Bathing in urban rivers

Predicting water quality for early warning at bathing sides

Quelle: Wolf Raber, Insel der Jugend

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Bathing in urban rivers is smart

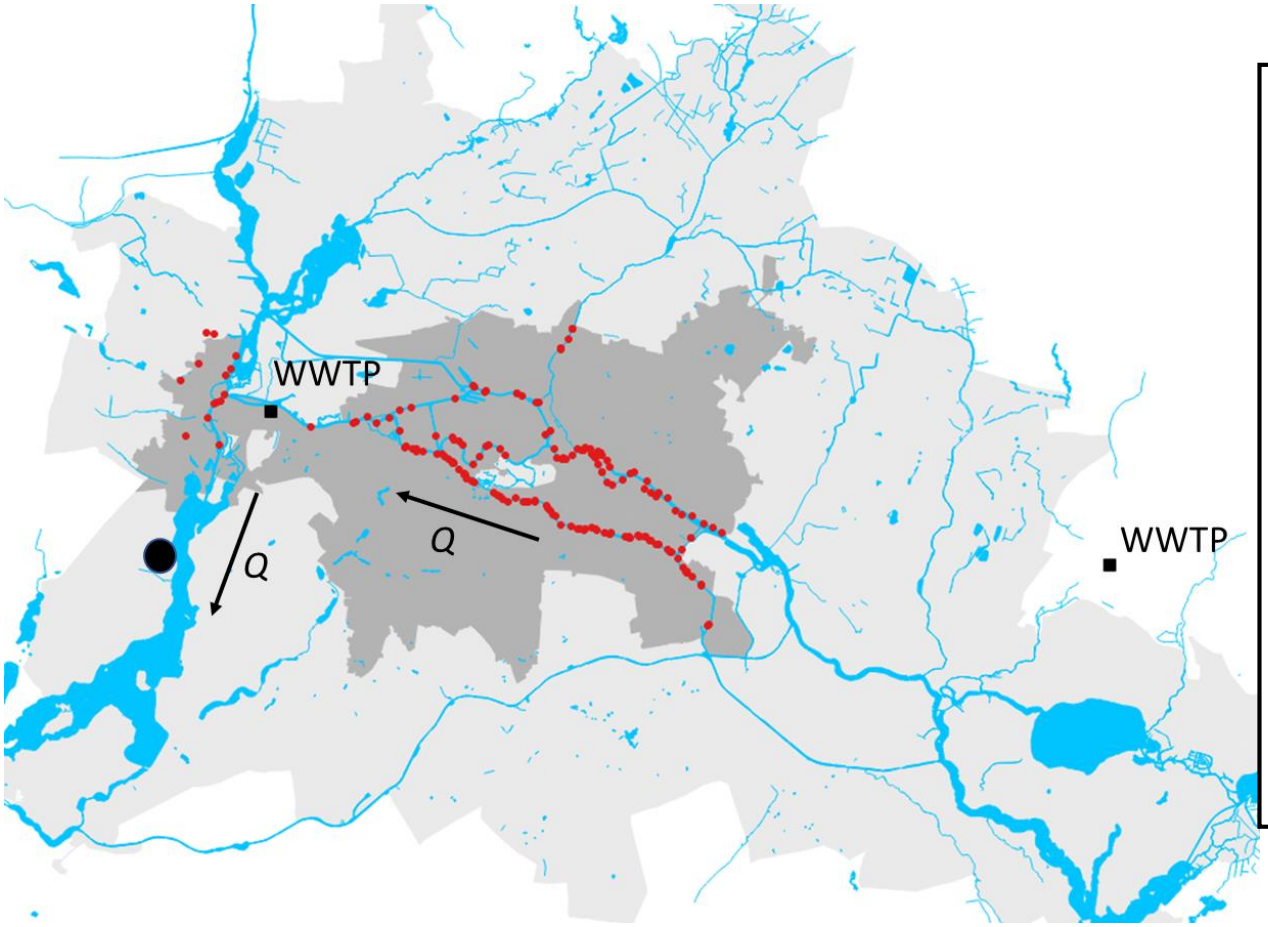
Quelle: Berliner Wasserbetriebe

Limmat Zürich

Marne in Paris
Quelle: AFP/Getty Images

Flaucher Isar
(Foto: Margit Schade)

Bathing in urban rivers means risks from urban drainage



Berlin combined sewer system

- 53 km² impervious surface
- 1,5 Mio Inhabitants
- 179 CSO discharge points
- 30 -40 events per year
- CSO Volume: 7 Mio m³/a

