

Sisimiut Greenland, 5000 people

This exercise is challenging you to find a sustainable solution for the wastewater handling in Sisimiut. Imagine you should plan the development of the sewage systems over a period of at least 10 years maybe 20-30 years. Maybe you will conclude that the current wastewater handling is good enough given the situation in Sisimiut or maybe you think that the wastewater handling could be optimized to yield a more sustainable system; ie: a system that has less negative impact on the environment, where you utilize or recycle some of the resources in wastewater and organic household waste and even produce vegetables in Sisimiut? Maybe you can produce energy or other useful products from the wastewater and waste resources. Remember there is no right answer, but there are many different systems and/or combination of systems that can be considered.

You should use what you know about the current wastewater handling and infrastructure as a base. With this background suggest what type of treatment is needed before discharge. Then try to outline a system or systems that can meet your requirements.

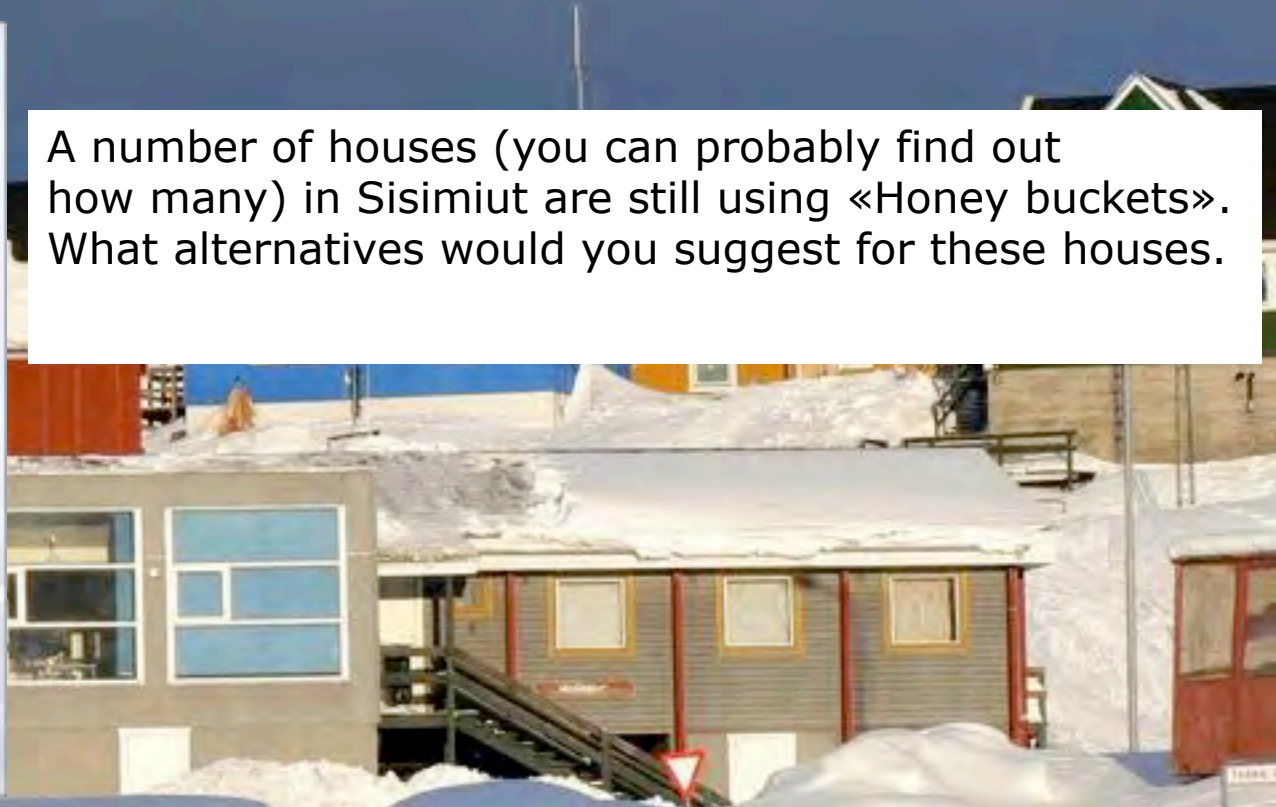
The following slides give you some background information. You may need to supply the information with your own inquiries.

Sisimiut Greenland, 5000 people

?? on «Honey buckets»

