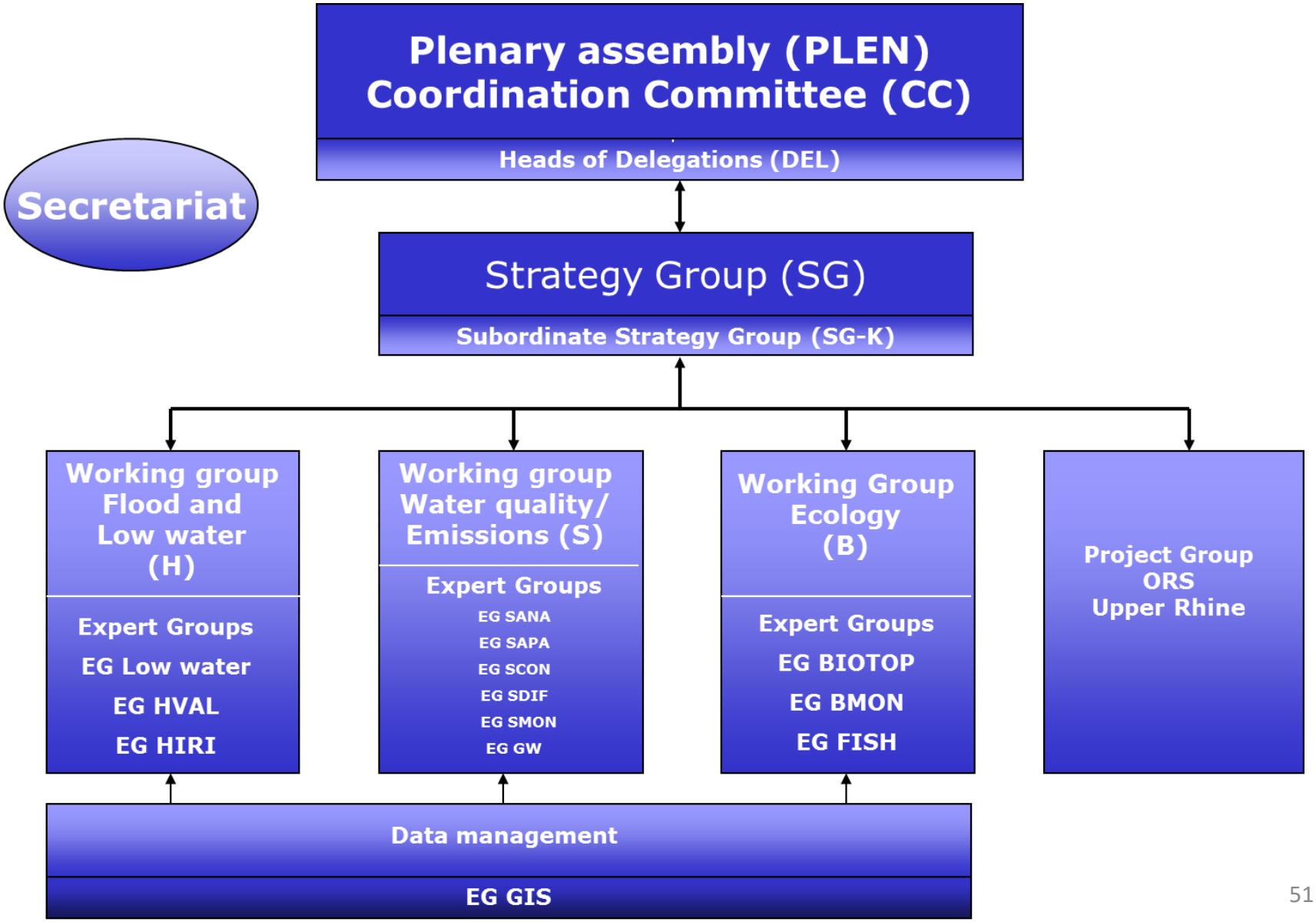
- **Decision making by consensus. Measures as recommendations to countries, no sanctions.**

- **Legal framework: EU Directives (WFD and FD) and national legislation**
- **Obligation to report on implementation of measures**
- **Small neutral secretariat with technical & scientific knowledge, 3 working languages & English**

ICPR: Stakeholder involvement

- since 1995 cooperation
- 20 international and national NGOs that vary by topic:
    - Nature protection/conservation
    - Flood protection
    - Association of water supply companies
    - Hydropower
    - Chemical industries

ICPR: How are we organized?