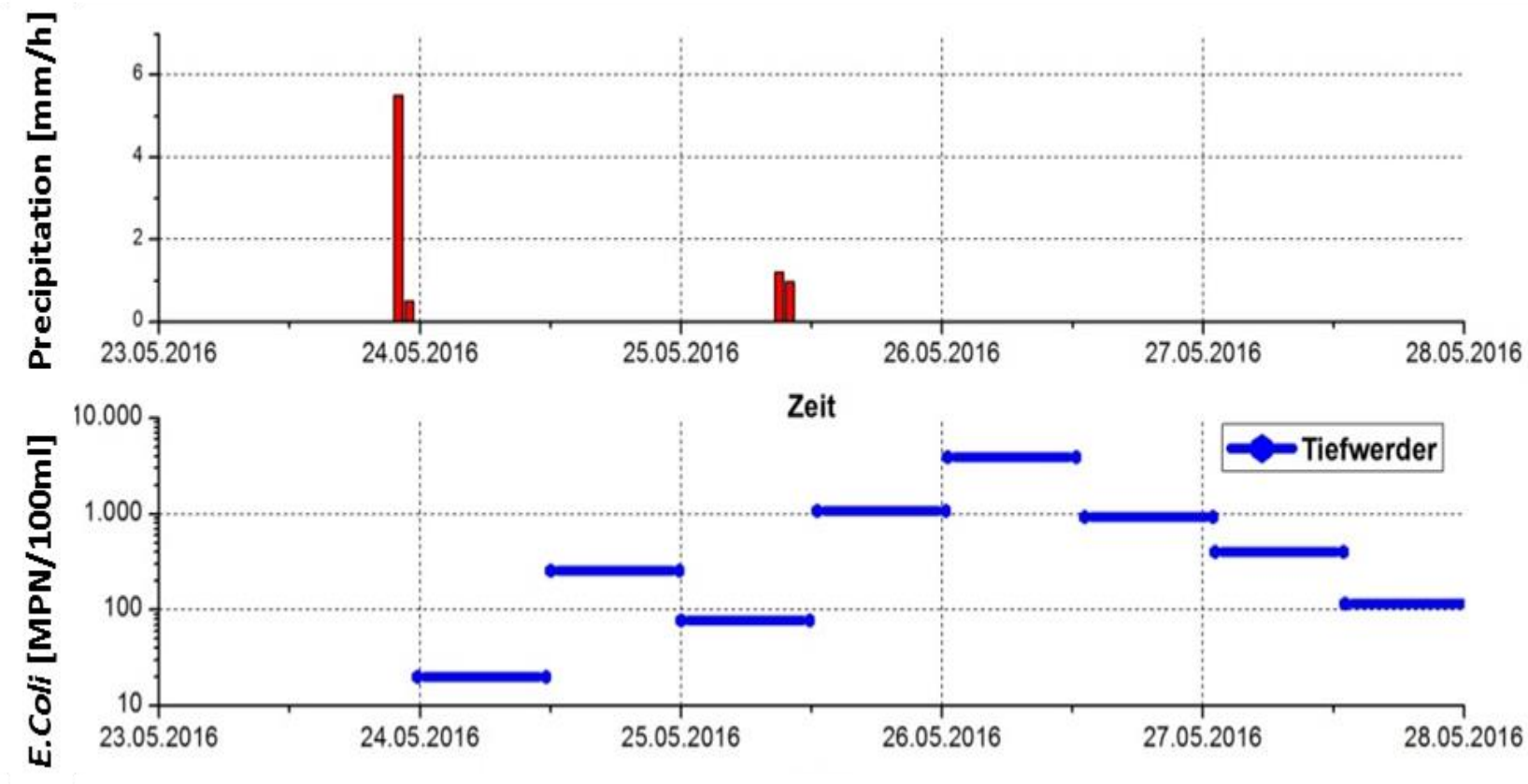
Berlin separate sewer system

- 53 km² impervious surface
- 2 Mio Inhabitants
- 47.6 Mio m³/a
- **100-120** events a year

WWTP

- 234 Mio m³/a
- UV disinfection dry weather
- Bypass stormwater

E-Coli pollution after rain event at river bathing sites



Statistical models can be used for early-warning

Main effects:

- **Precipitation (P) [mm] (5min)**
- **River flow (Q) [m³/s] (15min)**
- **non-disinfected WWTP discharges (WWTP) [m³/s] (30 min)**

Transformations:

