

Miljøringen, Moss 21.11.2023

Mikroplast i grøftemasser – et skjult problem for miljømyndighetene?

Elisabeth Rødland – NIVA

Lene S. Heier – SVV

Ole Christian Lind – NMBU

Sondre Meland - NIVA



Statens vegvesen



Rinnleiret, E6

- **Norge har mer enn 55 000 km riks- og fylkesveier (SVV, SSB)**
- **Store deler av veinettet forbinder tettsteder og byer**



Vikhammer, FV941

Det er stor variasjon i

- **Topografi, sideterreng, jordtyper**
- **Trafikkmengde**
- **Fartsgrenser**
- **Kjøremønster**

Skullerud, E6

- Det er stor variasjon i**
- **Dreneringsforhold**
 - **Bortledning av vann**
 - **Rensing av veivann**



VEIFORURENSING

PARTIKLER

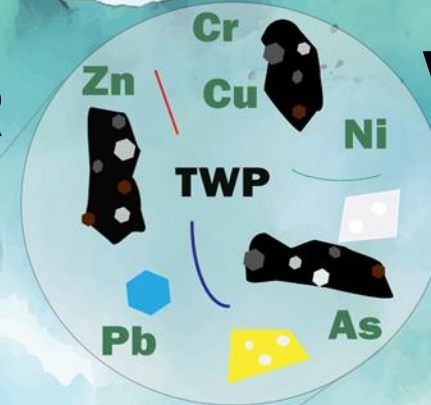
NÆRINGSSTOFFER

METALLER

VEISALT

**ORGANISKE
MILJØGIFTER**

OLJEFORBINDELSER



Lavtrafikerte veier i Trøndelag

RAPPORT

Håndtering av forurensede masser langs veg

OPPDRAAGSGIVER

Statens vegvesen Region Midt

EMNE

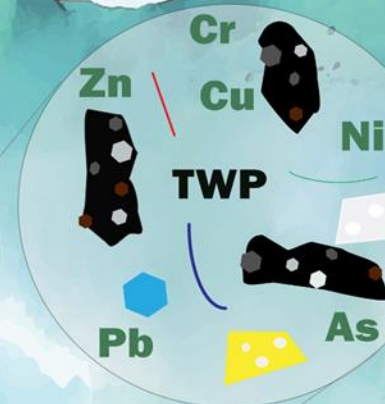
Undersøkelser i Trøndelag 2018

DATO / REVISJON: 21. desember 2018 / 00

DOKUMENTKODE: 10205153-RIGm-RAP-001



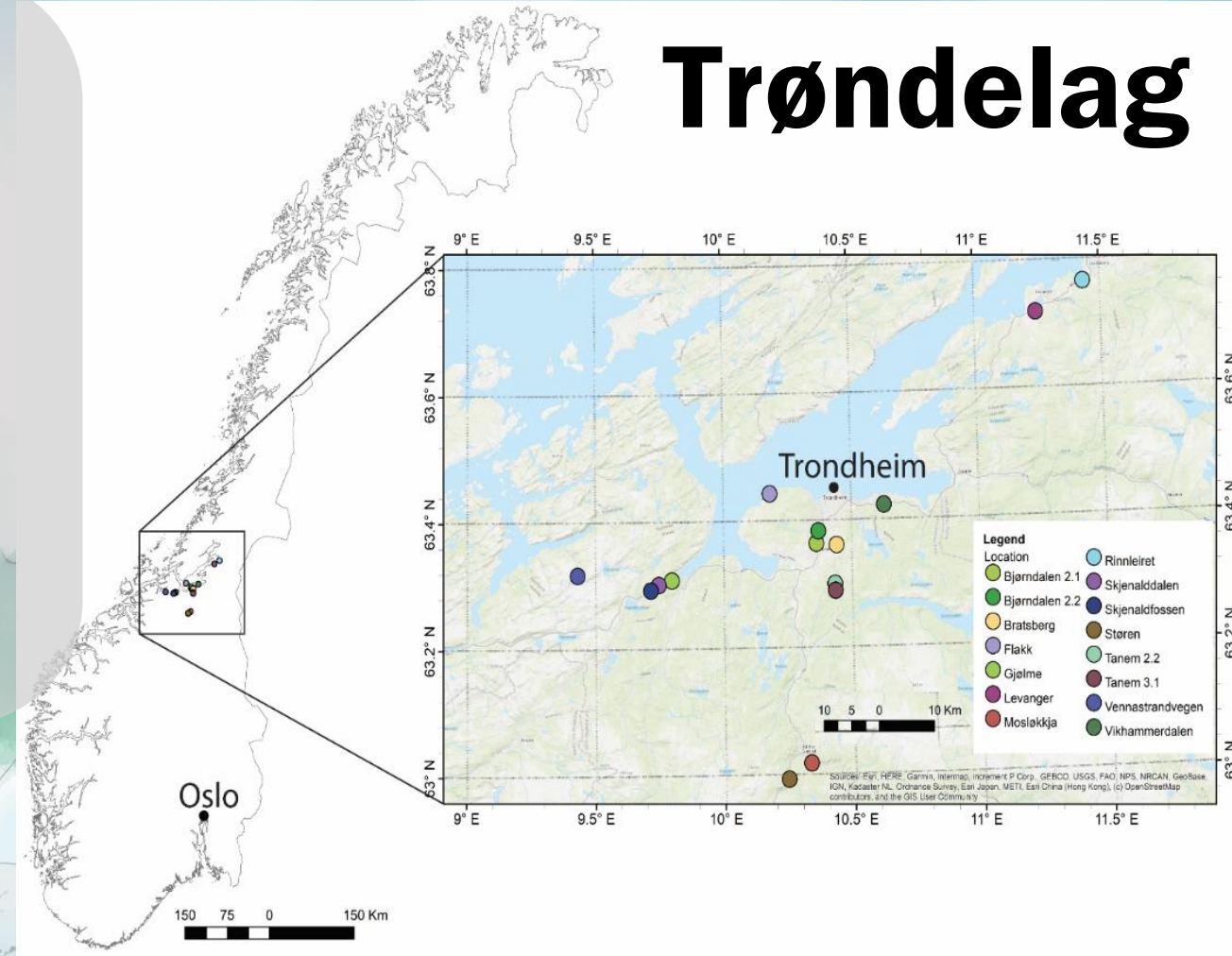
Multiconsult



- **15 lokaliteter (2018)**
- **Lav trafikk (650 -14500 v/d)**
- **Medium fart (60-80)**
- **Målt metaller, PAH, PCB, olje, salt og organisk innhold**
- **Distanse fra vei (0, 3, 5m)**
- **Ulike typer jord (sand/morene, silt/leire, myr)**
- **Ulike grøfteprofil (opp, flatt, ned)**