Conference of ministers

- gives ambitious goals to the Commission
- takes place regularly
- political support for the work of the states in the Rhine basin

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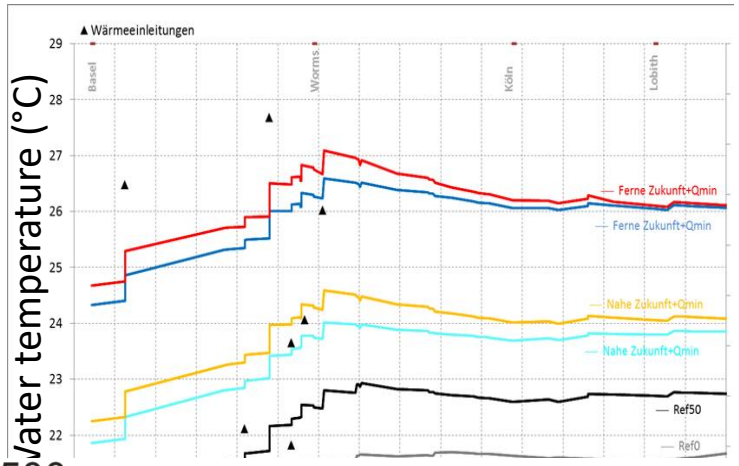
Future challenges: Climate change

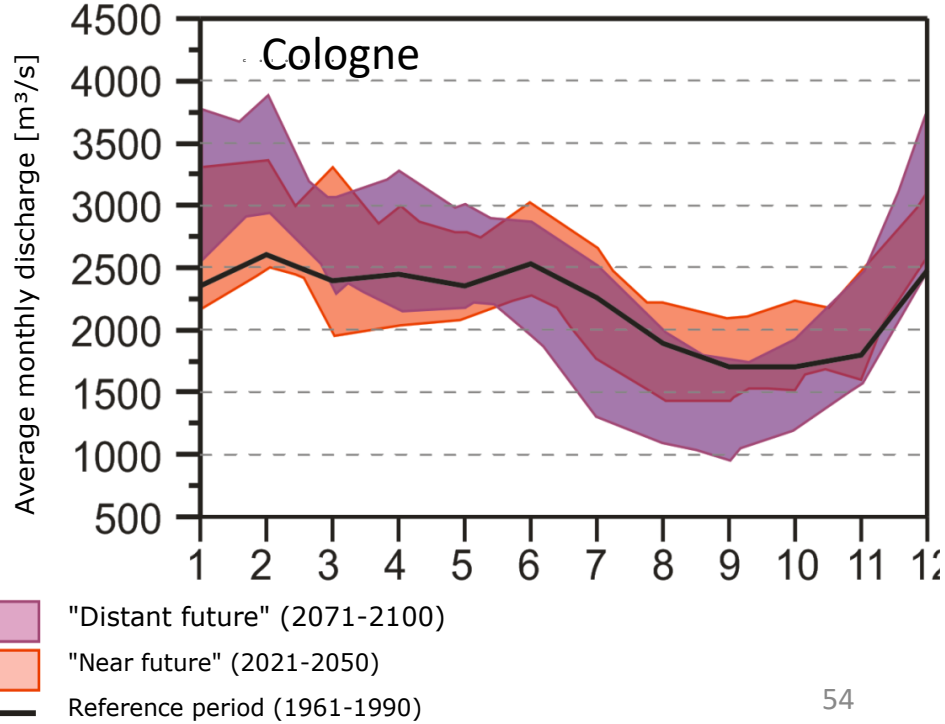
until 2050 and 2100

- **Rise of winter/summer air temperatures**
- **Precipitation: winter wetter, summer drier**

Possible consequences:

- **Winter: increase of runoff (risk of flood)**
- **Summer: decrease of runoff (risk of low water)**