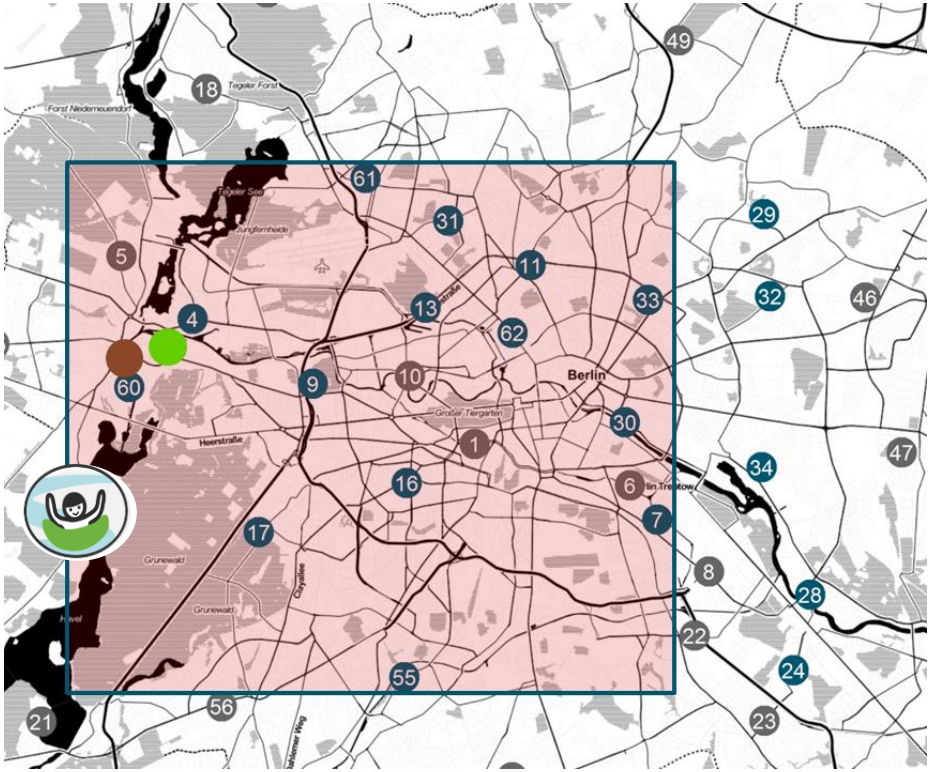
- Log_{10} transformation of *E.coli* concentrations
- Log transformation of precipitation data

Interactions:

- Flow and WWTP + flow and precipitation

Software:

- R, rstanarm-package for applied Bayesian regression modelling



General form of the used regression models

$Log_{10}(E.coli) \sim N\,(\,Q\,(\,log(P) + WWTP\,),\ \sigma^2)$

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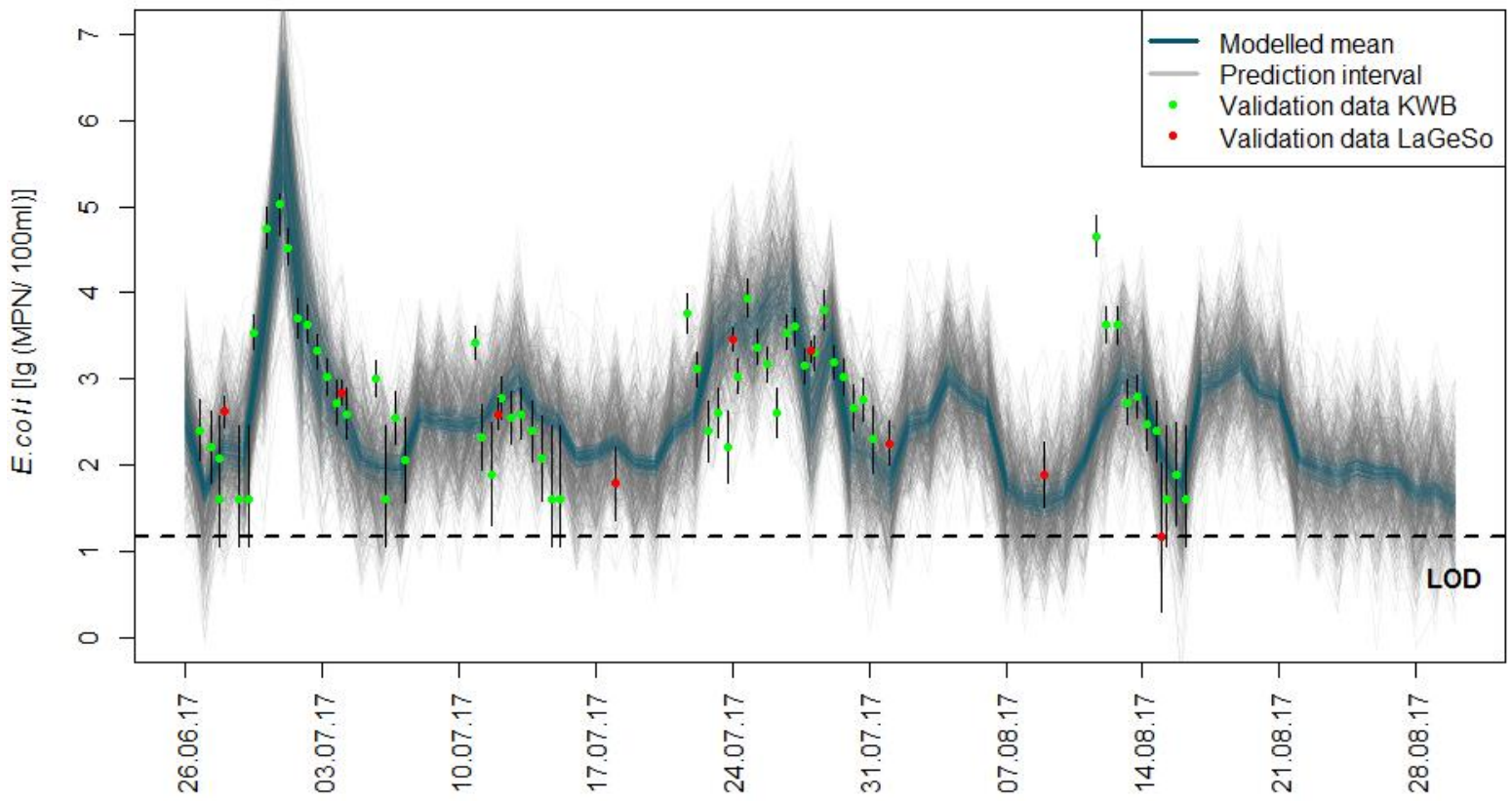
Regression model can be validated