Trøndelag

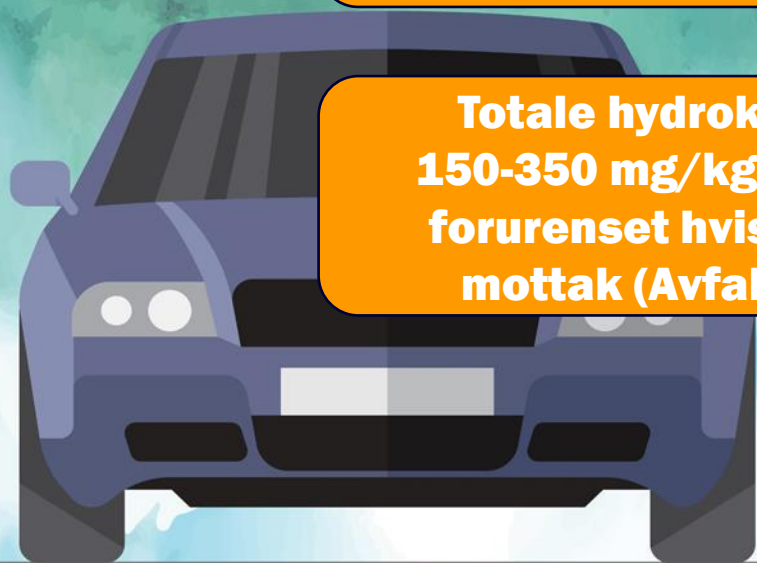
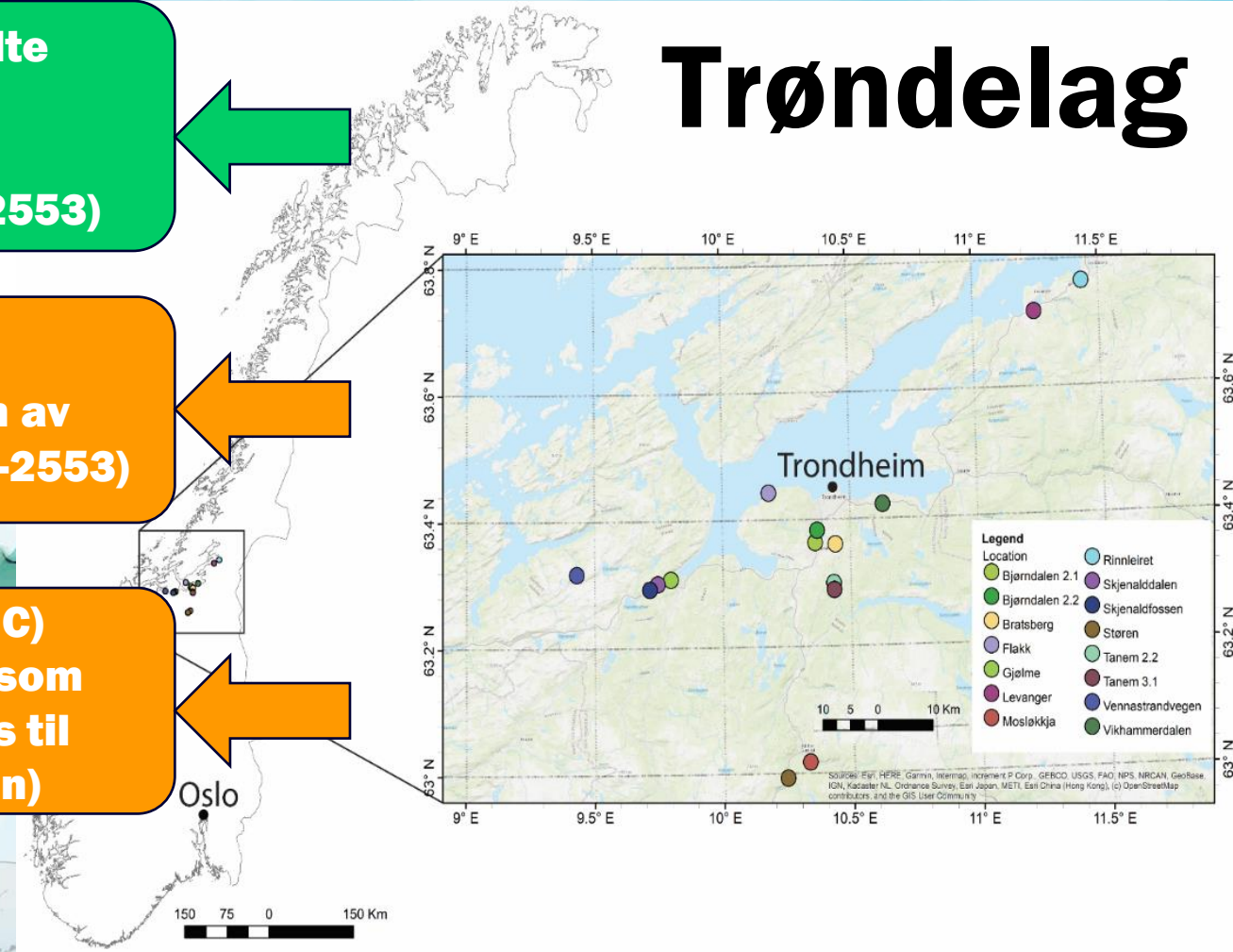