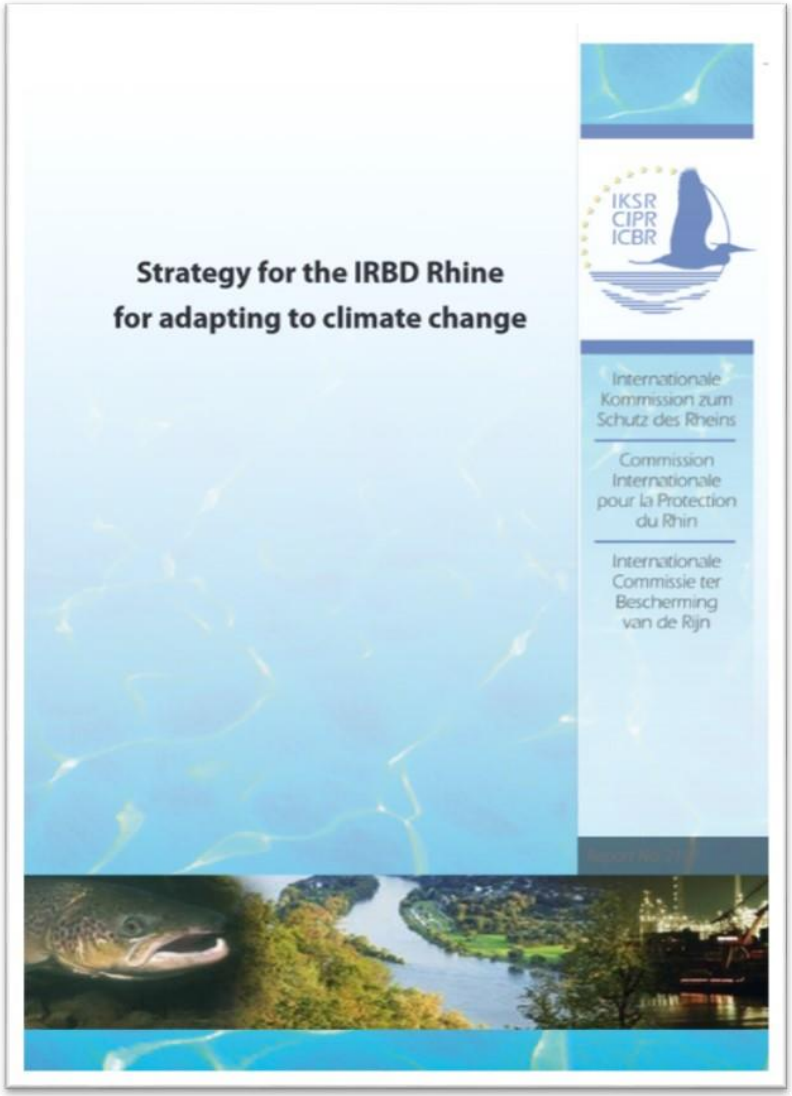


ICPR- Climate Change Adaptation Strategy

ICPR Report 219, 2015 www.iksr.org

Identification of:

- **Direct effects** of CC on flow regime and water temperature
- **Indirect effect** thereof on
  - –ecology
  - –chemistry
- **Impact on different uses**



ICPR- Climate Change Adaptation Strategy

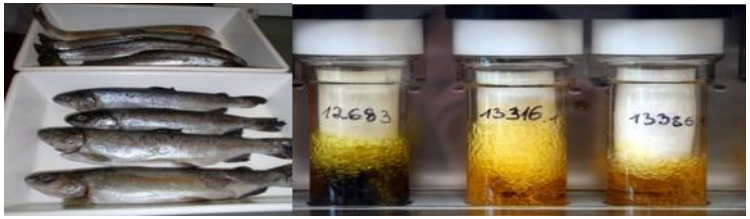
- **enhance the resilience of the river & floodplain ecosystems**
- **Improvement of monitoring to know more about changes, especially for low discharge periods in the River Rhine**
- **Exchange of best practice**

Future challenges

Climate change: Mitigation measures

Water quality: New substances (micropollutants), microplastics

Contamination of fish (EU directive)



Ecological continuity: Migration of fish up- and downstream

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- Pollution prevention and control after Sandoz 1986
- Water quality and ecosystem improvement
- Flood management
- Success factors for river restoration
- International Commission for the Protection of the Rhine (ICPR)
- Future challenges
- Conclusion

Conclusions

- **The story of the river Rhine is a success story given the improvements achieved in its water quality and biodiversity.**
- **Nonetheless, new challenges are ever present such as effects of climate change and micropollutants.**
- **Success can be explained by**
  - **→the institutional governmental framework for cooperation of states and involvement of stakeholders through ICPR**
  - **→pressure/acceptance from the public**
  - **→building common trust;**
  - **→identifying common interests;**
  - **→defining common goals, reinforced through a recognizable objective/symbol (Salmon)**
  - **→ open and transparent communication**

and …..Patience.

Thank you for your attention!

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Masterplan Migratory Fish – Ongoing discussions

FREE MIGRATION
Upper Rhine:
10 hydropower plants

Fish passages:
Iffezheim (2000)
Gambsheim (2006)
Straßburg (2016)
Gerstheim (2018)
Kembs (2016)
PG ORS:
(Rhinau, Marckolsheim, Vogelgrün)