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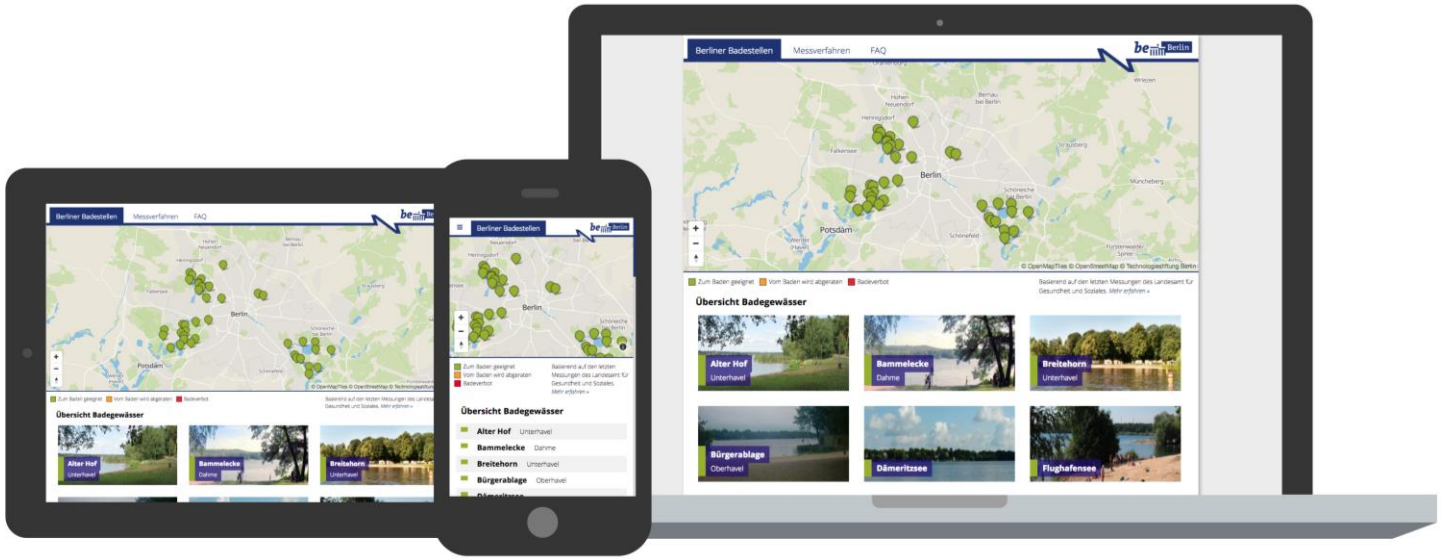
Early-warning system is only based on available data and is now communicated!



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- Use city data makes life in urban areas smarter!
- City data means cooperation between city partners….
- Statistical models can be used instead of complexe ones
- Risk communication to citizen is important!