Trøndelag

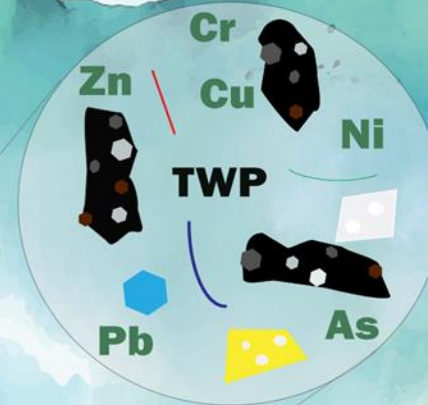
75% av prøvene tilfredstilte tilstandsklasse 1 ihht Miljødirektoratets tilstandsklassifisering (TA-2553)

24% av prøvene var i tilstandsklasse 2 på grunn av alifater (oljeforbindelser) (TA-2553)

Totale hydrokarboner (THC) 150-350 mg/kg håndteres som forurenset hvis det leveres til mottak (Avfallsforskriften)

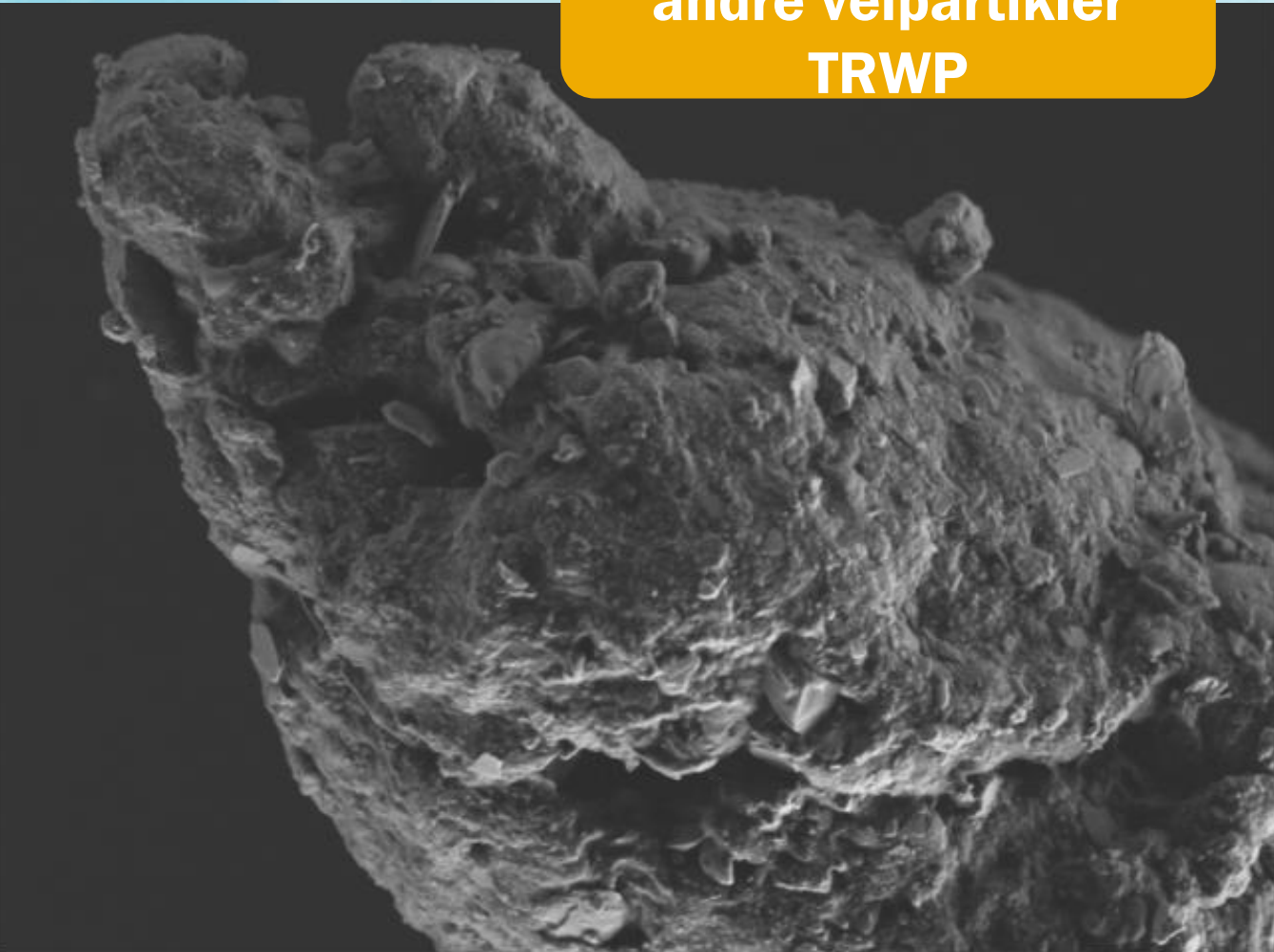


HVA MED MIKROPLAST FRA VEIENE?



