

Health and water – think together!

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Translation*

*Note: The translation of the original presentation „Wasser und Gesundheit – zusammen denken!“ from German was the responsibility of the Green Ring Leipzig, not the author.



Frechen Brook, Köln D



New opera, Copenhagen DK

Health, well-being and prosperity are dependent on or influenced by water and bodies of water in many ways

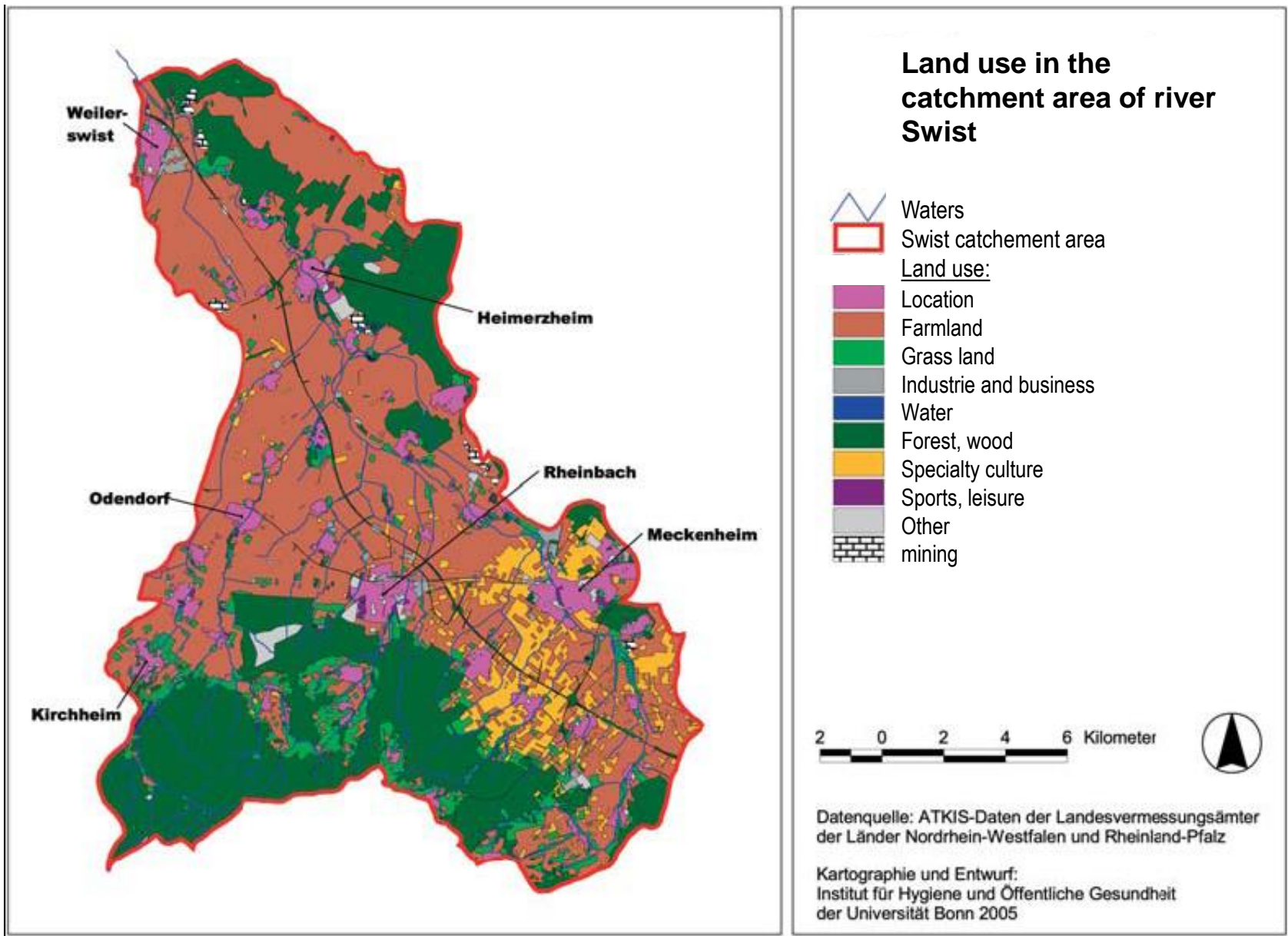


Zürichsee, „downtown Switzerland“ CH

Water-related health risks

1. Too much water: *drown, get lost, injuries*
2. Not enough water:
 - direct effects: *thirst, hunger*
 - indirect effects: *water-washed diseases (e.g. Trachom)*
3. Water-borne diseases (“dirty water diseases”)
Exception via ingestion, breathing in, skin contact
 - **pathogens (e.g. *salmonella, giardia*)**
 - toxic substances (e.g. *heavy metals*)
4. Water-based diseases (e.g. *Schistosomiasis*)
5. Water-related vector diseases (e.g. *Malaria*)
6. Harassment by smell, noise, flood

