NORWEGIAN SCHOOL OF VETERINARY SCIENCE
Virological Survey of Surface waters in Norway

Ricardo C Rosado(Ricardo.Rosado@nvh.no), Mette Myrmel (Mette.Myrmel@nvh.no)
Norwegian School of Veterinary Science

Dep of Food Safety and Infection Biology
Section for Microbiology, Immunology and Parasitology

Virus i vann, Skandinavisk kunskapsbank

The project VISK is part of the INTERREG IV A programme, with the ultimate goal of reducing susceptibility to waterborne viral diseases in Scandinavia, in spite of climate change.

The most widespread health risk associated with drinking water is microbial contamination by pathogenic agents, as bacteria, parasites, and viruses. Drinking water in Scandinavia is subject to different risks, seen on the illustration to the right. Climate change studies show an increase by 65% of extreme events in Europe between 1998 and 2007, events which affect both the quantity and quality of water resources. At this time, there is little information on outbreaks in Scandinavian raw water:

Finland – 18, 1998-2003 (Maunula et al., 2005)
Sweden – 4 in 2010, 900 affected (SMI)
Norway – 13, 1988-2002, 6480 affected (Nygård et al., 2003)

Objectives

- Establish filtration methods for virus detection in raw water commonly used in the project area.
- Survey surface water at the intake of the Nedre Romerike water plant for the presence of viruses implicated in human waterborne disease outbreaks.
- Survey both inlet and outlet waste water from sewage treatment plants in the project area for the same viruses.
- Produce data on virus quantities in sewage and drinking water in relation to season and precipitation.

