

# Drinking water in northern villages in Nunavik – Prof. Stéphanie Guilherme



# Northern villages

## Nunavik

- Large northern territory (14,000 inhabitants in 14 villages)



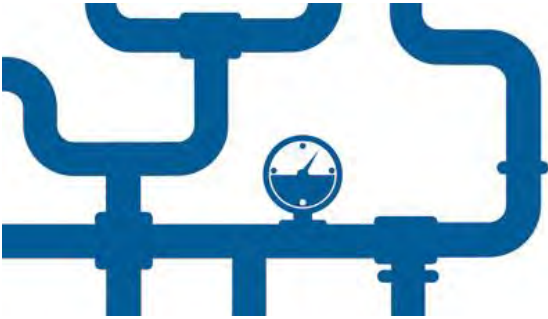
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# Northern village

## Nunavik

## Québec (South)



### Québec

average water consumption:

**400 L/pers./day**

(MELCC, 2009)

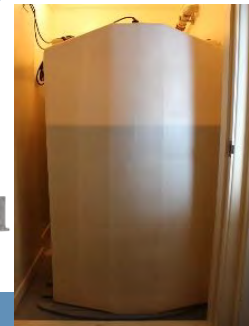
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### Nunavik

average water consumption:

**108 L/pers./day**

(Lemieux et al., 2016)



# Water treatment in most villages - Disinfection

## UV lamps



## Chlorine



## Alternative source water : consumption of untreated « freshwater »



Use of alternative water sources has largely declined between 2004 and 2017  
QANUILIRPITAA? 2017 - Nunavik Inuit Health Survey, RRSSN



# Our research in Nunavik

The overall objective is to optimize the management of drinking water services in northern communities

1. Better understand **access to drinking water supply**, as well as **water consumption habits**;
2. Evaluate the **quality of water** at different stages of the supply process and the **quantity** of water available;
3. Identify sources of contamination and **assess risks** to human health;
4. Develop **dedicated strategies** to limit these risks (treatment, monitoring and management)



# Researchers involved

Stéphanie Guilherme (uOttawa)  
Water treatment and water  
quality in northern  
communities



Caetano Dorea (UVic)  
Water treatment and  
public health



Sabrina Simard  
(Research  
professional, UlaVal)  
Responsible of water  
samples analysis in  
the laboratory