MIKROPLAST

Bildekk blandet med andre veipartikler
TRWP



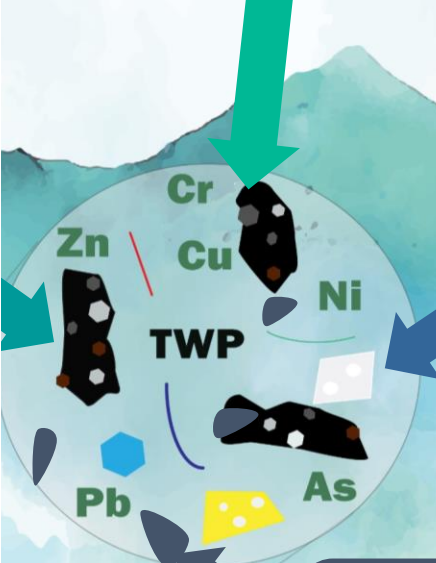
5µm

Bilde av Particle Vision, MikroRENS finansiert av SVV

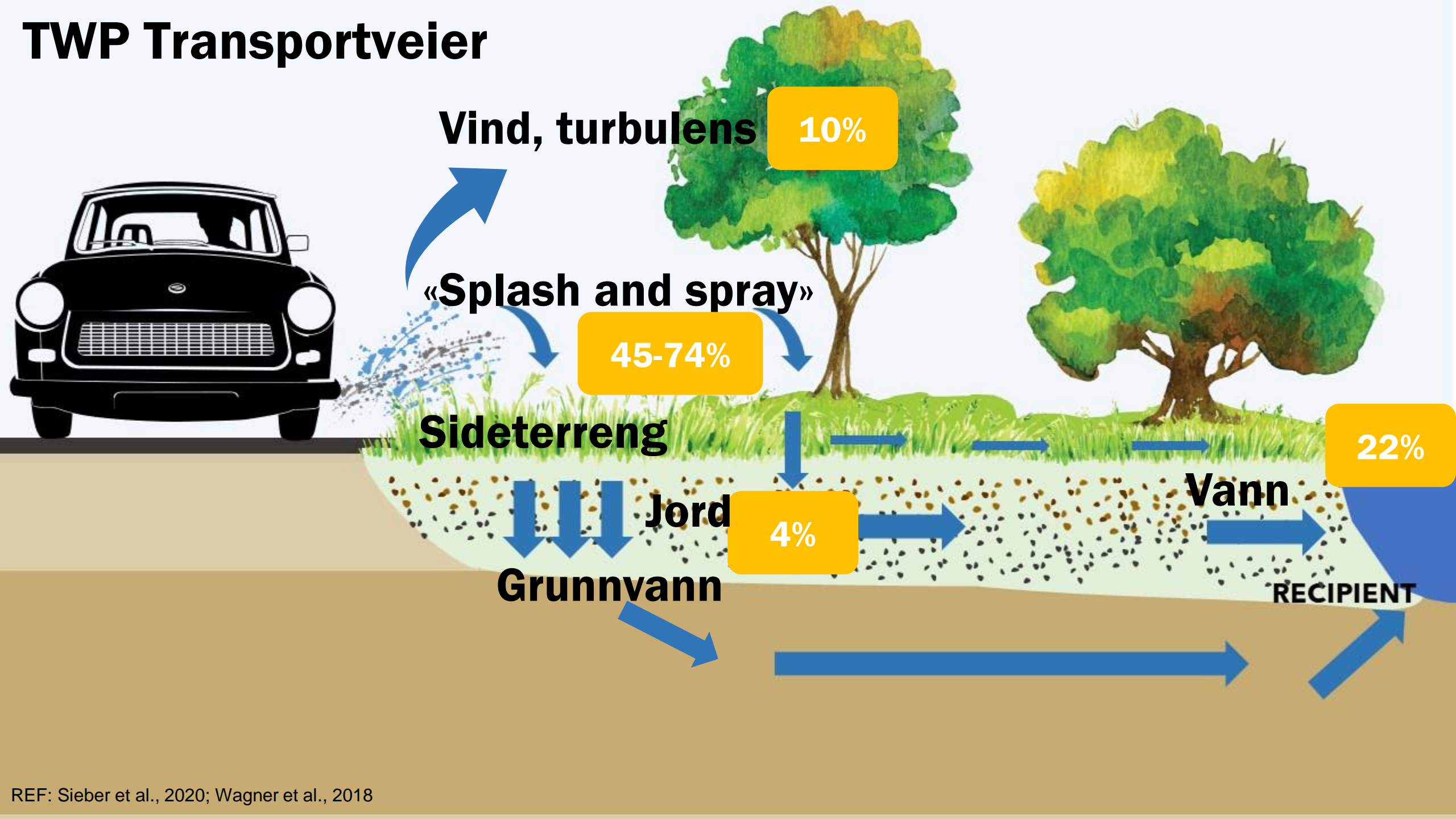
Veipartikler med PMB
(RWP_{PMB})
SBS, scrap tires, other