Risks to drinking water
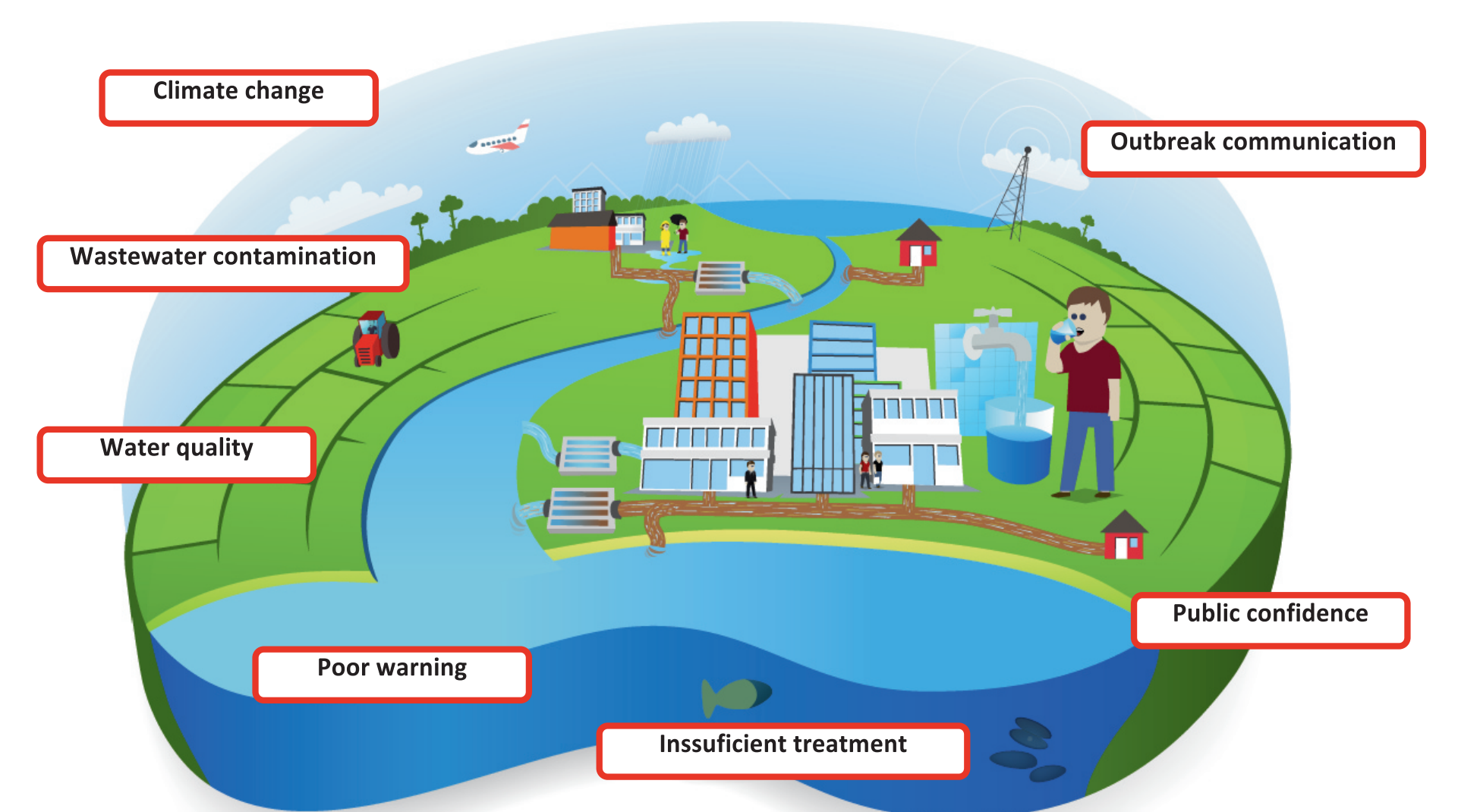