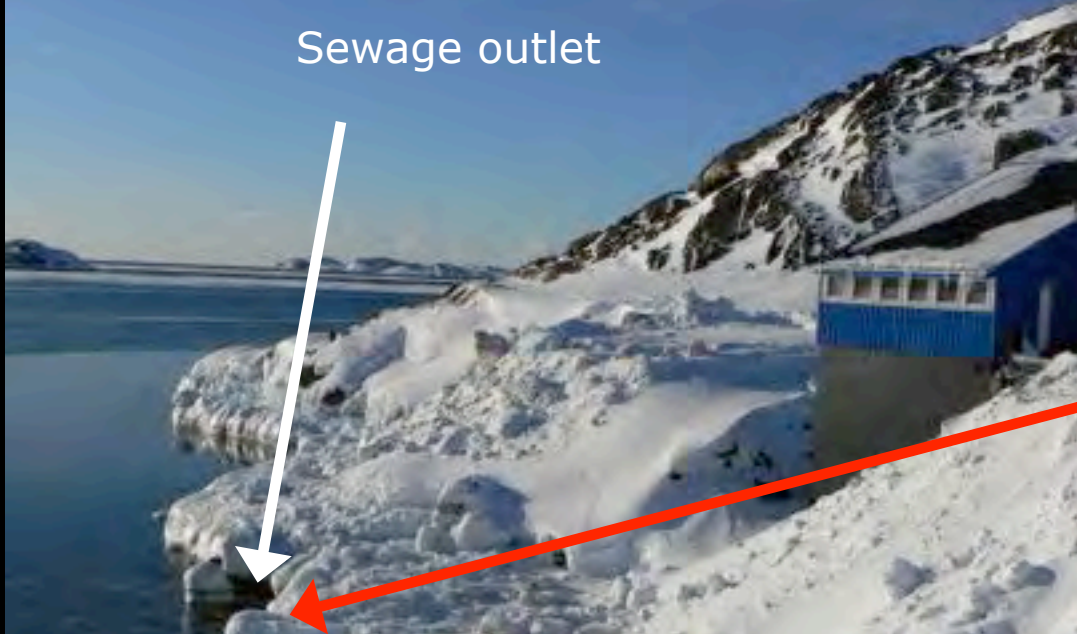


A number of houses (you can probably find out how many) in Sisimiut are still using «Honey buckets». What alternatives would you suggest for these houses.



Blackwater collection and discharge

Sewage outlet



The honey buckets collected with a tractor and a vacuum tank are emptied at the «Chocolate factory» the blue building in the picture. The excreta is discharged untreated.