Water-related
diseases



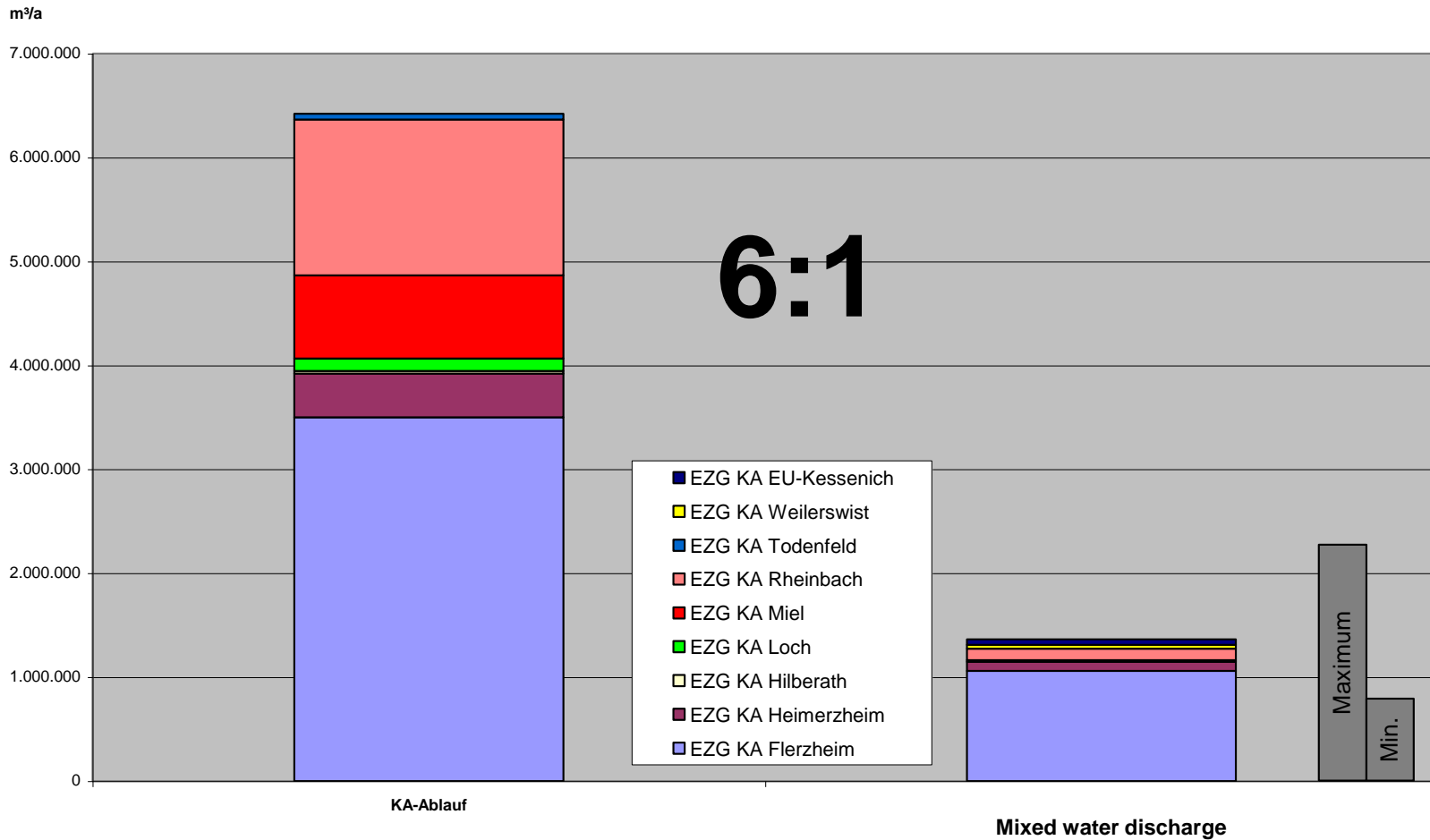
Reduction performance of the sewage treatment plants

	Giardia I. (/100 L)	KBE 20°C (/1 ml)	KBE 36°C (/ml)	E. coli, MPN-Verfahren (/100ml)	E. coli, CC-Verfahre (/100ml)	Coliforme (MPN) (/100 ml)	Fäkalstreptokokken (/100ml)	sulfitred., sporenb. Anaerobier (/100ml)	Median
KA Flerzheim	3,0	2,8	3,0	3,5	3,2	3,3	3,3	2,9	3,0
KA Heimerzheim	2,3	2,9	2,9	3,6	3,7	2,8	3,1	2,6	2,8
KA Hilberath	1,8	1,7	1,6	2,2	2,2	2,6	2,5	1,8	1,8
KA Loch	0,9	2,1	1,9	2,0	2,5	1,7	2,3	1,4	1,7
KA Miel	3,1	2,6	2,6	4,0	3,5	3,0	3,6	2,3	2,6
KA Rheinbach	3,5	2,9	3,3	3,7	3,6	4,0	3,5	3,0	3,3