Veimerking
(RM)
SIS, EVA, PA

Bremsepartikler
(BW)
Rubber



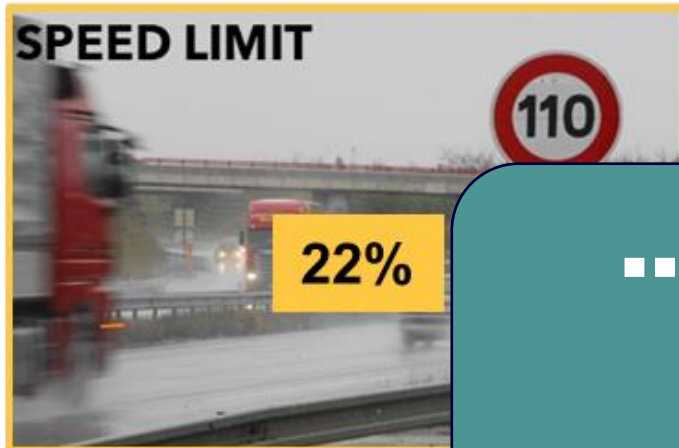
TWP Transportveier



REF: Sieber et al., 2020; Wagner et al., 2018

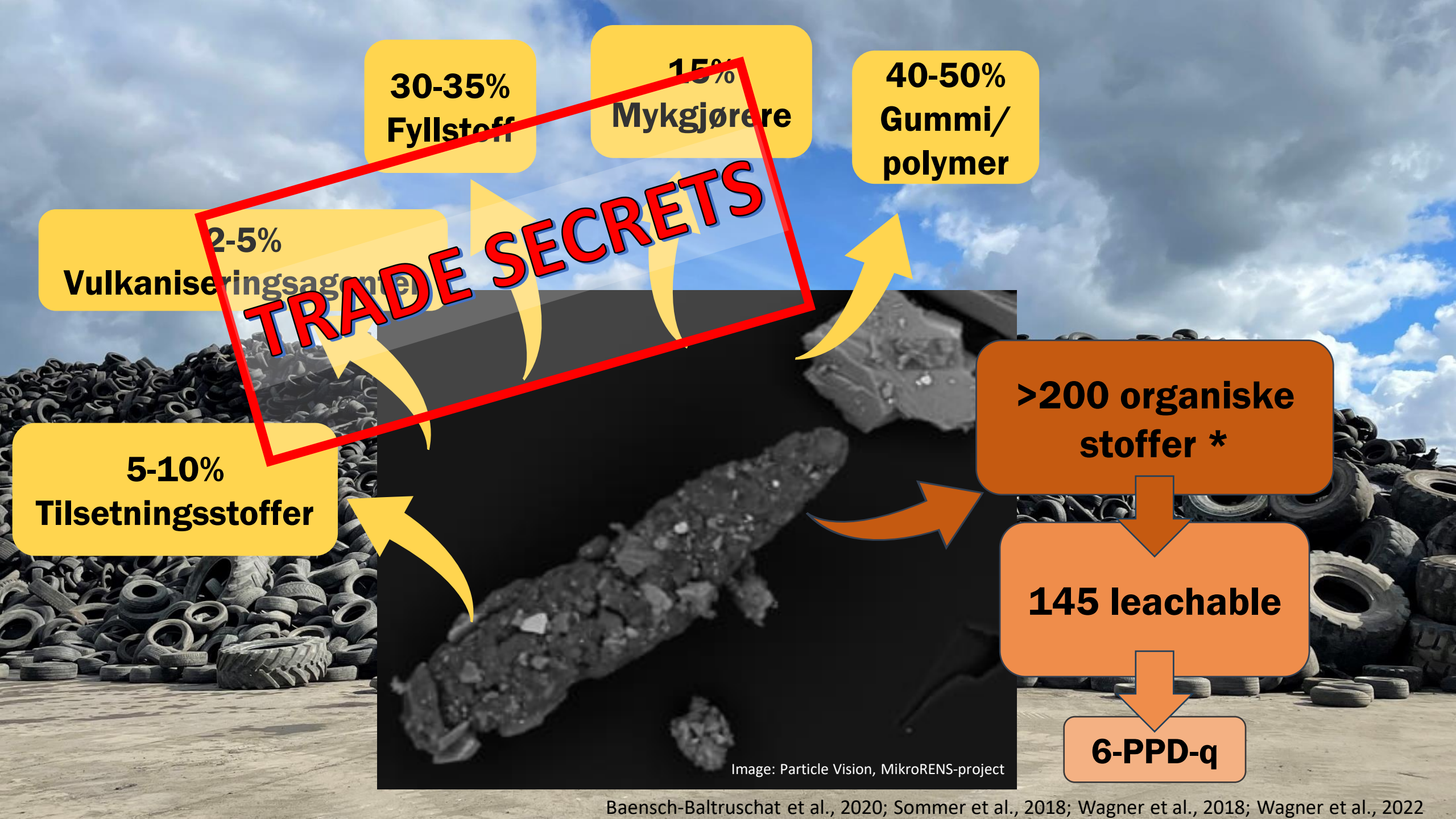
FAKTORER SOM PÅVIRKER TWP

TWP VEINÆR SNØ



... MEN ER TWP ET PROBLEM FOR MILJØET?