Sisimiut - greywater outlet winter





Sisimiut - greywater outlet summer

Sisimiut - greywater handling

Frozen greywater



Centralized systems

Water pipe

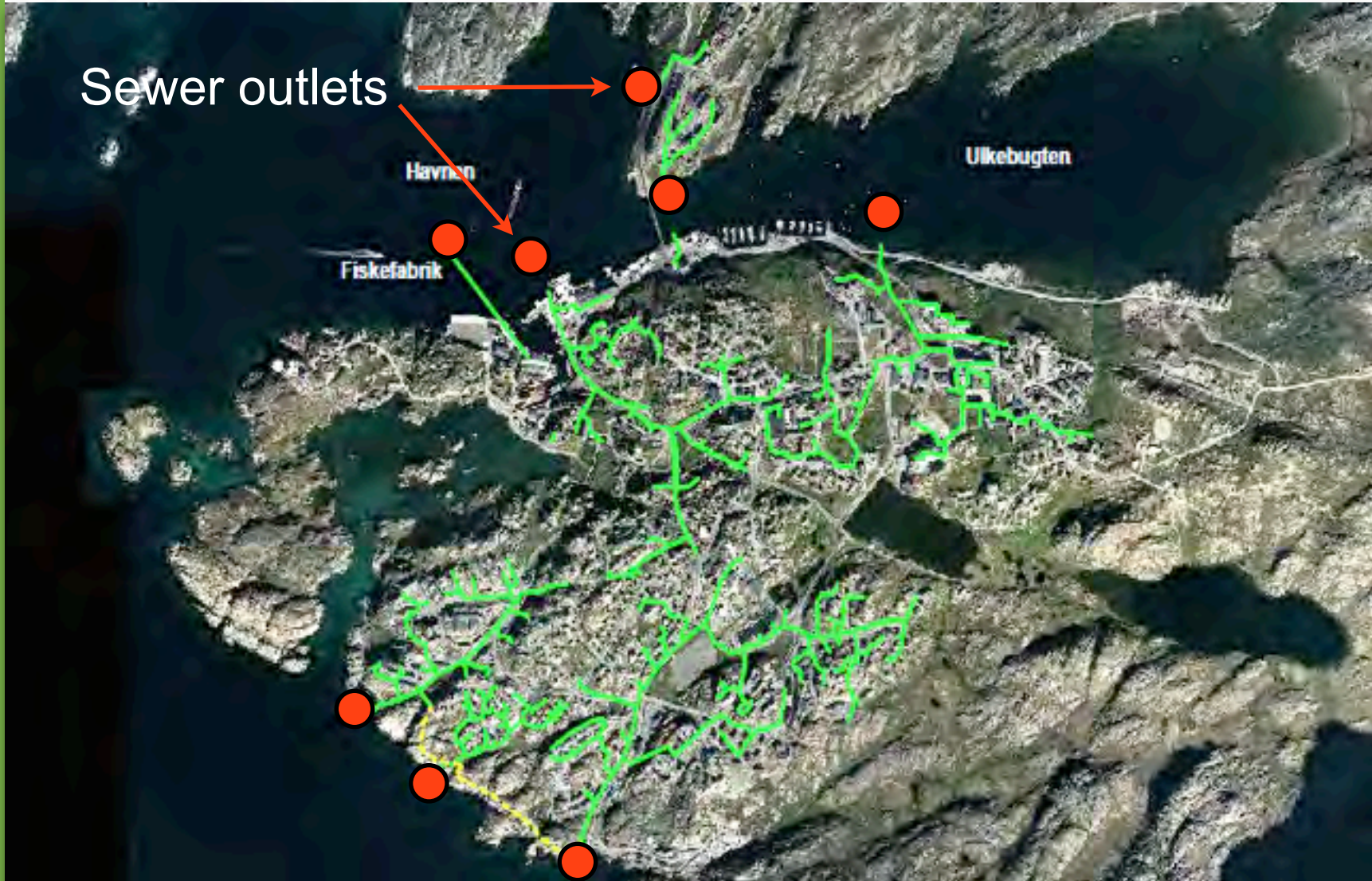


Centralized systems

Wastewater pipes



Sisimiut - sewers and sewer outlets



Blackwater discharge





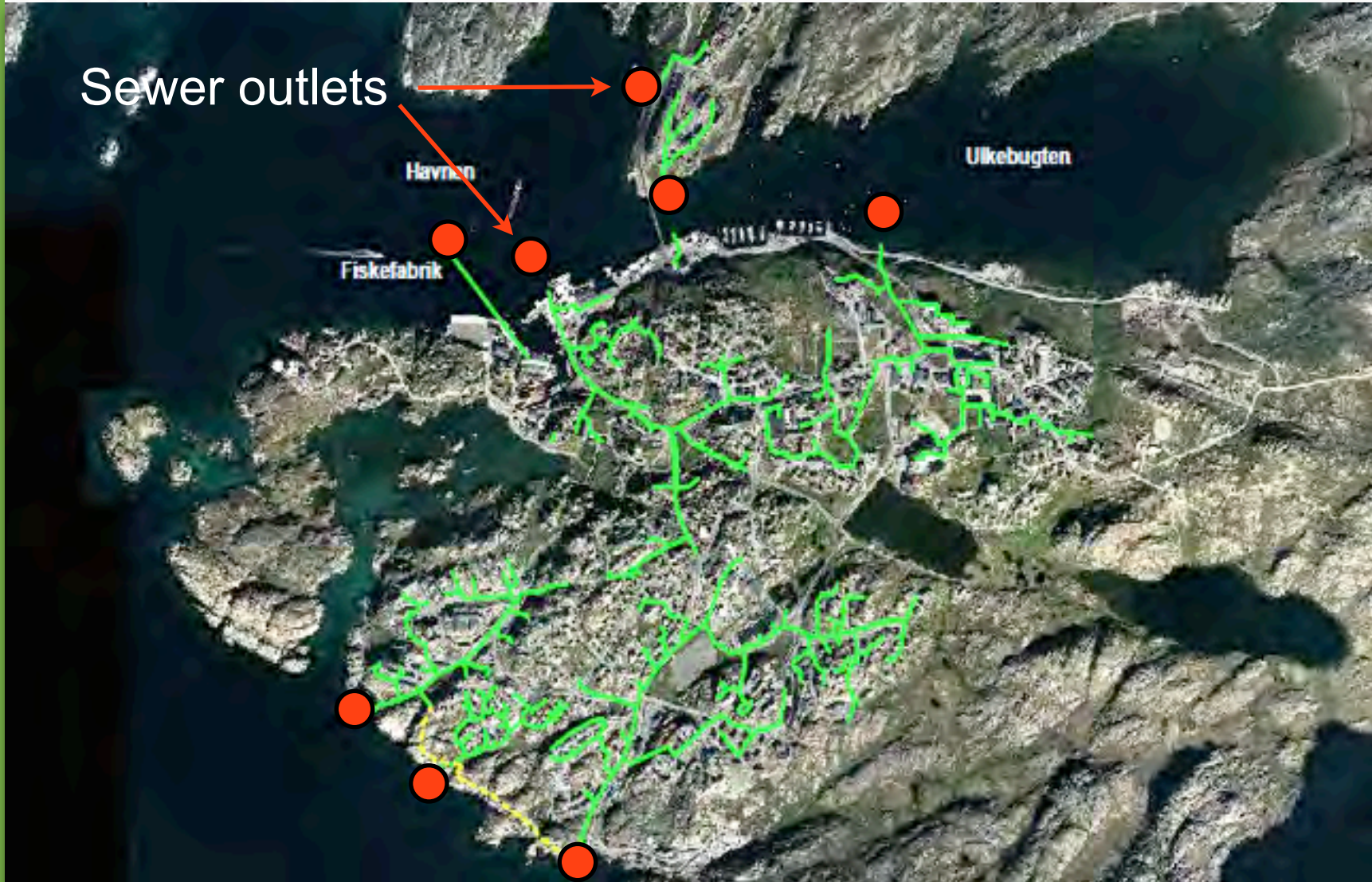
**Accumulation of
unwanted
substances in the
food chain !**



A photograph of a red wooden building, possibly a cabin or observation post, situated on a snowy mountain peak. The building has several windows and a white fence around its base. In the foreground, a large, frozen waterfall cascades down a rocky cliffside, with thick icicles hanging from the frozen water. The sky is overcast and grey.