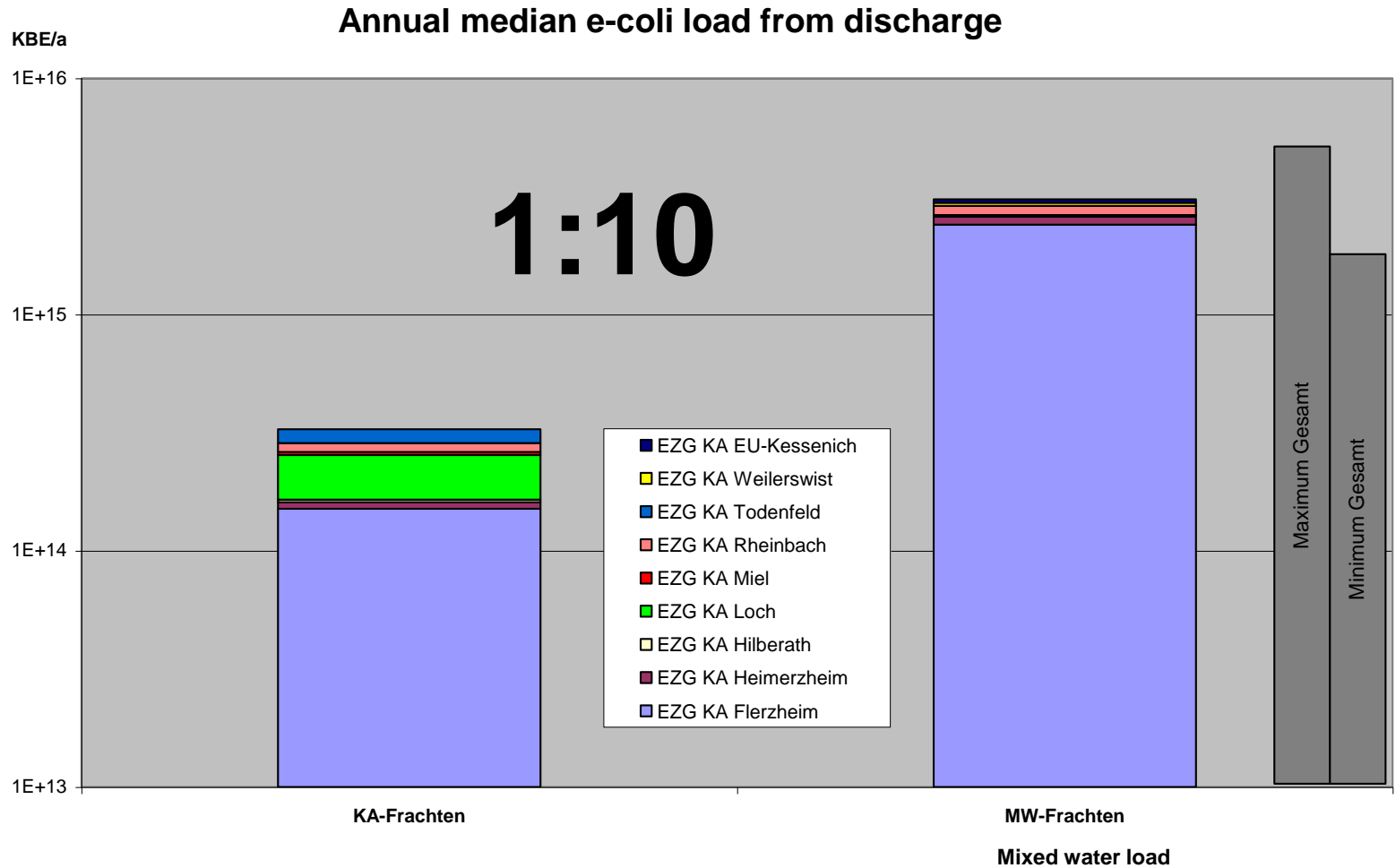
Median reduction in microbial load: 2-4 log-steps

Mixed water discharge

Annual median discharge quantities

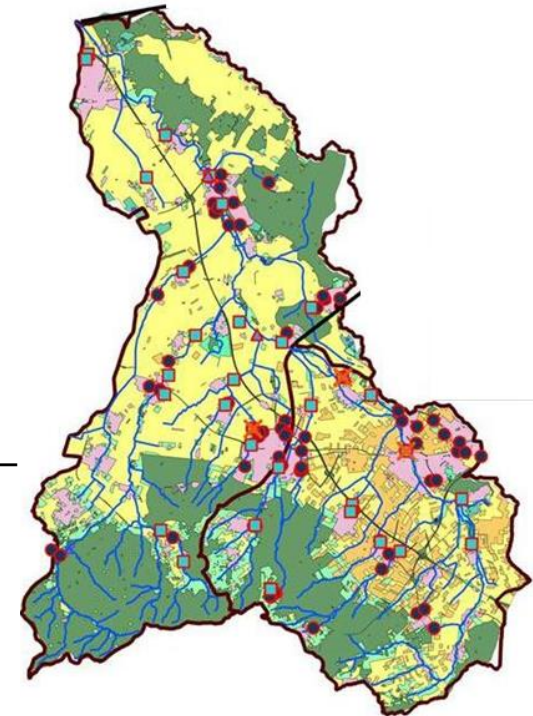
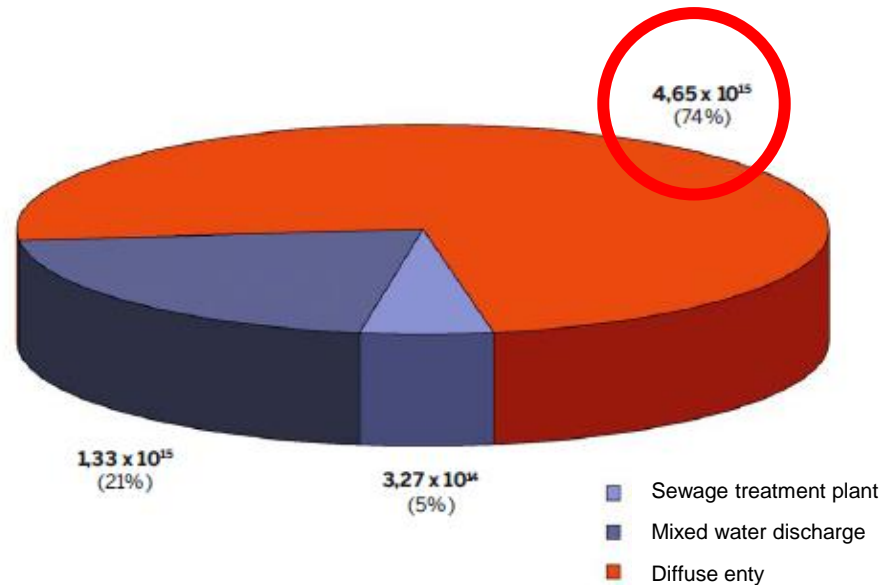