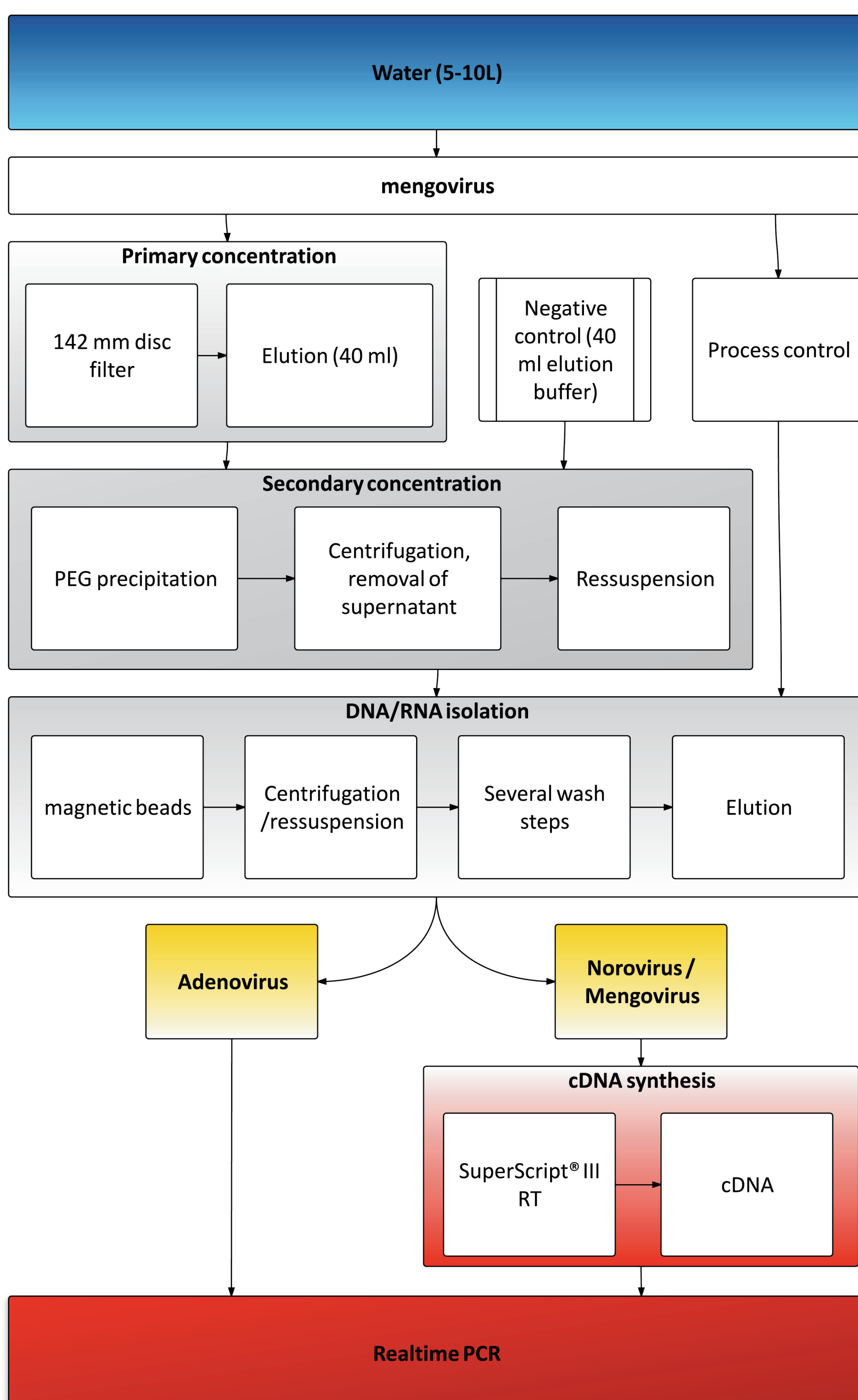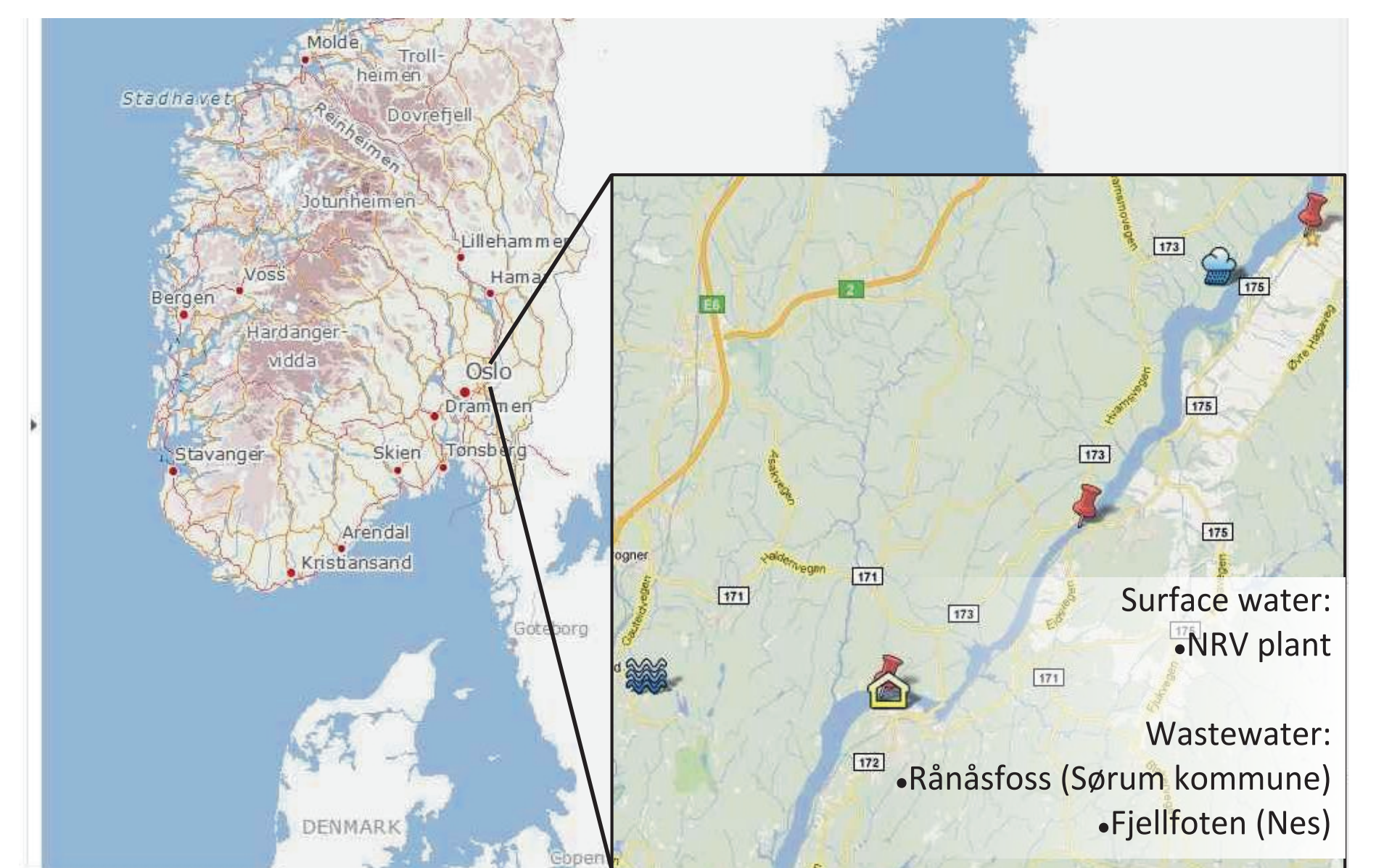