Greywater

Sisimiut - sewers



Sisimiut - waste incineration



The waste incineration plant in Sisimiut is located close to the «Chocholate factory»

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Single home - source separation

* Low flush vacuum, gravity, urine diverting



Single home - source separation

- * Low flush vacuum, gravity, urine diverting
- * Dry/composting
- * Compact greywater treatment
 - inhouse (biofilter, membrane....)
 - outside (biofilter, infiltration.....)

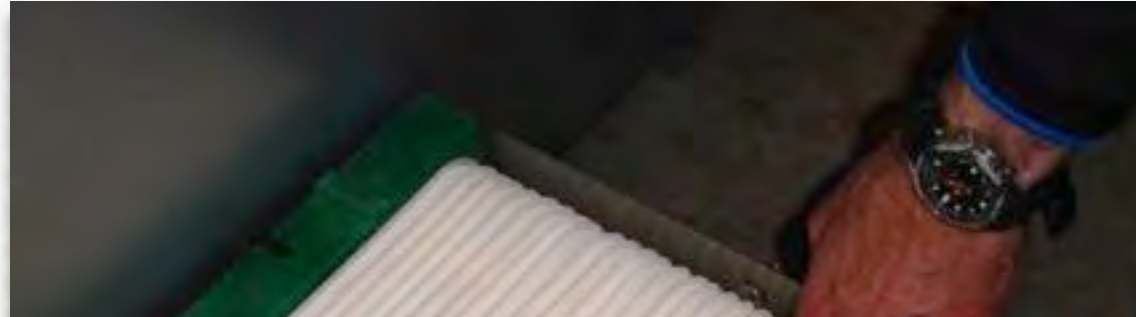


Compact greywater treatment system



Package treatment plants

Membrane bioreactor systems (MBR's)



