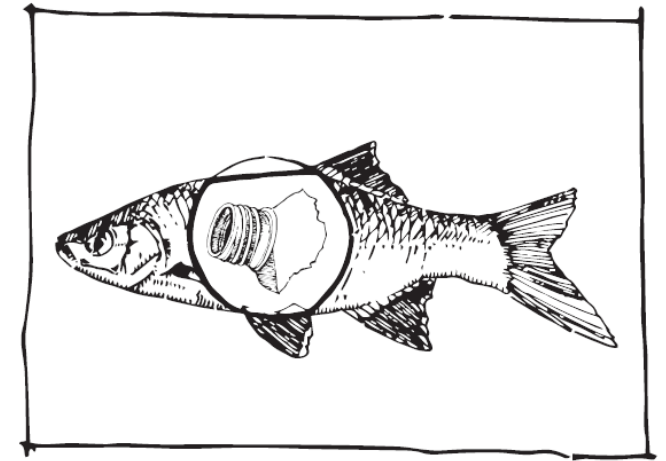


RIVERINE MACROPLASTICS AND HOW TO FIND THEM



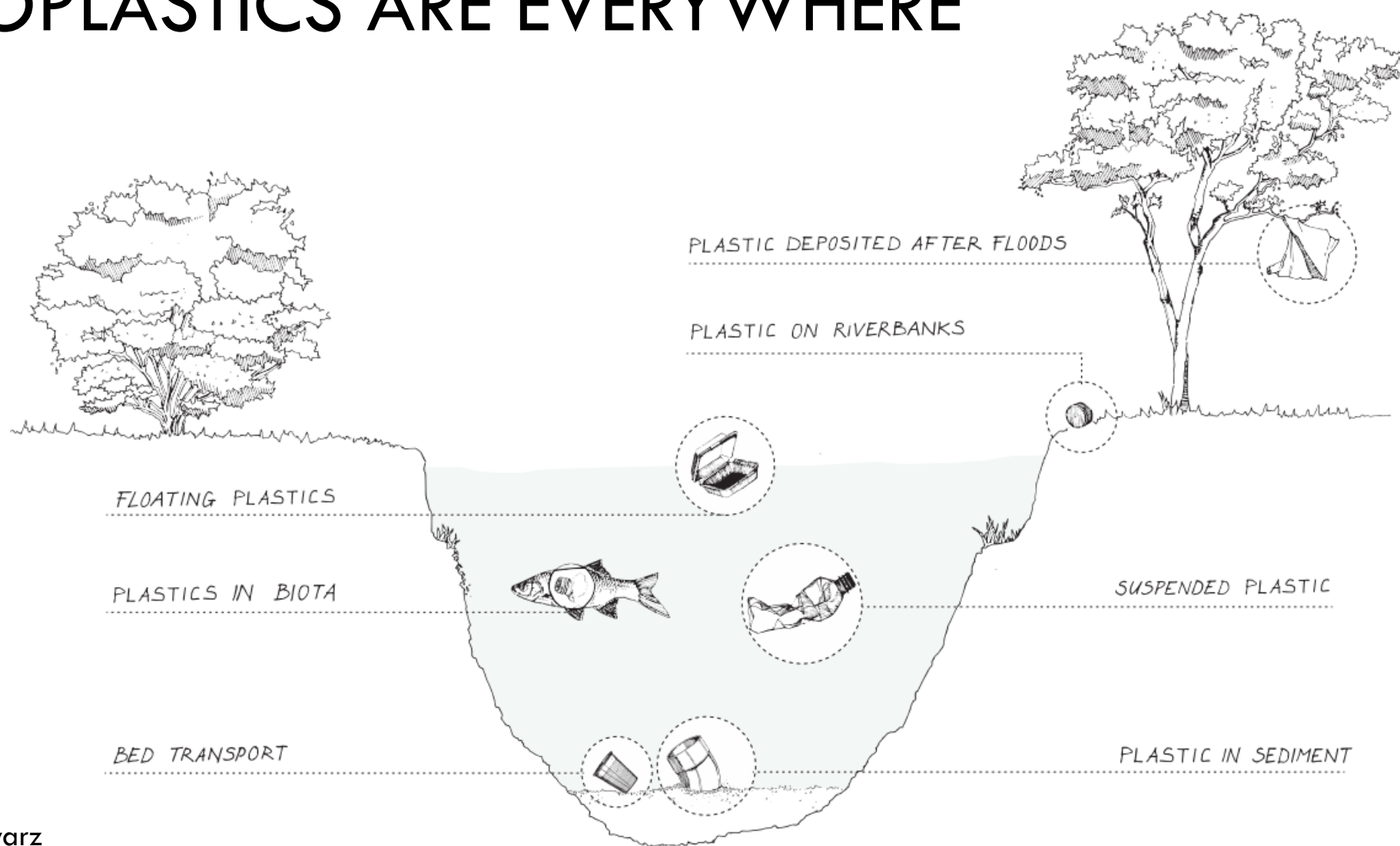
Tim van Emmerik¹, Anna Schwarz²

¹Wageningen University, The Netherlands, ²Netherlands Organization for Applied Scientific Research (TNO), The Netherlands

Contact: TIM.VANEMMERIK@WUR.NL | @TIMVANEMMERIK | ANNA.SCHWARZ@TNO.NL

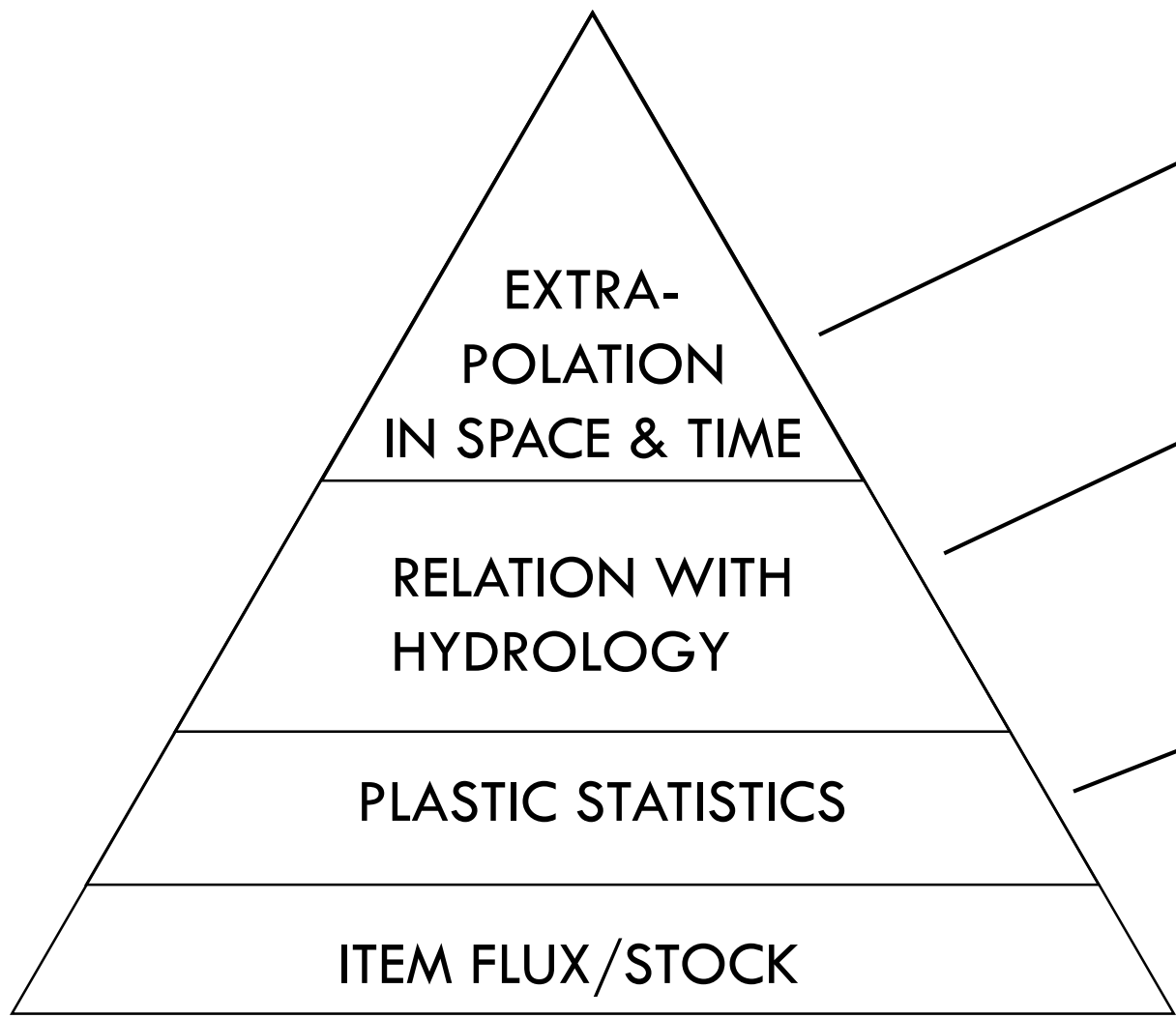
- Macroplastics are abundant in all components of the river system
- Observations are scarce, and often inconsistent
- We propose to always start simple, and add more complexity once you have the basics
- Simple consistent measurements allow us to compare rivers over time and space
- We can explore relations with hydrology
- At the same time, we develop new methods to measure the unmeasured