30-35%
Fyllstoff

15%
Mykgjørere

40-50%
**Gummi/
polymer**

2-5%
Vulkaniseringsagenter

TRADE SECRETS

5-10%
Tilsetningsstoffer

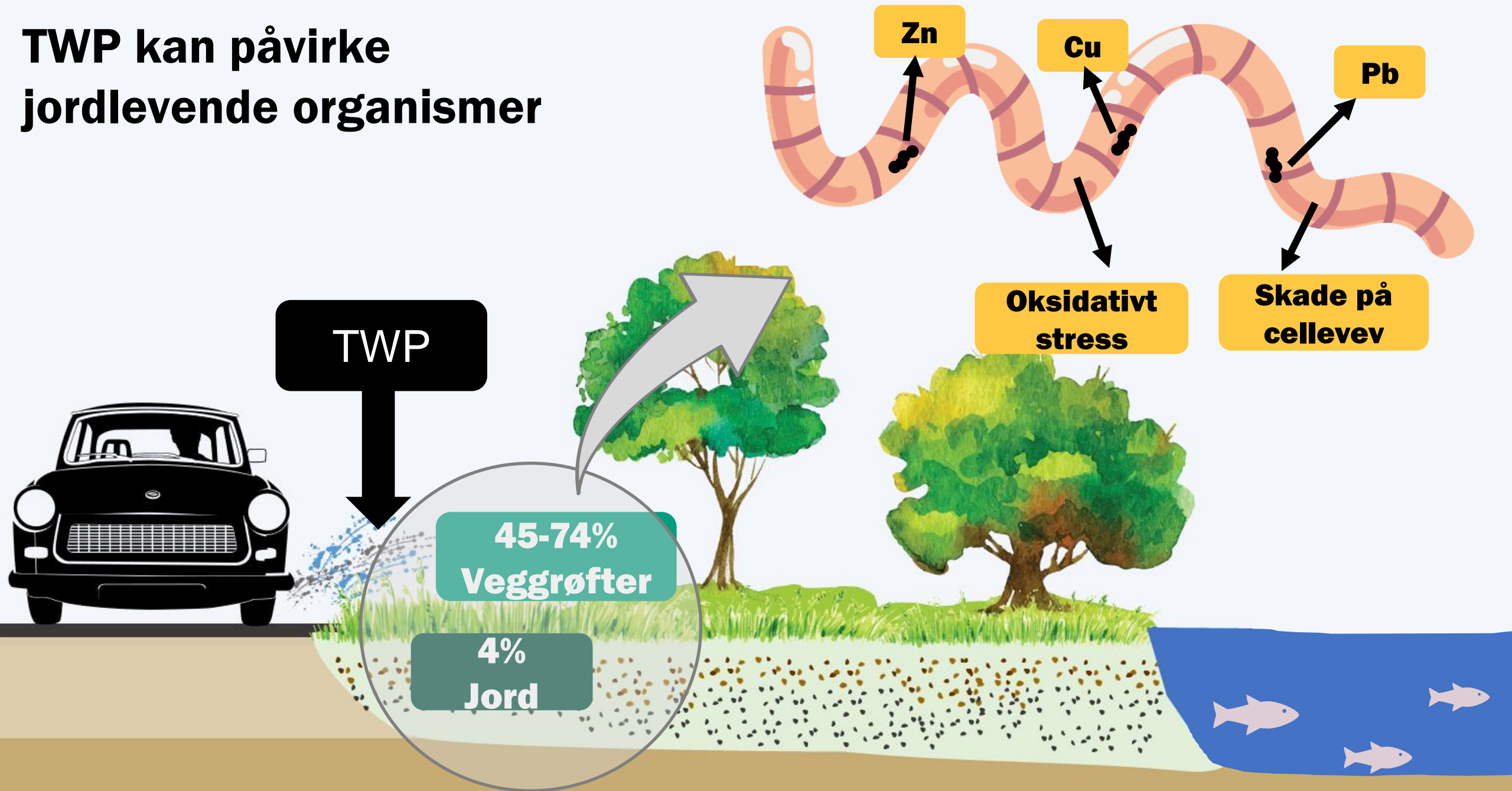
**>200 organiske
stoffer ***

145 leachable

6-PPD-q

Image: Particle Vision, MikroRENS-project

TWP kan påvirke jordlevende organismer



REF: Sieber et al., 2020; Wagner et al., 2018

REF: Sheng et al., 2021: Ecotoxicological effects of micronized car tire wear particles and their heavy metals on the earthworm (*Eisenia fetida*) in soil