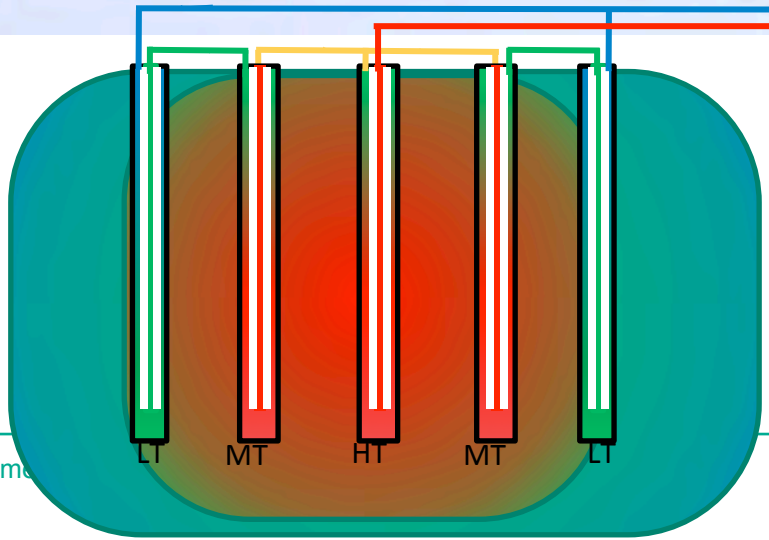
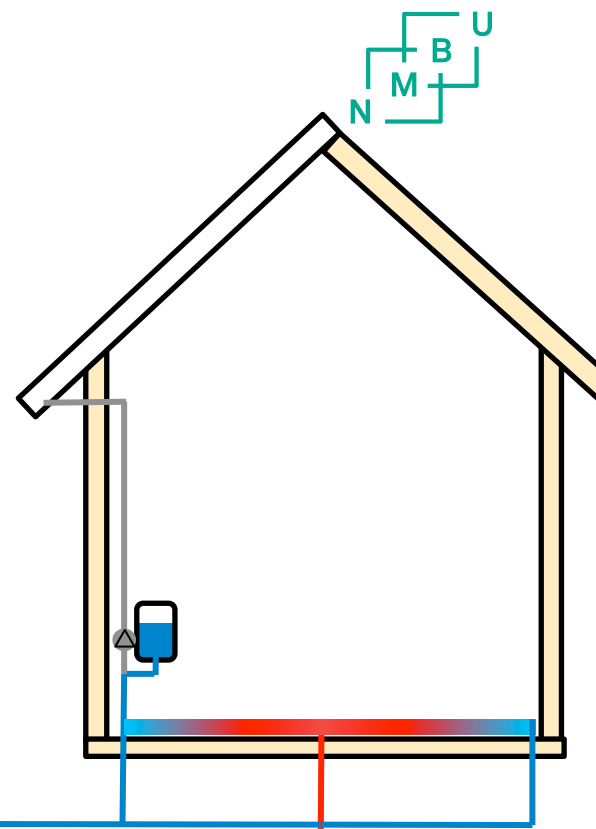
+Compact

- High energy consumption



WINTER:

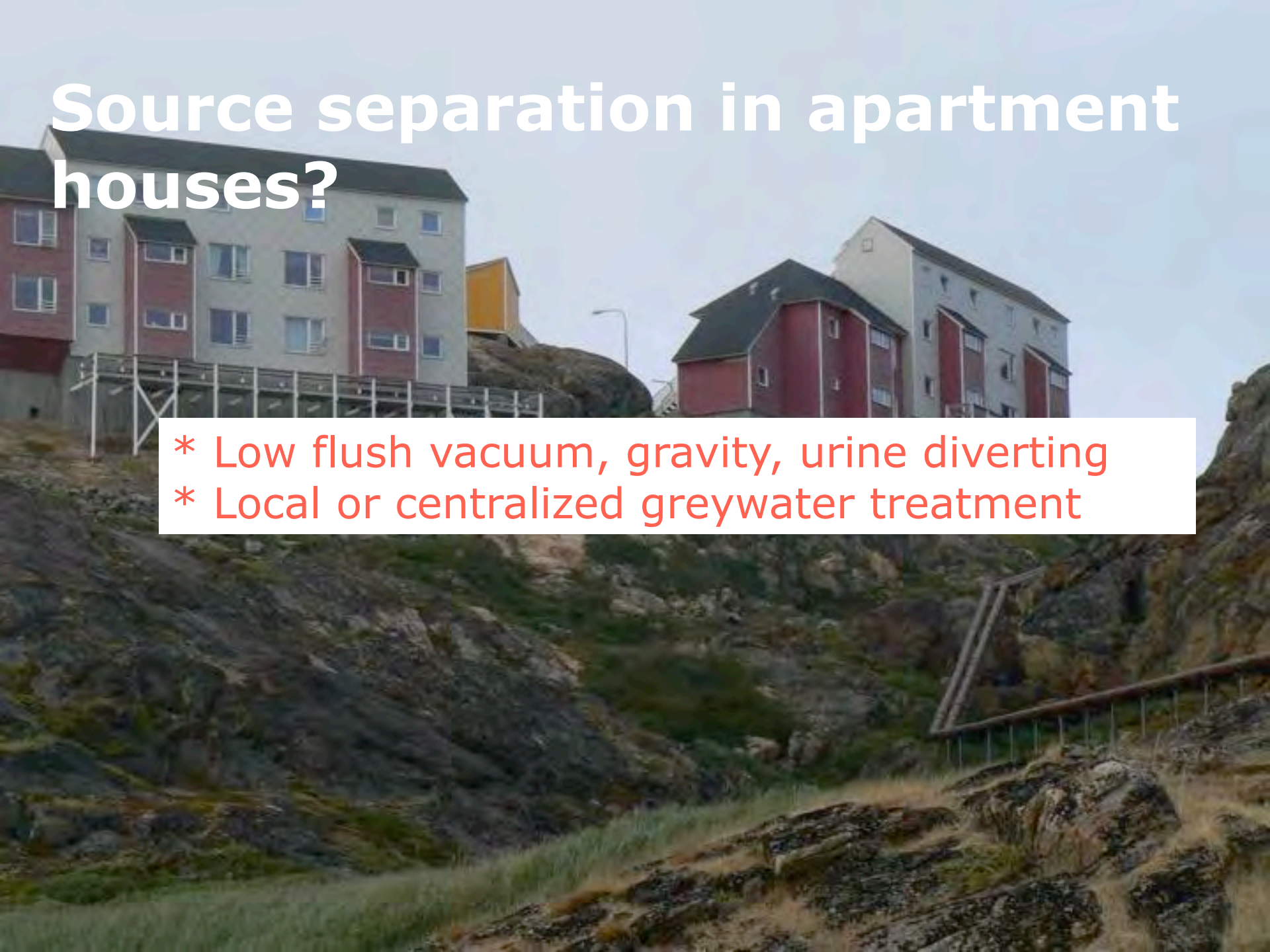
Stored heat is extracted from the ground