MACROPLASTICS ARE EVERYWHERE



van Emmerik & Schwarz
(WIREs Water, 2020)

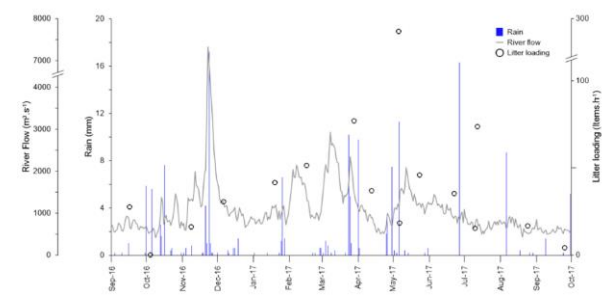
START SIMPLE, ADD COMPLEXITY LATER



van Emmerik et al. (*Frontiers in Marine Science*, 2018)



4: SYSTEM
APPROACH



3: HYDROLOGICAL
MEASUREMENTS

Castro-Jiménez et al. (2019)

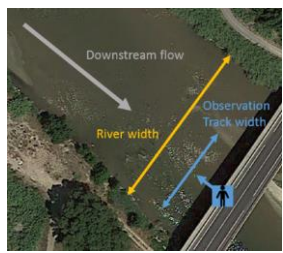


Gasperi et al. (2014)



Moore et al. (2011)