TWP kan påvirke akvatiske organismer

**Coho salmon
Brook trout
Rainbow trout**

Langtidsskader

Akutt toksisitet

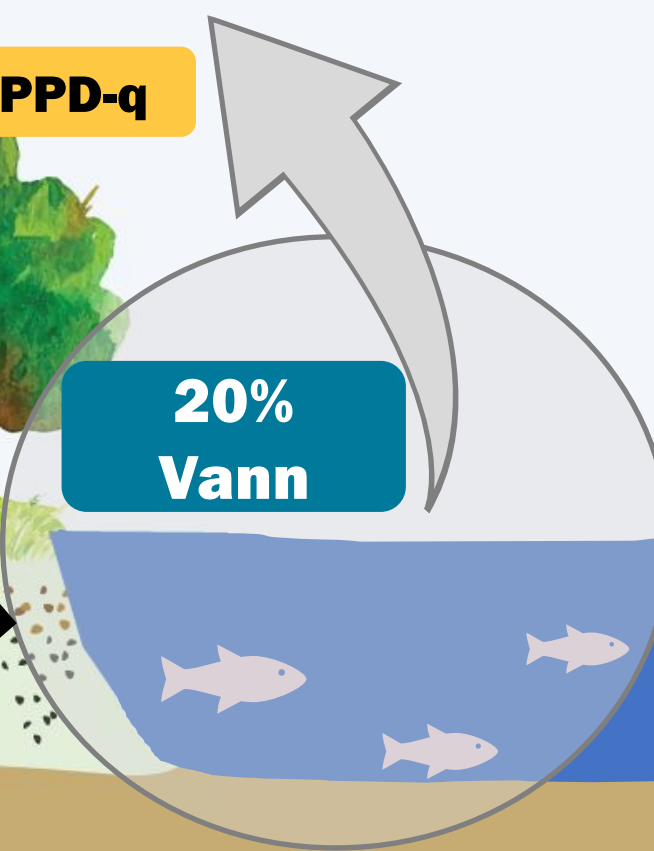
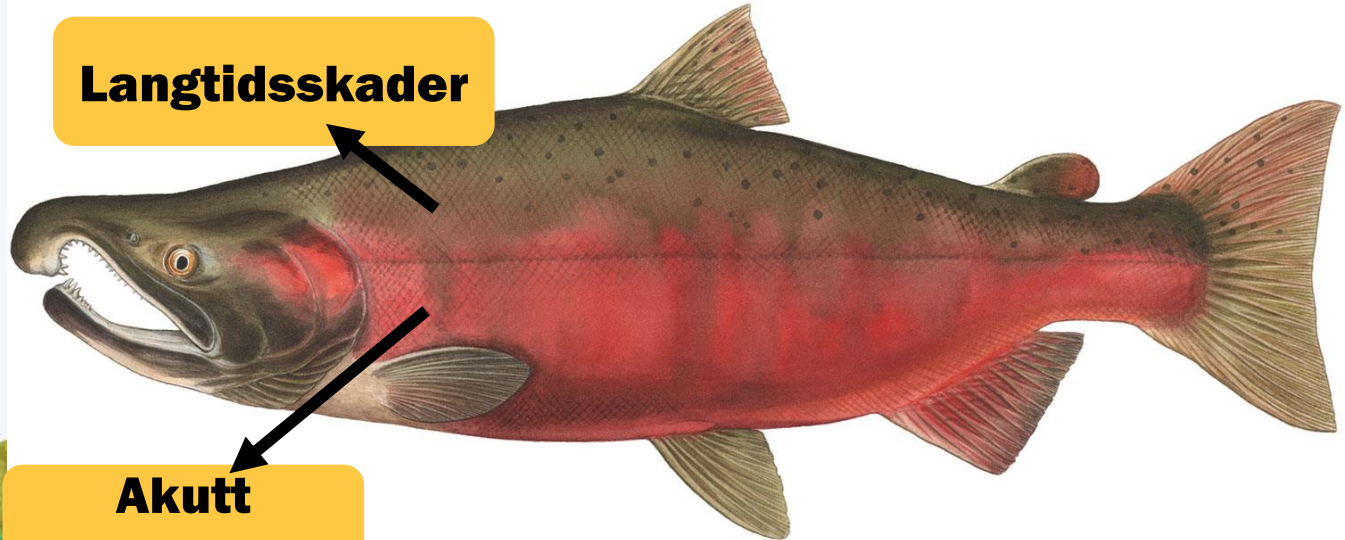
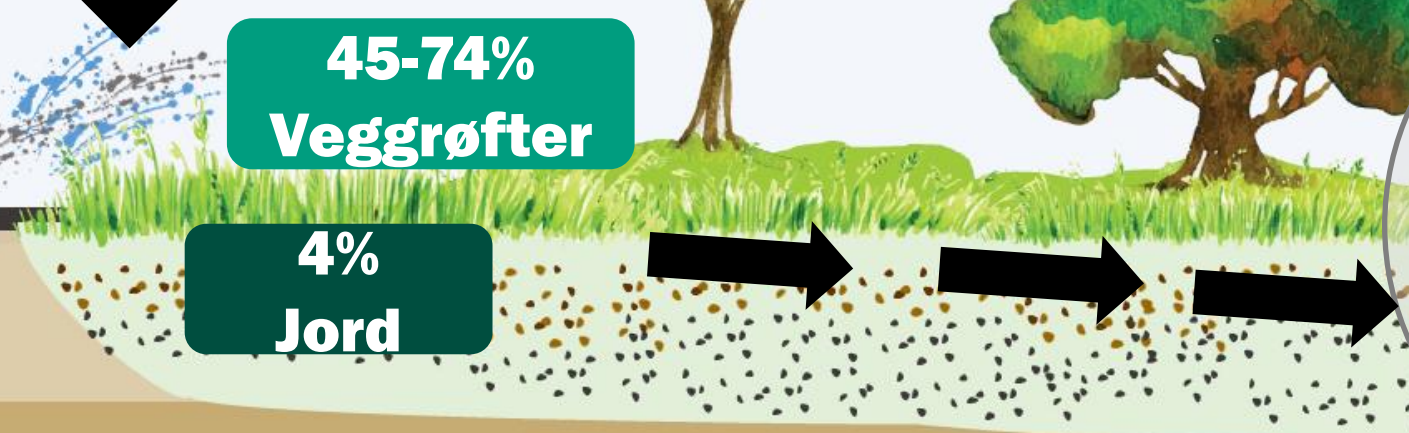
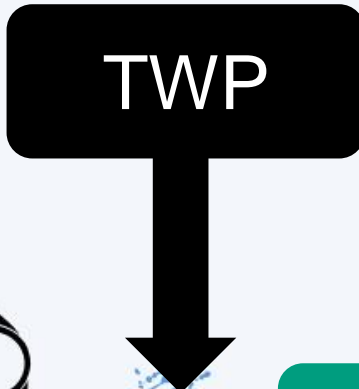
6PPD-q