Annual microbial load from mixed water discharges



Meaning of diffuse microbial contamination

E. coli



Environ Earth Sci (2016) 75:1393
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ORIGINAL ARTICLE

Two decades of system-based hygienic–microbiological research in Swist river catchment (Germany)

Christiane Schreiber¹ · Andrea Rechenburg¹ · Christoph Koch² · Ekkehard Christoffels³ · Thomas Claßen^{1,4} · Marlene Willkomm^{3,5} · Franz Michael Mertens³ · Andrea Brunsch³ · Susanne Herbst^{1,6} · Esther Rind¹ · Thomas Kistemann¹

River bathing in Germany

- Since the 1760s: bathing boats are modern on rivers all over Europe
- Ban of public bathing arguing that it is dangerous and immoral
- Student resistance in German university cities: Göttingen, Jena, Halle, Erlangen, Heidelberg, ...
- To control the movement, official bathing areas were opened for students (e.g. Göttingen 1819, Jena 1842)
- Wild bathing, on the other hand, punished draconian
- In the second half of 19th century, a large number of public baths were set along the rivers
- Peak of river bathing in Germany was in the beginning of the 20th century



Decline of river bathing

- Population growth, urbanization, industrialization: rivers are losing their natural characters
- Bank reinforcements, industrial and port facilities, river regulation, intensifying of ship transport
- Rivers disappeared from the public eye
- Water courses as receiving waters of the centralized sewage disposal: in Germany approx. 9.500 sewage treatment plants, $1.0 \times 10^{10} \text{ m}^3$ treated sewage/ year = 1/4 of the annual Rhine runoff
- In the 20th century, river bathing was increasingly perceived as unsafe, unhygienic and out of fashion
- Since the inter-war period, numerous municipal outdoor pools have opened
- River bathing establishments closed “for hygienic reasons”

River bathing in Germany today

- Only 31 official river bathing areas left
- Example NRW: in total only 108 outdoor swimming pool waters, that means: 1 / 165.000 inhabitant (average Germany: approx. 1 / 40.000), until 2016 no river bathing area
- After 200 years, river bathing has almost disappeared
 - health protection and hygiene as key arguments
- European Bathing Water Directive (2006)
not a simple yes/no decision, but rather definition of a „health tolerable“ limit value – what risk is (socially) „acceptable“?

	A	B	C	D
	Parameter	Ausgezeichnete Qualität	Gute Qualität	Ausreichende Qualität
1	Intestinale Enterokokken (cfu/100 ml)	200 (*)	400 (*)	330 (**)
2	Escherichia coli (cfu/100 ml)	500 (*)	1 000 (*)	900 (**)

(*) Auf der Grundlage einer 95-Perzentil-Bewertung. Siehe Anhang II.

(**) Auf der Grundlage einer 90-Perzentil-Bewertung. Siehe Anhang II.

Development of river water quality

- In the past 50 years, environmental standards and requirements have been constantly increased
- Great and effective efforts have been taken to improve the chemical quality of river water
- EU-Water Framework was an effective driver here, goal: „good ecological condition“
- measures: improvement of technology of sewage treatment plants, bank margins, better control of agricultural fertilizer use
- Improved water quality, water quality structure
- Hygienic-microbiological water quality lagged behind
- „good ecological condition“ doesn't necessarily mean „good hygienic condition“ (Kistemann & Claßen, 2003)

Baldeneysee (Essen)

- Built from 1931-1933 in the course of the river Ruhr
- In the upper reaches sewage treatment plants and mixed water discharge
- Depth 4 m , surface 2.6 km²
- Use: river cleaning through sedimentation
- Raw water extraction for drinking water production
- Energy production
- Bath use:
 - 1937: river bath
 - 1952: Polioepidemic bathing ban in the lower reaches
 - 1971: Baldeney bath closed
 - 1973: bathing ban in the upper reaches



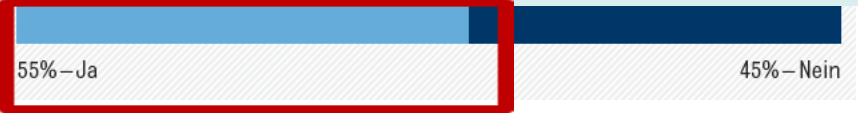
(1938)

www.derwesten.de

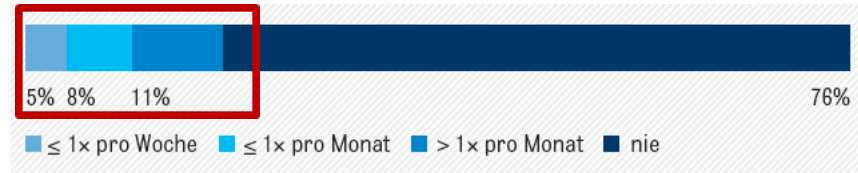
No bathing in Baldeneysee?