2: SAMPLING

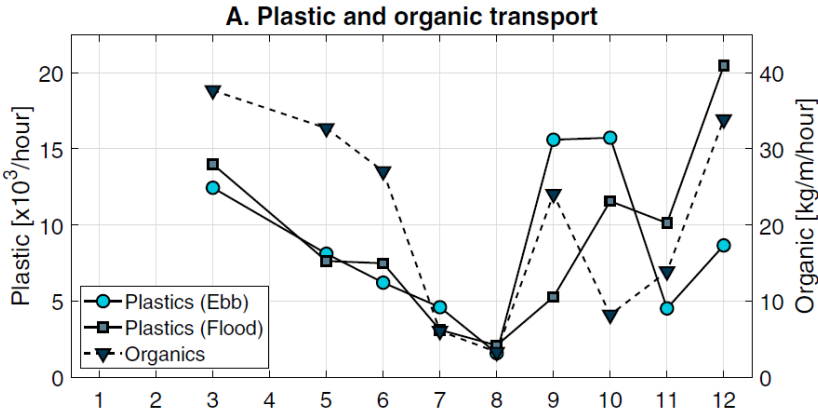


1: VISUAL
COUNTING

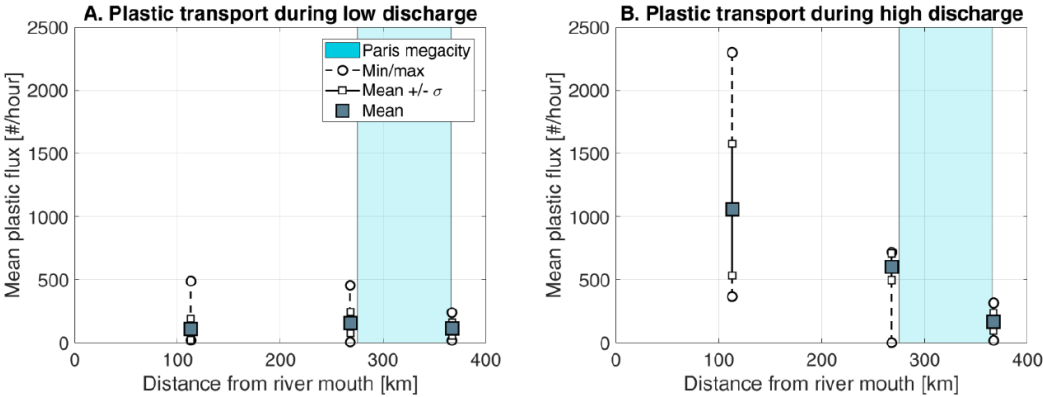
González-Fernández & Hanke (2017)

RECENT DEVELOPMENTS:

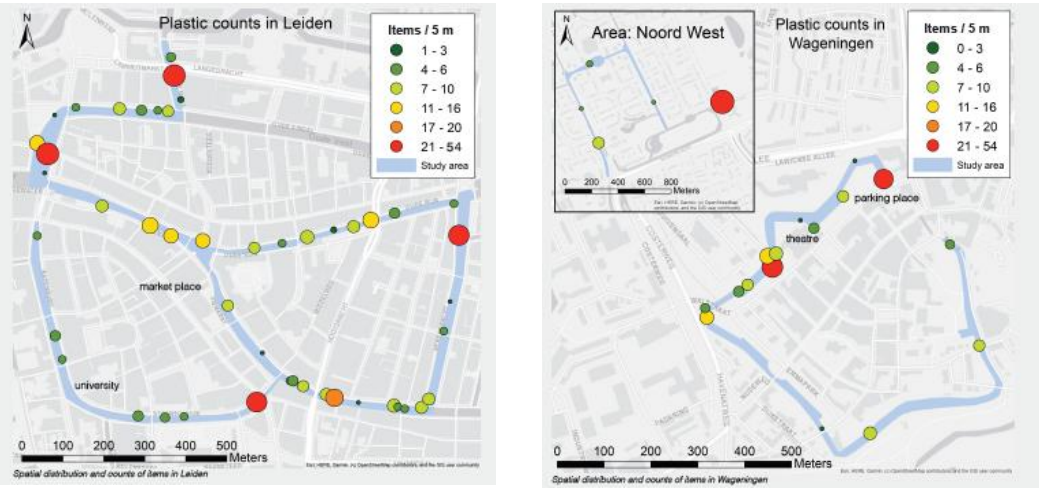
VARIATION OVER TIME



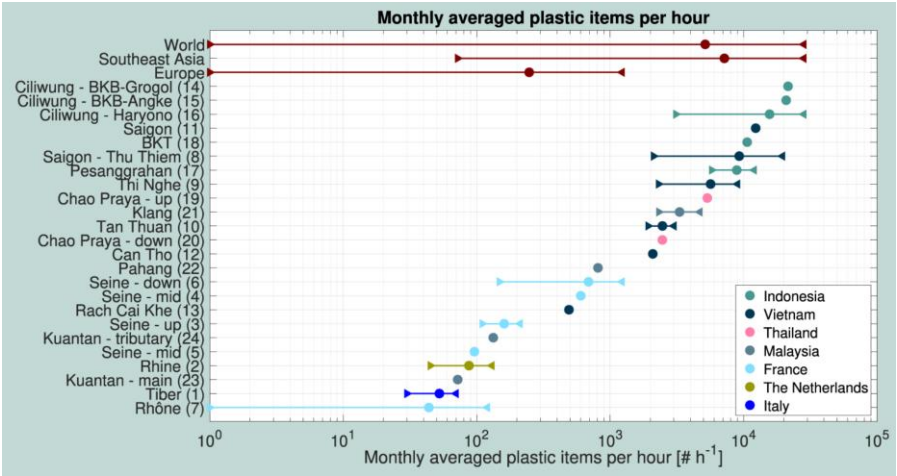
IMPACT OF HYDROLOGY



URBAN PLASTIC HOTSPOTS



GLOBAL COMPARISON



van Calcar & van Emmerik (ERL, 2019)