Jérôme Comte (INRS)  
Microbial diversity  
and function

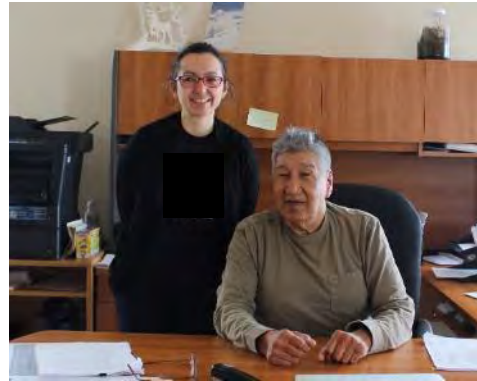


Manuel Rodriguez (ULaval)  
Water quality and source protection



Isabelle Laurion (INRS)  
Aquatic ecology and  
bio-optics

# Northern partners



uOttawa.ca



**Environnement et Lutte contre les changements climatiques**

**Québec**

**REGIE REGIONALE DE LA SANTE ET DES SERVICES SOCIAUX DU NUNAVIK**  
**REGIONAL BOARD OF HEALTH AND SOCIAL SERVICES**

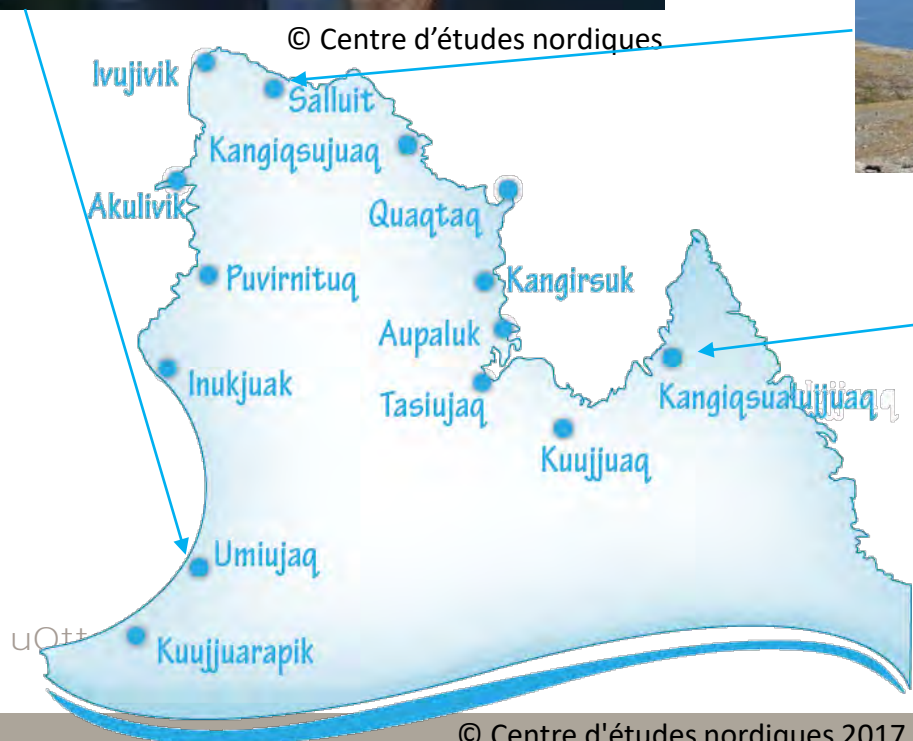
**uOttawa**



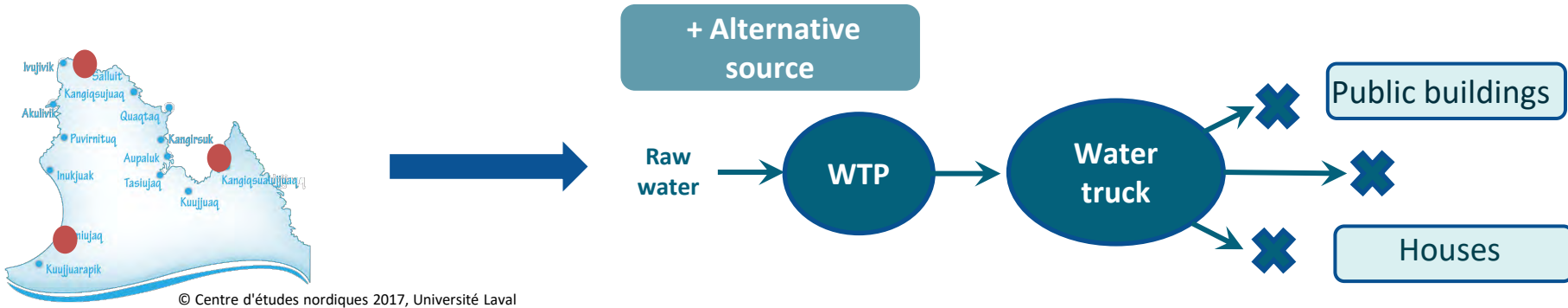
# First assessment of the water quality : Summer 2019



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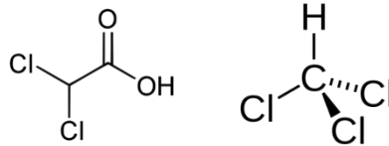
# Sampling campaign summer 2019



Measurement of the physico-chemical properties of water and contaminants in water