Heyerdahl et al. 2016

Source separation in apartment houses?

- * Low flush vacuum, gravity, urine diverting
- * Local or centralized greywater treatment



Source separation in apartment houses?

- * Low flush vacuum,
- * Local or centralized

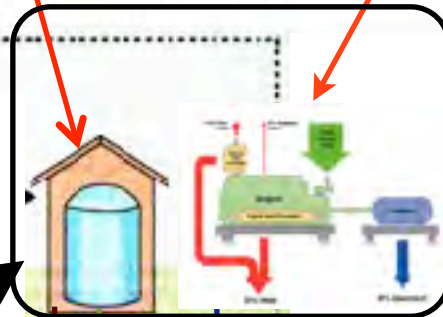


New possibilities - Sisimiut

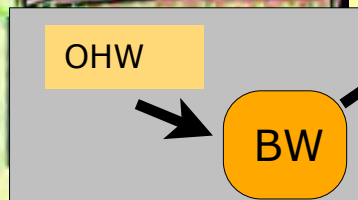
Thermophilic anaerobic treatment - BIOGAS

CHP - combined heat and power

Waste incinerator

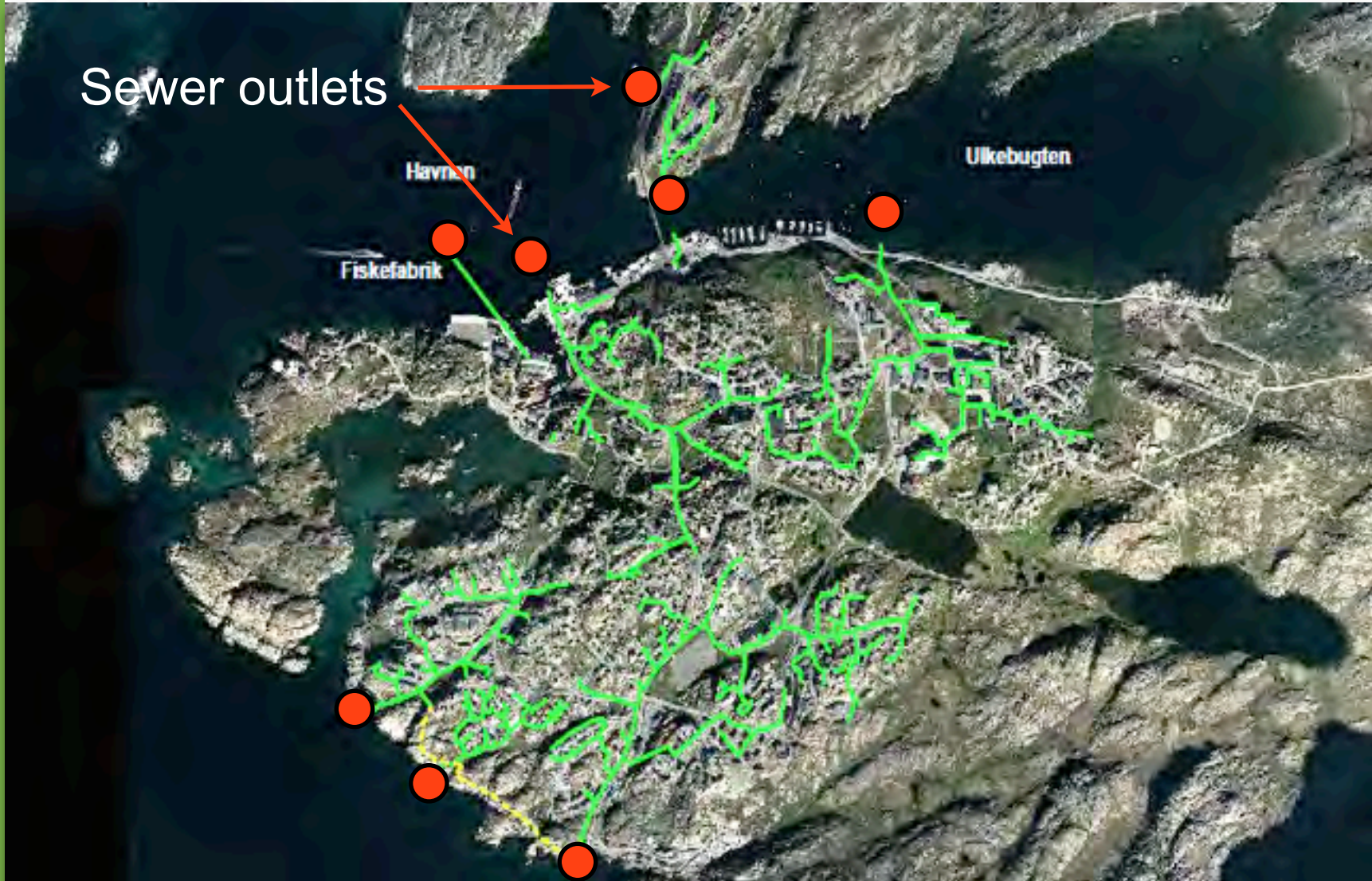


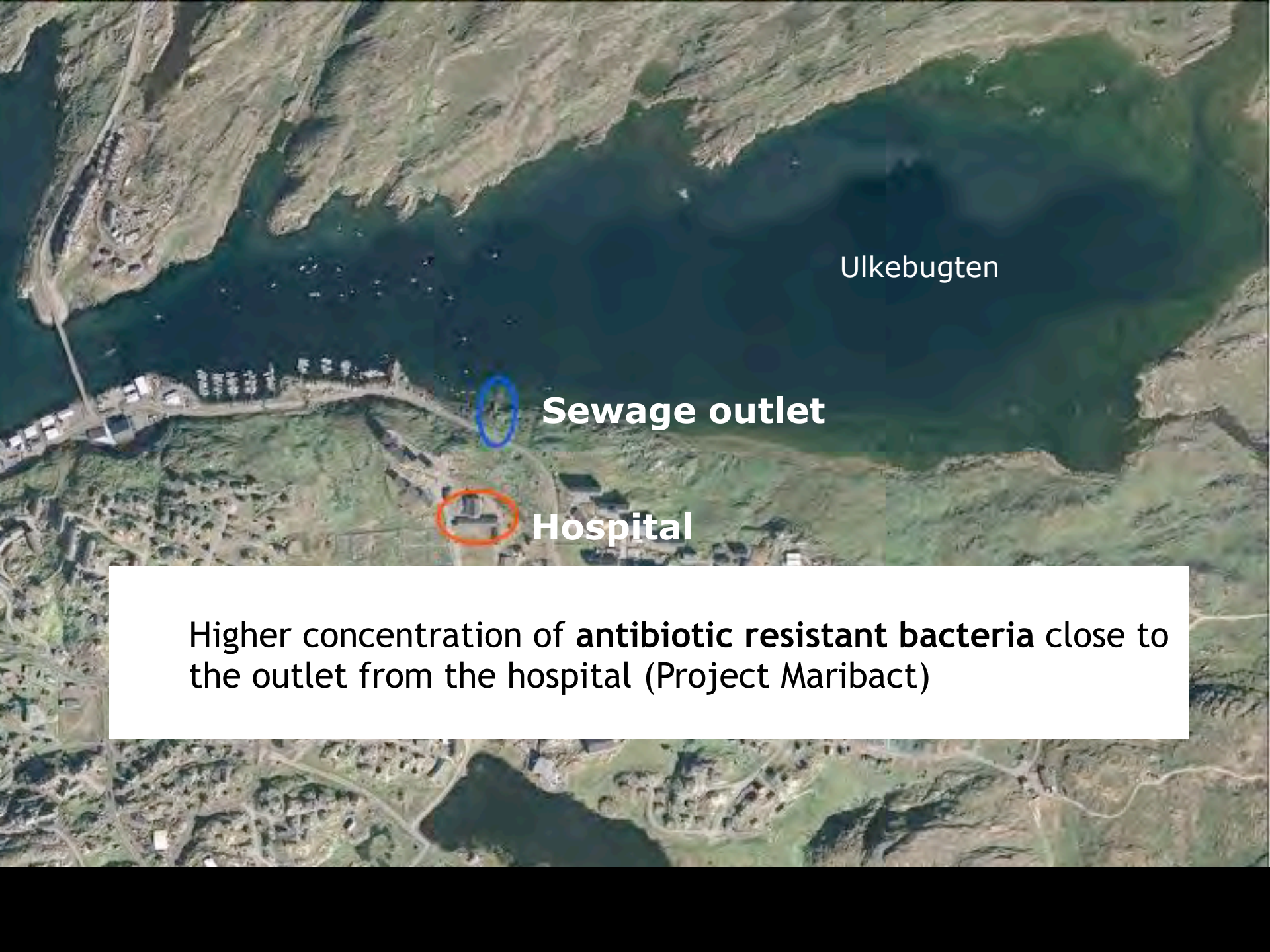
Heat



Growth medium

Sisimiut - sewers and sewer outlets



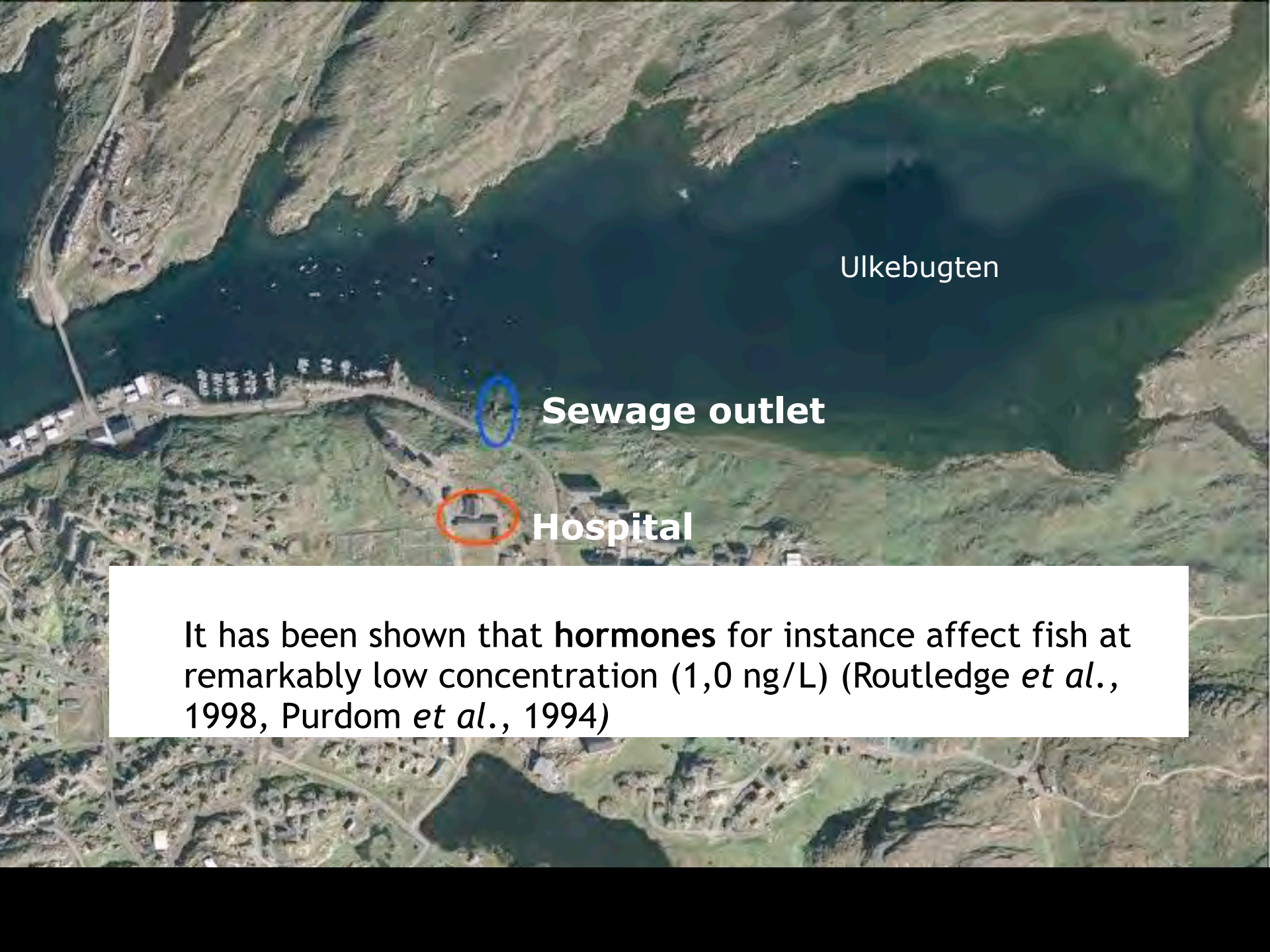


Ulkebugten

Sewage outlet

Hospital

Higher concentration of **antibiotic resistant bacteria** close to the outlet from the hospital (Project Maribact)