Viruses surveyed

Norovirus
- leading cause of viral diarrhea worldwide in every age group
- >90% of all outbreaks of viral origin, and
- ~50% of all-cause outbreaks worldwide
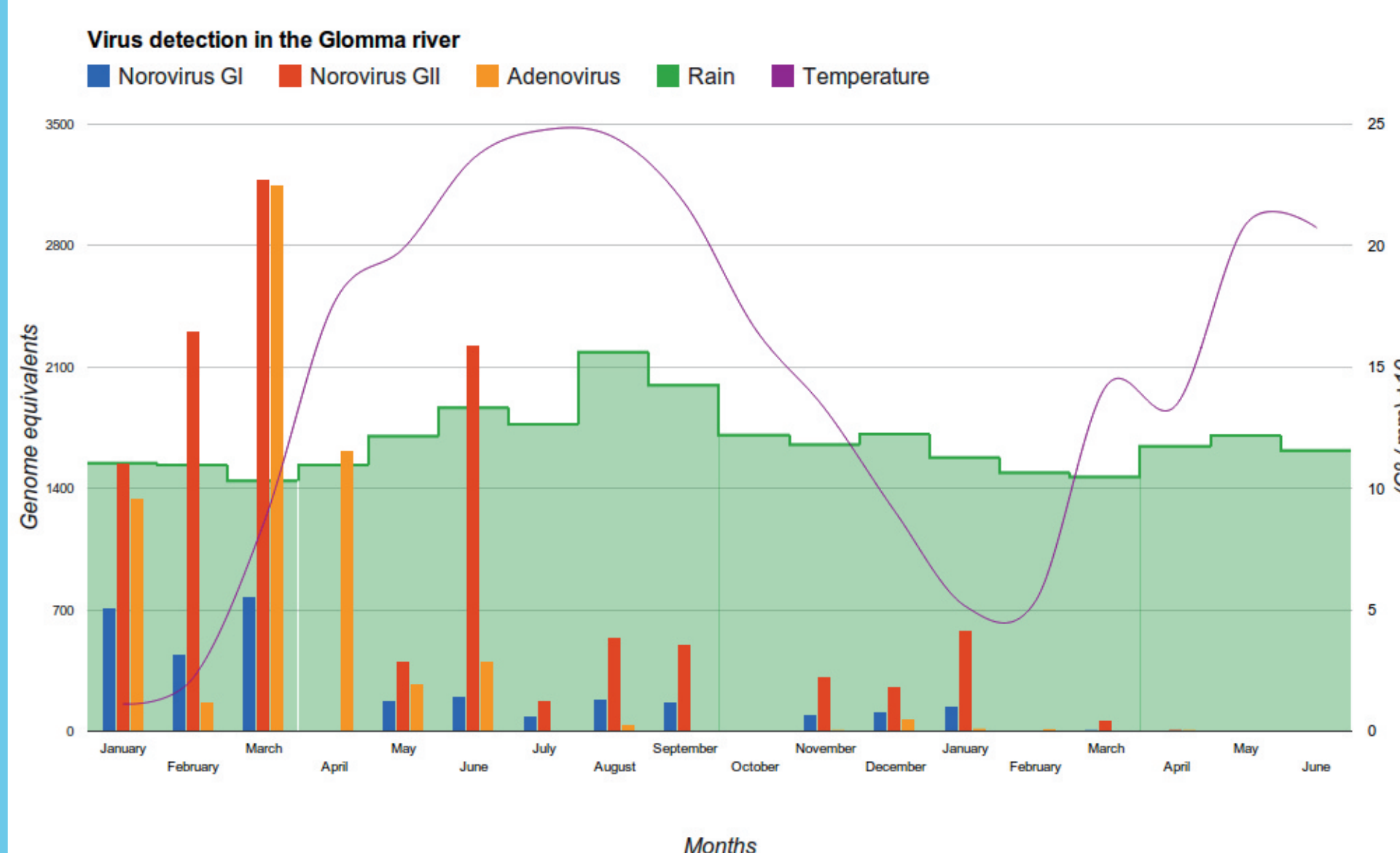- first detected as an agent of waterborne disease in 1997

Adenovirus (hAdV)
- third most common cause of infantile gastroenteritis after rotavirus and norovirus,
    - acute gastroenteritis, primarily in children.
    - almost half are subclinical
- proposed as an index of viral contamination of human origin.
- testing in the Glomma is of interest for two reasons:
    - to assess the presence of this human pathogen
    - as an indicator of faecal contamination

Project area - Norway

Surface water:
• NRV plant

Wastewater:
• Rånåsfoss (Sørum kommune)
• Fjellfoten (Nes)

Results

Virus detection in the Glomma river

	Positives	Average	Max
Adenovirus Glomma	52%	1,08E+03	1,22E+04
Adenovirus wastewater inlet	100%	2,16E+04	8,39E+04
Norovirus GI Glomma	44%	3,41E+02	1,86E+03
Norovirus GI wastewater inlet	52%	7,79E+03	3,54E+04
Norovirus GII Glomma	38%	1,32E+03	6,56E+03
Norovirus GII wastewater inlet	81%	2,73E+04	2,43E+05

Summary

- over 55 weeks sampled
- 85% positive for at least one virus
- 18% positive for all viruses
- 14% negative for all viruses,
- only 2 months out of 18 had no positives

Inhibitors

~20% of samples showed signs of inhibition

Virus recovery

- 7-30% using spiked surface water
- best recovery norovirus GI

Conclusions

- The method has consistent results, but variable recovery. No cause for this has been identified.
- Adenovirus was detected most often, but norovirus GII had the highest average concentration, questioning how useful it is as an indicator in the Glomma region.

- Large difference between winters of 2011/2012 complicates study of virus concentration in relation to observed weather events.