Bacteria (coliforms, E.coli), protozoa



Disinfection byproducts

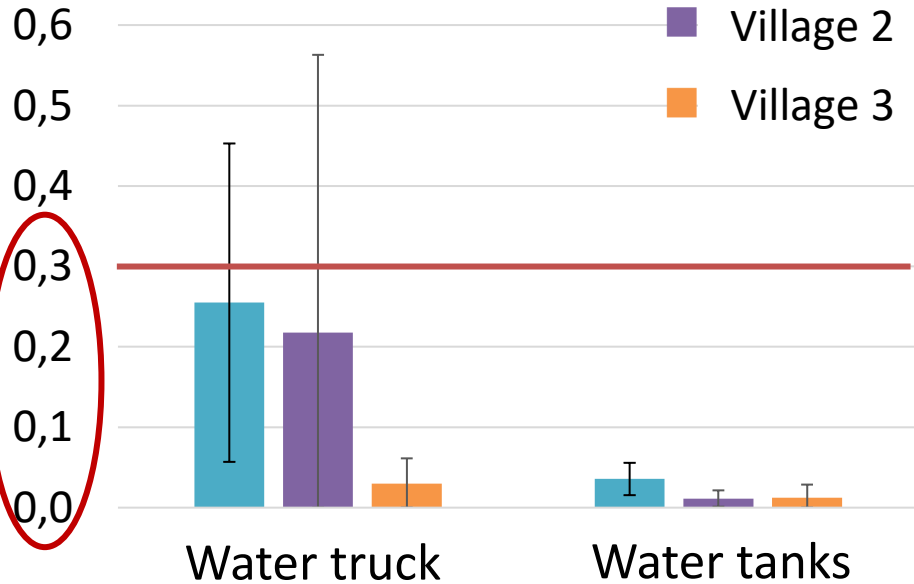


Analyses on site and samples sent in coolers in labs

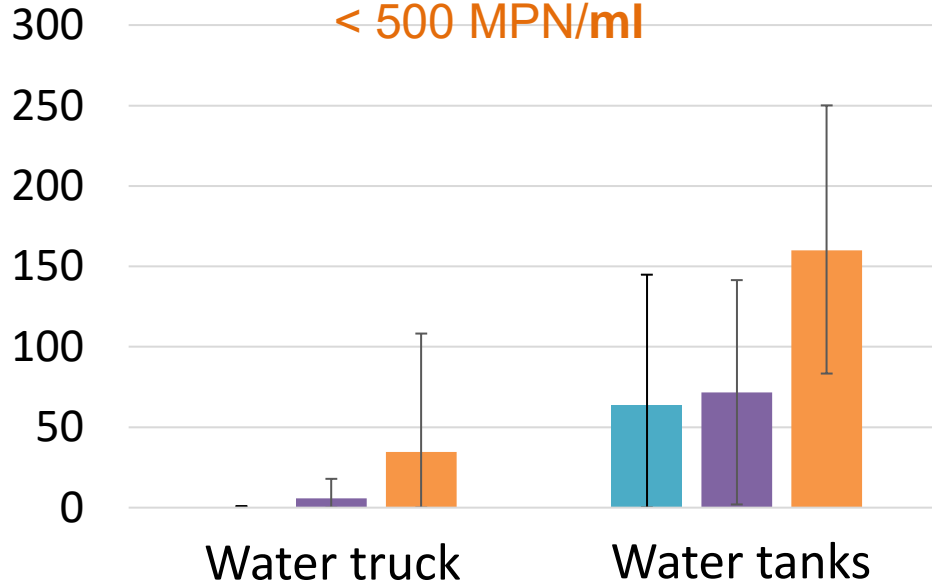
# Results

- Low free chlorine levels
- No coliforms/E. coli in treated water
- Various levels of general bacteria population expressed as heterotrophic plate count (HPC) in the tanks
- Highest bacteria levels in the village with the lowest chlorine level

Free chlorine (mg/L)