Is there a river bathing area near your place of residence?

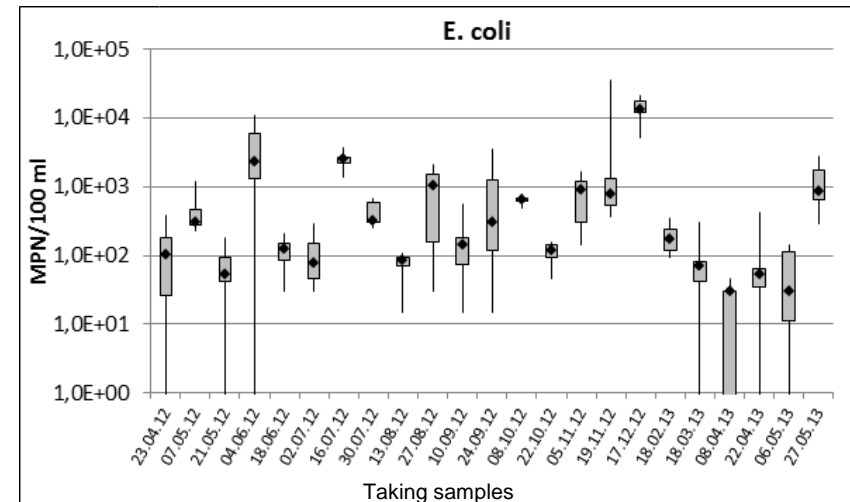
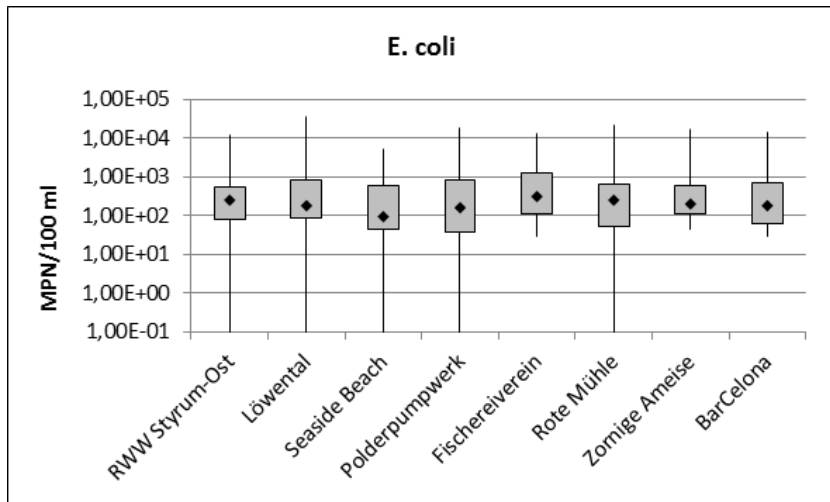
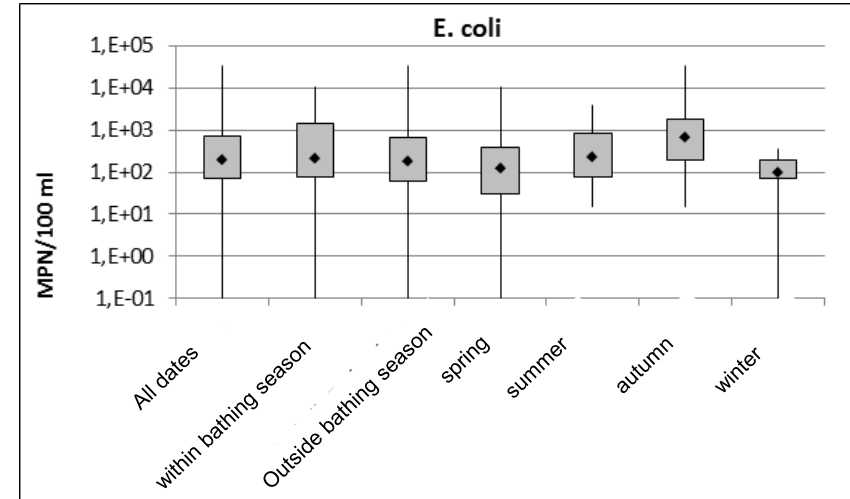


How often have you been bathing there in the last year?