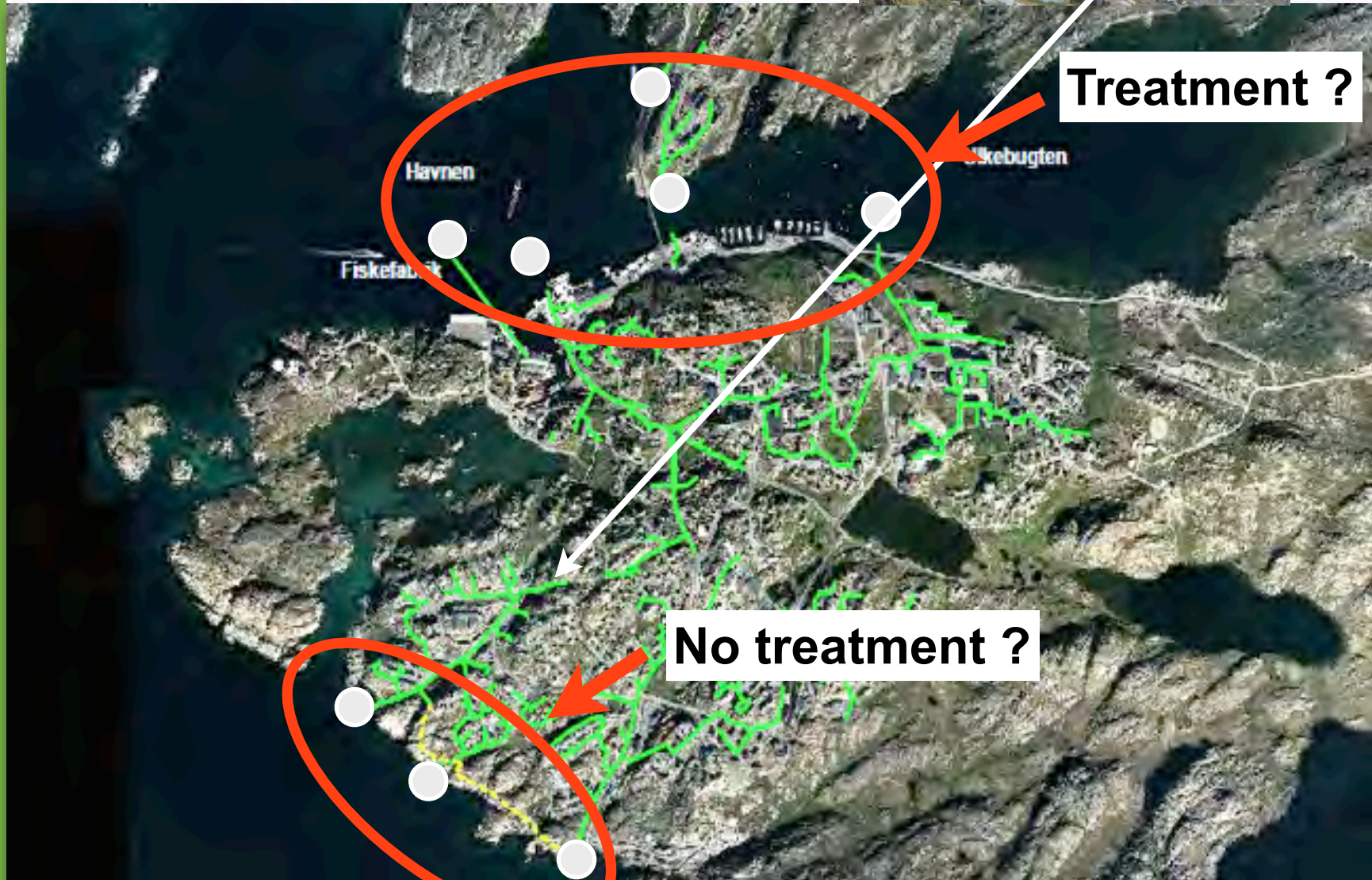
Ulkebugten

Sewage outlet

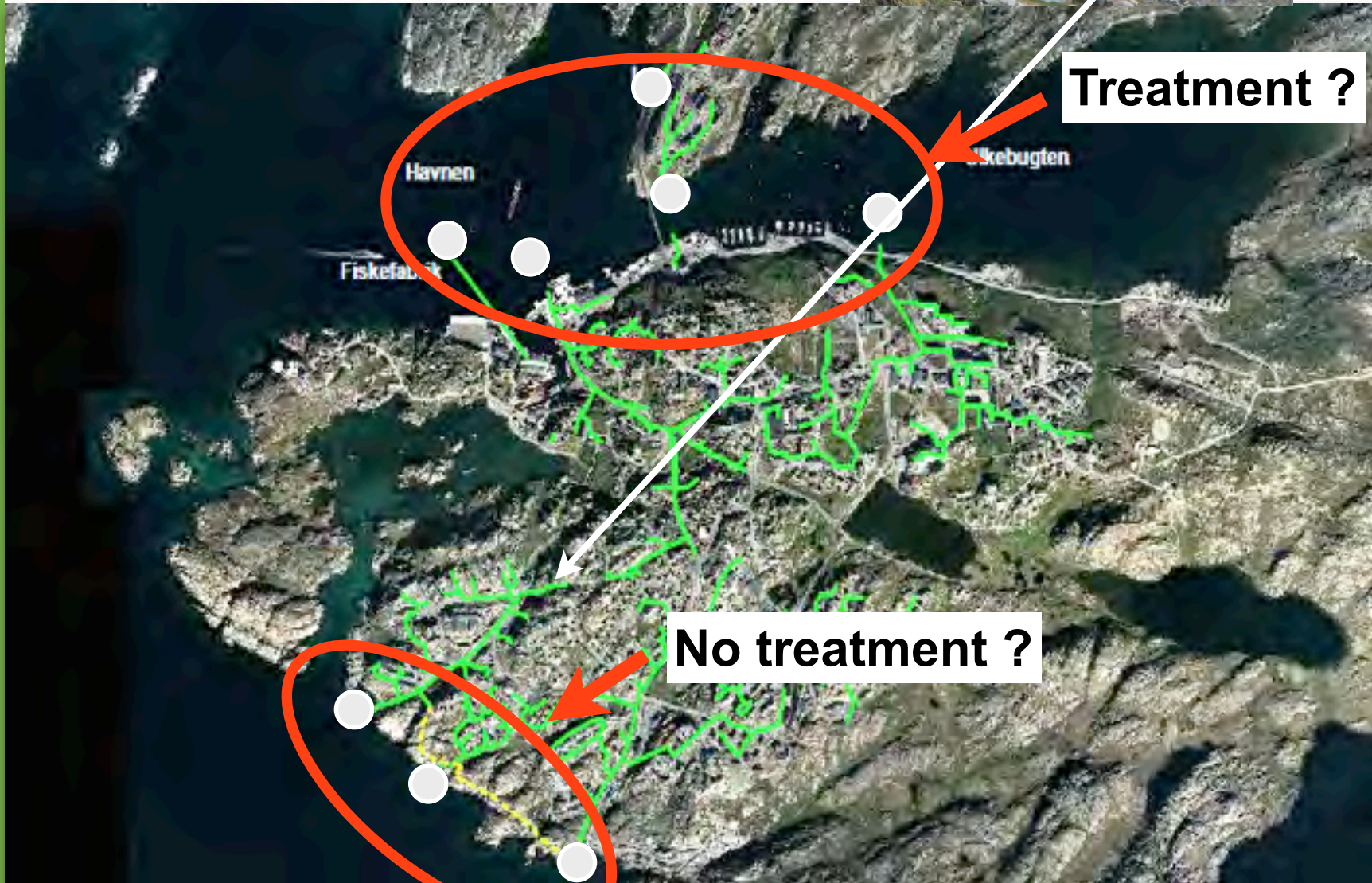
Hospital

It has been shown that **hormones** for instance affect fish at remarkably low concentration (1,0 ng/L) (Routledge *et al.*, 1998, Purdom *et al.*, 1994)

Sisimiut - sewers



Greywater collection & treatment



Greywater collection & treatment