RESEARCH CHALLENGES:

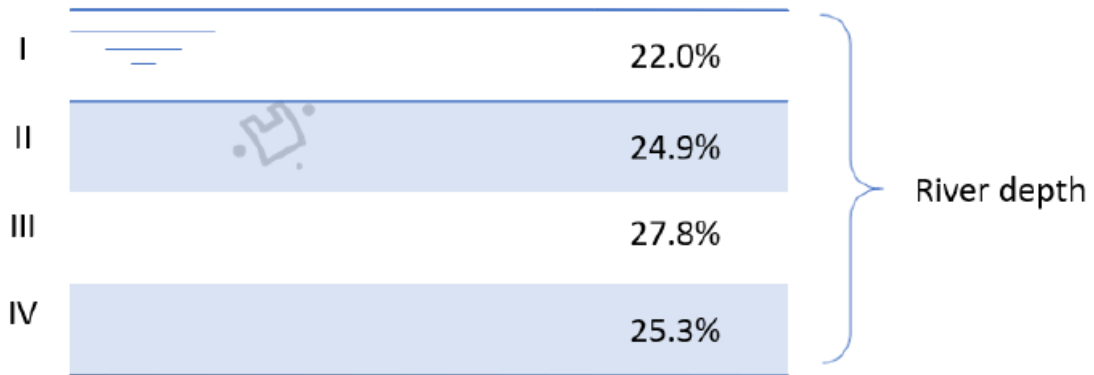
IMAGE-BASED METHODS



Geraeds et al. (*Remote Sensing*, 2019)

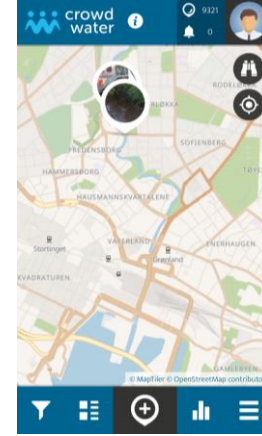
BELOW THE SURFACE

Zone



Broere (2020)

CITIZEN SCIENCE



EXTREME EVENTS



FURTHER READING

Introduction to riverine macroplastics

van Emmerik, T., and A. Schwarz. "[Plastic debris in rivers.](#)" *Wiley Interdisciplinary Reviews: Water* 7.1 (2020): e1398.

van Calcar, C. J., and T. H. M. van Emmerik. "[Abundance of plastic debris across European and Asian rivers.](#)" *Environmental Research Letters* 14.12 (2019): 124051.

Measurement methods

Vriend, P., et al. "[Rapid assessment of floating macroplastic transport in the Rhine.](#)" *Frontiers in Marine Science* 7 (2020): 10.

Geraeds, M., et al. "[Riverine plastic litter monitoring using unmanned aerial vehicles \(UAVs\).](#)" *Remote Sensing* 11.17 (2019): 2045.

van Emmerik, T., et al. "[A methodology to characterize riverine macroplastic emission into the ocean.](#)" *Frontiers in Marine Science* 5 (2018): 372.

Case studies – Indonesia

Honingh, D. et al. "[Urban River Water Level Increase Through Plastic Waste Accumulation at a Rack Structure.](#)" *Front. Earth Sci.* 8 (2020):28.

van Emmerik, T., et al. "[Riverine plastic emission from Jakarta into the ocean.](#)" *Environmental Research Letters* 14.8 (2019): 084033.

Case studies – France

van Emmerik, T., et al. "[Seine plastic debris transport tenfolded during increased river discharge.](#)" *Frontiers in Marine Science* 6 (2019): 642.

Case studies – Vietnam

van Emmerik, T., et al. "[Seasonality of riverine macroplastic transport.](#)" *Scientific reports* 9.1 (2019): 1-9.