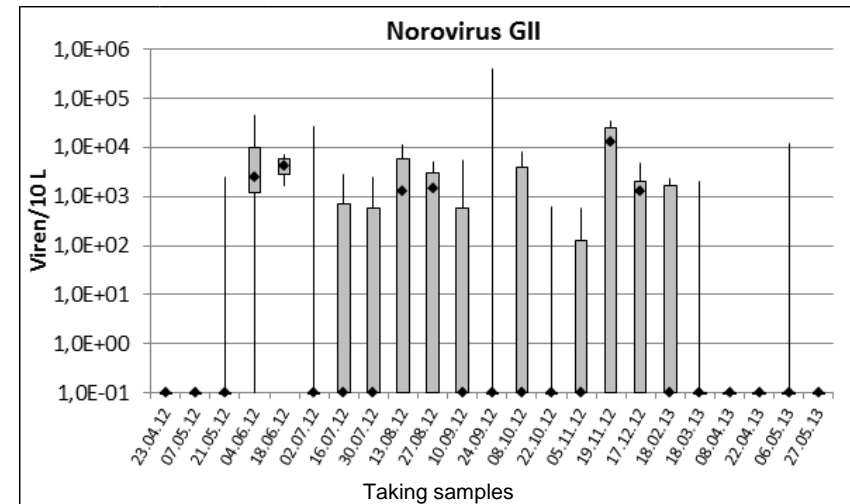
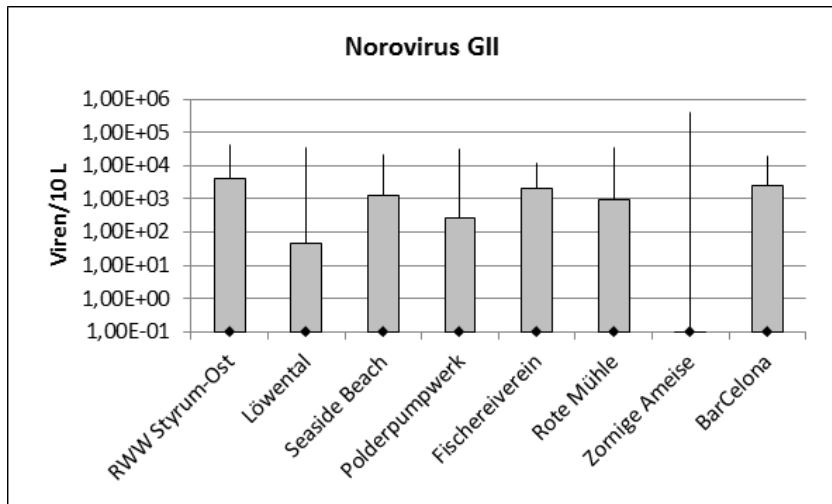
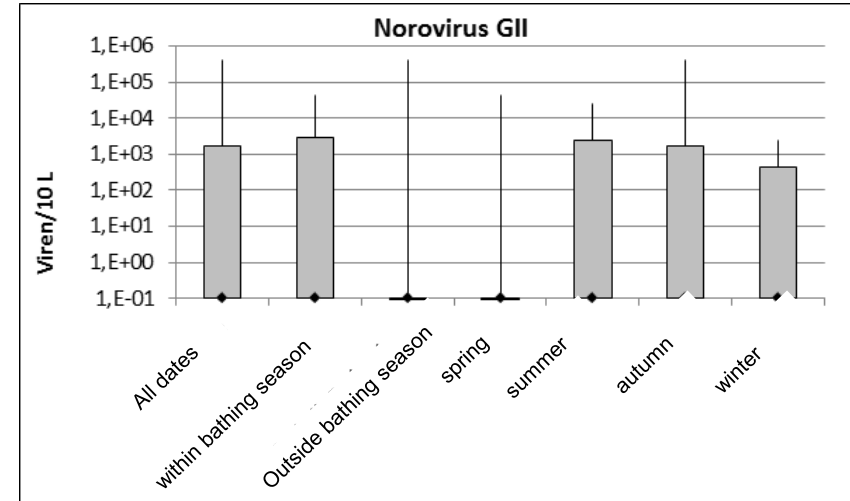
Bacteriological examination of Baldeneysee (2014)