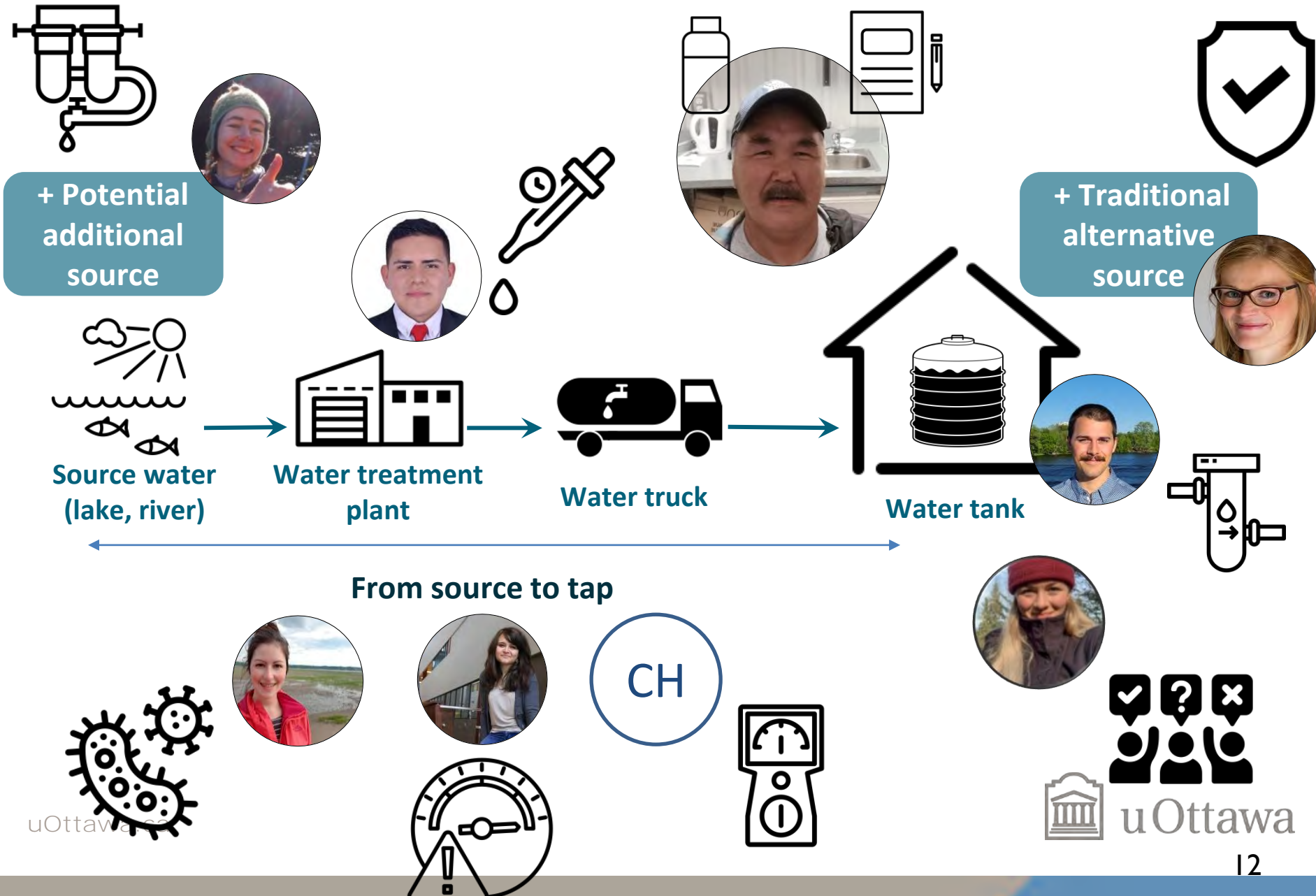


HPC bacteria (MPN/100ml)





# Follow-up research - Kangiqsualujjuaq



# Sampling campaign – 2020-2021

## Research during COVID-19

### Kangiqsualujjuaq



Monthly water sampling campaign organized remotely

- Local sampler: water operator
- All material needed for sampling shipped
- Water samples are send back to the University lab in coolers



# Research on the field – summer 2021

**Dates: from August 11 to September 8, 2021**

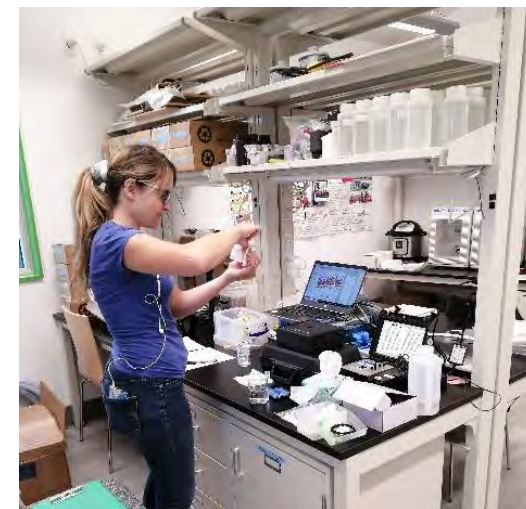




# Visit of Kangiqsualujjuaq - Summer 2021

**Dates: from August 11 to September 8, 2021**

1. Sampling campaign from the water source to the tap : sources (+ alternatives ones), WTP, trucks, reservoirs (public buildings)



## Visit of Kangiqsualujjuaq - Summer 2021

2. Observations of the operations at the water plant and in water trucks
  - Decision making process in the WTP
  - Estimation of water residence time in WTP/Truck/house
3. Household questionnaires on water supply and consumption habits
  - Alexandra Cassivi - <https://www.eaupotable.chaire.ulaval.ca/> Conférence-midi – Chaire de recherche en eau potable de l'Université Laval | « Approvisionnement en eau potable dans les communautés isolées en région arctique : Quels sont les enjeux ? » - Dec. 09 – 12pm





# Visit of Kangiqsualujjuaq - Summer 2021

## Key facts of this fieldwork

- 4 weeks in the village
- 3 lakes around the village
- 5 public buildings + water tank from CEN
- 12 sampling campaign from source to tap
- 9 days following water operators
- 68 questionnaires collected



Crédit photo: Alexandra Cassivi



Crédit photo: Alexandra Cassivi





Other videos available in early 2022 through the activities of the Chaire de recherche en eau potable de l'Université Laval – <https://www.eaupotable.chaire.ulaval.ca/>

## Next steps

### **Results of the summer field work presented to northern partners (northern village, KRG, NRBHSS)**

- Spring 2022
  - Report on water quality data
  - Report on questionnaire data

### **Sampling campaigns**

- From winter 2022
  - Monthly sampling campaign made by the water operator – follow up on water quality (from sources to tap)
- Summer 2022
  - Additional sampling: source vulnerability assessment, in-depth study of risks related to water reservoirs and individual water containers



## Water outreach activities in schools

- 💧 Make a science initiation activity for youth
- 💧 Strengthen the link with the community

**EXPO  
SCIENCES**





# Thank you for your attention



**Chaire de recherche en eau potable  
de l'Université Laval**



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## Questions??

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