

## Minutes from interview Hans Brinkhof (19 May)

*Sidenote: at this moment there was being looked at an underwater plastic recognition robot.*

### Who's Hans Brinkhof?

Hans lives in Maastricht and studied civil engineering at the HTS in Heerlen (graduated in 1985). He has worked abroad and in Amsterdam before returning to Maastricht. He has now been working for Rijkswaterstaat for 25 years.

### What does Hans' job entail?

Hans deals with water and ecology (mainly water). He is coordinator of technical advisors and mainly acts as an intermediary. He connects the right people and companies to set up projects. Think of companies like Arkadis, Althea and THV.

Hans also briefly explained the history of Rijkswaterstaat. It was decided 100 years ago that all waterways should be taken care of by one authority instead of all municipalities for themselves and this is currently being extended to the whole of Europe. This ensures that problems can be tackled together.

### 1. How is data collected now?

In 3 ways:

a) A engineering office is called in to map out the pollution load measured in flux (number of plastics per cubic meter) that goes through the Maas. It also looks at where it goes through the Maas.

b) Network monitoring: employees at locks observe the quantity of waste and pass on this information to Rijkswaterstaat. In addition, IVN and Leiden University have also looked at waste loads on banks.

c) Finally, an app has been developed in which people can pass on information on observed waste, whereby Rijkswaterstaat is sent the location + the observed waste.

### 2. Problems collecting data:

The water in the Maas is murky, so it is more difficult to see deeper. Rijkswaterstaat also looks at drones that can distinguish waste from nature. This is especially used for the banks.

Underwater: until now, only a net is stretched to take a representative sample. This is extrapolated to give a representation.

### 3. What kind of data is useful:

It's an interplay, you want to know what your total amount of waste is, i.e. floating, on the banks and in the water, because you want to have the complete picture.

The way in which you can observe underwater flux is now being investigated. Important information for cleaning up rivers is where and when waste passes by.

Another important question is when you set up an installation, do you do so permanently or temporarily. Permanent or temporary also has consequences for the location. For permanent installations, the location does not matter much, but temporary installations are better used at high tide because more waste will pass by.

### 4. Where to collect data:

For image recognition, there is no shipping close to weirs, meaning there is a large area for easy navigation. However, precautions must be taken so that the robot does not fall down the weir.



Figure 1: Weir at the Maas

## 5. What kind of data:

Amount of waste and where it lies are interesting for Rijkswaterstaat.

Bert Bellert is working on what kind of waste exists in the water.

Tips that were mentioned during the interview:

- Interview Lulu Zaat (from the thesis),
- Contact Rinze de Vries (graduated TU Delft), who made a plastic shovel (Noria river cleaning). Ask if you can test there, he also might want to recognize waste to see what ends up in shovel. ([www.Noria.earth](http://www.Noria.earth))
- Look at TRL ( Technology Readiness Levels )
- SRL systematics (Stakeholder Readiness Level). (The technique is often not the problem - > finding stakeholders is)
- Contact Bert Bellert, he's monitoring waste, so he knows what kind of data is useful.
- Flux graph examples.

<https://www.sciencedirect.com/science/article/pii/S0048969720304940>

<https://www.nature.com/articles/s41598-020-59201-1>

<https://theoceancleanup.com/rivers/>

Finally, Hans made the remark, that if we indeed want to design an underwater robot we won't have enough time for a prototype and so we have to do a simulation. Simulation does not mean a computer program, but just putting down on paper all the steps that our project would have to take to get a working robot.

Hans has discussed the project of Rinze de Vries and dropped that we can approach him. Rinze has designed the next robot.



*Figure 2: Noria*

Rinze is always looking for extensions for his robot and we could help with that. We can place our image recognition software + hardware on his machine and immediately categorize and count the passing waste. This gives a concrete feasible goal for our project but also means a big change.

(This is where it was decided to shift the focus of the project).