E. coli

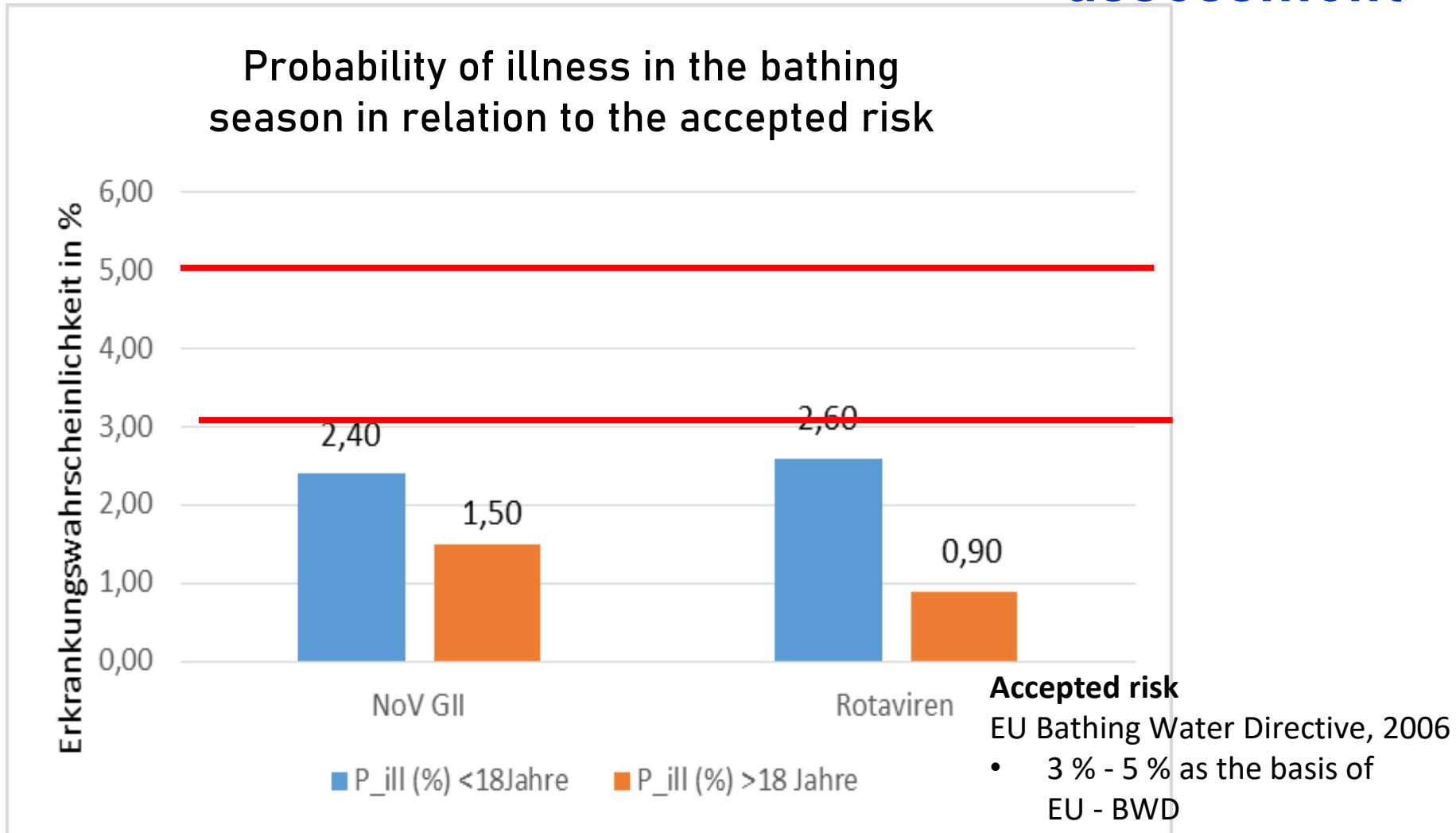


Virological examination of Baldeneysee (2014)

Norovirus GII



QMRA – quantitative microbiological risk assessment



Health risks through river bathing

- Mainly caused by viruses (and swimming accidents!)
- In terms of the EU-risk assessment, these risks can be assessed as „tolerable“
- Example river Ruhr: the EU-limit values for faecal indicators are usually not exceeded in dry weather conditions
- Major contamination sources
 - Dry weather (low): sewage treatment plants
 - Rainy weather (high): mixed water reduction
- For dry weather conditions, further improvements can be achieved through technical upgrading of the sewage treatment plants
- Precipitation-guided early warning system (bathing ban until 2-3 days after the precipitation event)

Protection of health through waters

- **Thermal loads**

- Reduction through radial urban fresh air corridors
 - Convection cooling
 - Cooling by evaporation
 - In winter and at night warming effect

- **Noise**

- Reduction of noise pollution through distance
 - Reduction of noise perception through pleasantly perceived water noises
 - Masking

- **Air pollutants**

- Reduction of typical urban air pollutant concentration through intensified air exchange close to the ground

- **Exposure**

- Improvement of exposure due to the lack of shadows, particularly effective when the sun is low

- Provision of **drinking water resources**

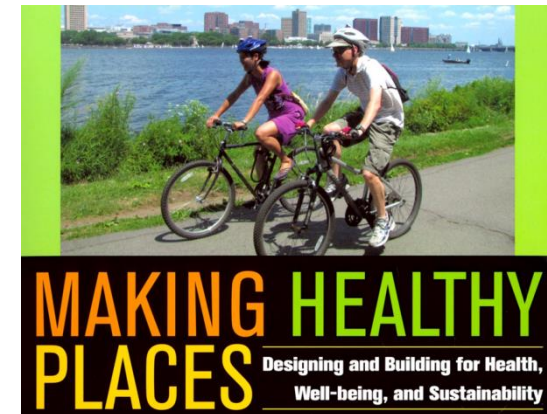


S. Völker, 2010

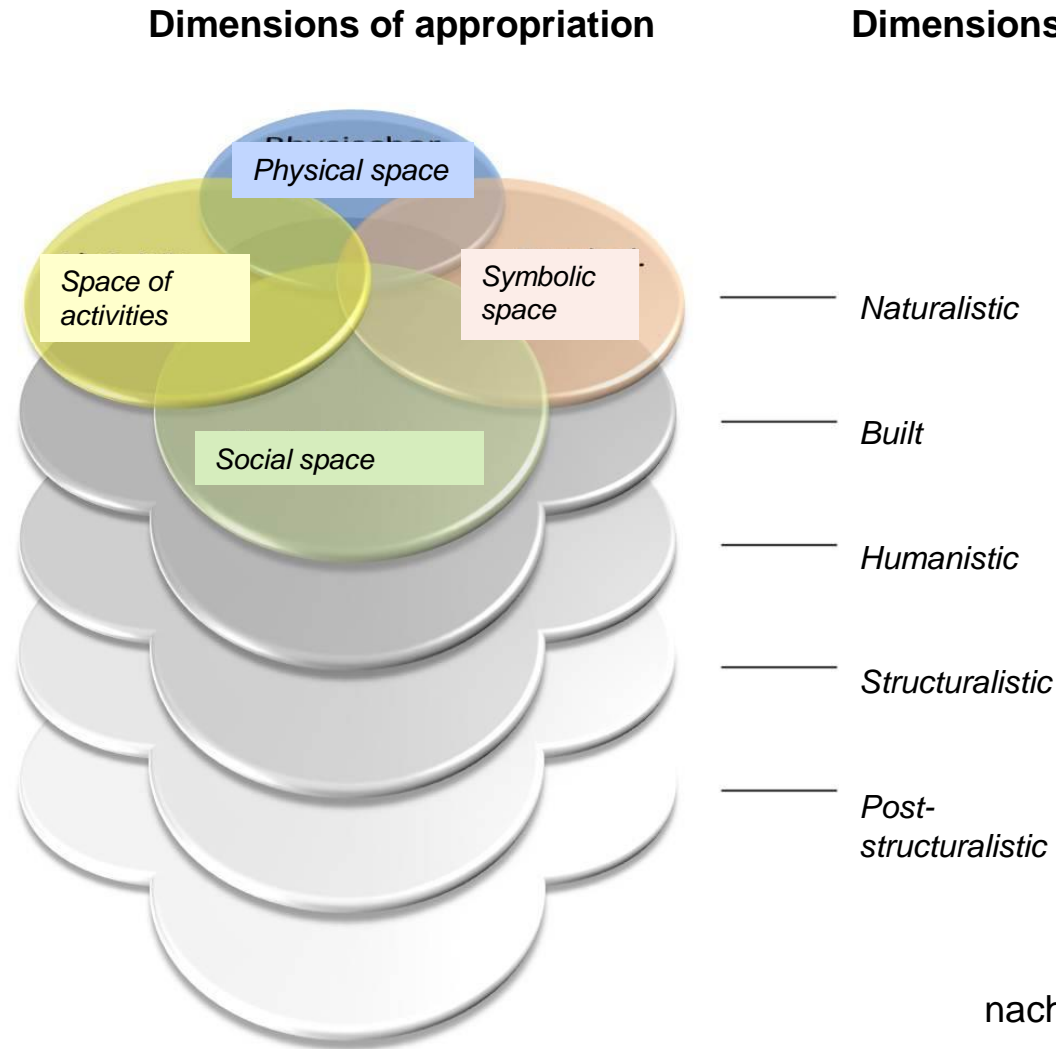
Ottawa Charta 1986

- First International Conference on **Health Promotion** of the World Health organization (WHO), Ottawa 1986
- Health policy model: Reorientation from the prevention of diseases to the **promotion of health**
 - **Salutogenesis** (Antonovsky 1979)
- Strategies of action:
 - **Advocate:** advocating health by influencing political, biological and social factors
 - **Enable:** Promotion of skills in order to reduce differences in the state of health and to realize the greatest possible health potential
 - **Mediate:** cooperation of all actors inside and outside the health care system
- A central action field:
Health promoting lifeworlds

Dannenberg, Frumkin &
Jackson, 2011



Matrix of health promoting landscapes



nach: Völker & Kistemann IJHEH 2011

Urban waters / urban-blue

- All publicly perceptible linear and flat **surface waters** (e.g. brooks, rivers, canals, lakes, ponds, reservoirs) including their **bank areas** and **retention areas**
- all **decorative aquatic facilities**, such as water basins, water games and fountains
- In a broader sense also **near-natural outdoor pools**
- In coastal cities the **sea**

(Claßen et al 2014, S.31)

Gesundheitsförderung durch Gewässer

- In addition to the „nature“ of waters (=reality dimensions), the forms of their appropriation (=appropriation dimensions) play a decisive role in the development of health promoting effects
- Places for **physical activity** close to home
- Places of **social interaction**
- **Contemplative experiences**
- **Symbolic connotations**

- Upgrading urban green spaces
- Effective factor in landscape preferences
- Reinforcement of salutogenic effects of green spaces

- Reinforcement of the place identity / sense of place



Urban-blue health justice?

- Port locations that were once very disadvantaged and heavily used are becoming extremely attractive
- Physically improved water quality, strong reduction in noise and air pollution, unsealing, ...
- Wasteland harbor becomes waterfront location close to the city center with an unobstructed view - a "**counter version**"!
- Results: extreme economic re-assessment of the locations: from very unattractive to very attractive
- Often privately owned land - even after they have been opened to the public, areas often remain limited under private control / half-hearted local political influence

- gentrification... greenification... **azurification!**

Recommendations to the planners

- Urban-blue is a public matter!
- Urban-blue is a public health resource!
- Open communication processes are required
- Merge terms/languages and qualifications of actors
- Interdisciplinary and transdisciplinary exchange of experiences
- Early and proactive participation
- informal steering structures
- Integrate urban-blue in municipal planning concepts
- Environmental justice and health justice against azurification

Thanks for your attention!



Isle of Vilm