TWP

**45-74%
Veggrofter**

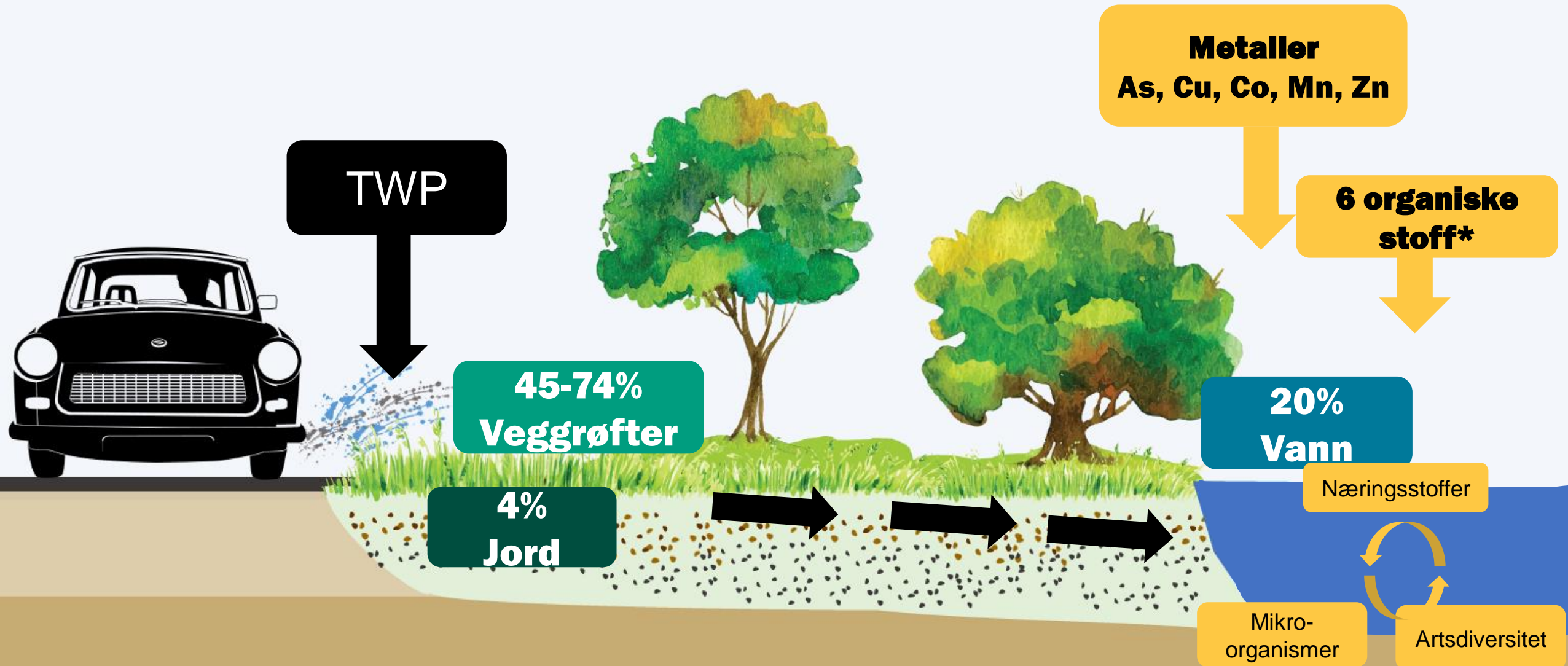
**4%
Jord**

**20%
Vann**



REF: Sieber et al., 2020; Wagner et al., 2018, Tian et al., 2021,

TWP kan påvirke vannkjemi og artsdiversitet



TWP I GRØFTER

Delprøver fra
Multiconsult/SVV
re-analysert for TWP



TWP I GRØFTER

Hypoteser

- Det er sterk sammenheng mellom trafikk mengde og mengde TWP i grøfter
- Det er sterk sammenheng mellom TWP og metaller i grøfter
- Det er sterk sammenheng mellom TWP/metaller og forklaringsvariabler (trafikk og jord)



PRØVETAKING

NIVA

**TWP analysert med
PYR-GC/MS**

Multiconsult

- Målt metaller, PAH, PCB, olje, salt og organisk innhold
- Distanse fra vei (0, 3, 5m)
- Ulike typer jord (sand/morene, silt/leire, myr)
- Ulike grøfteprofil (opp, flatt, ned)



0-1m

1-3m

5-8m

0-10 cm

10-30 cm

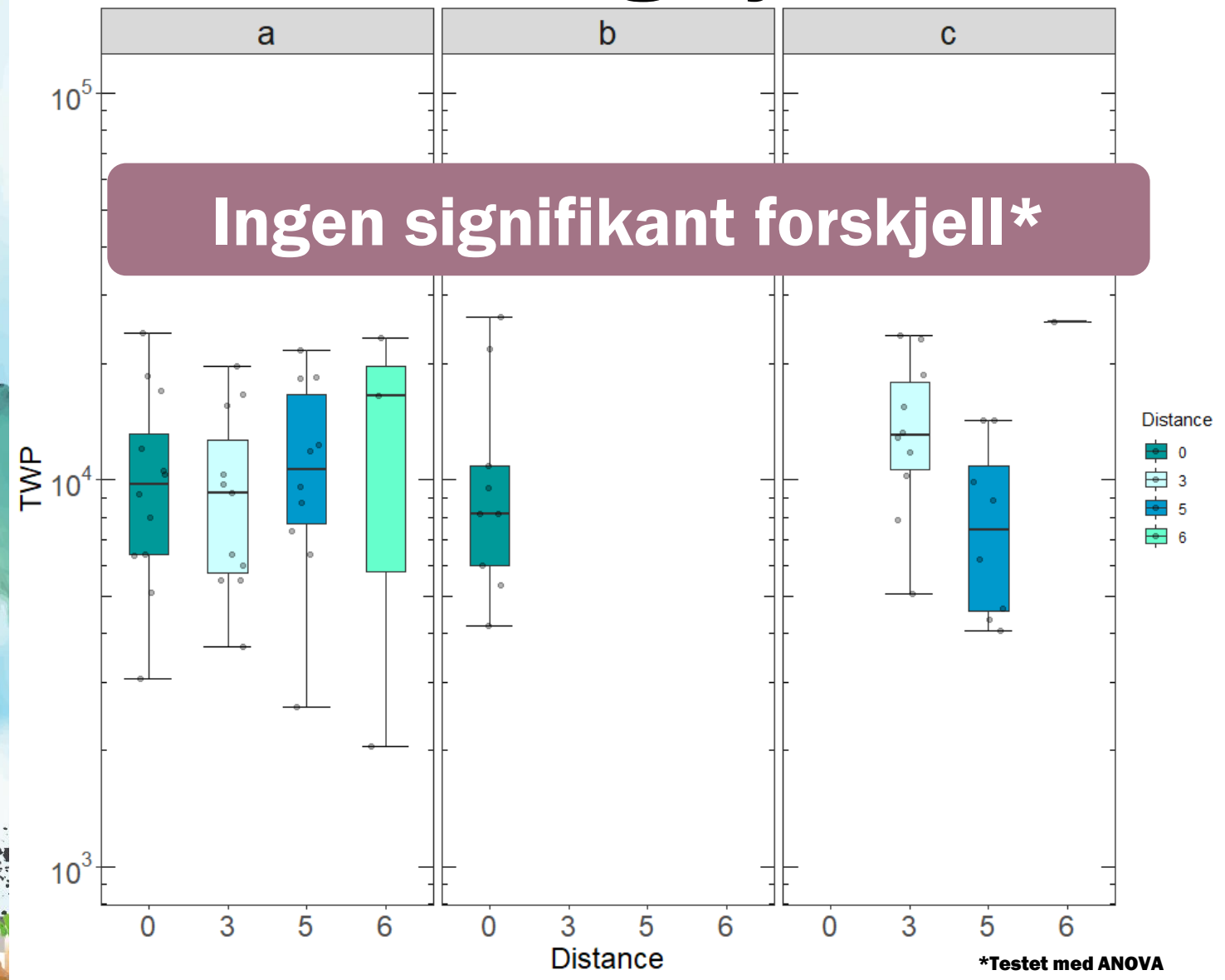


RESULTATER TWP

Trolig for grov prøvetaking for å kunne se forskjeller i dybde

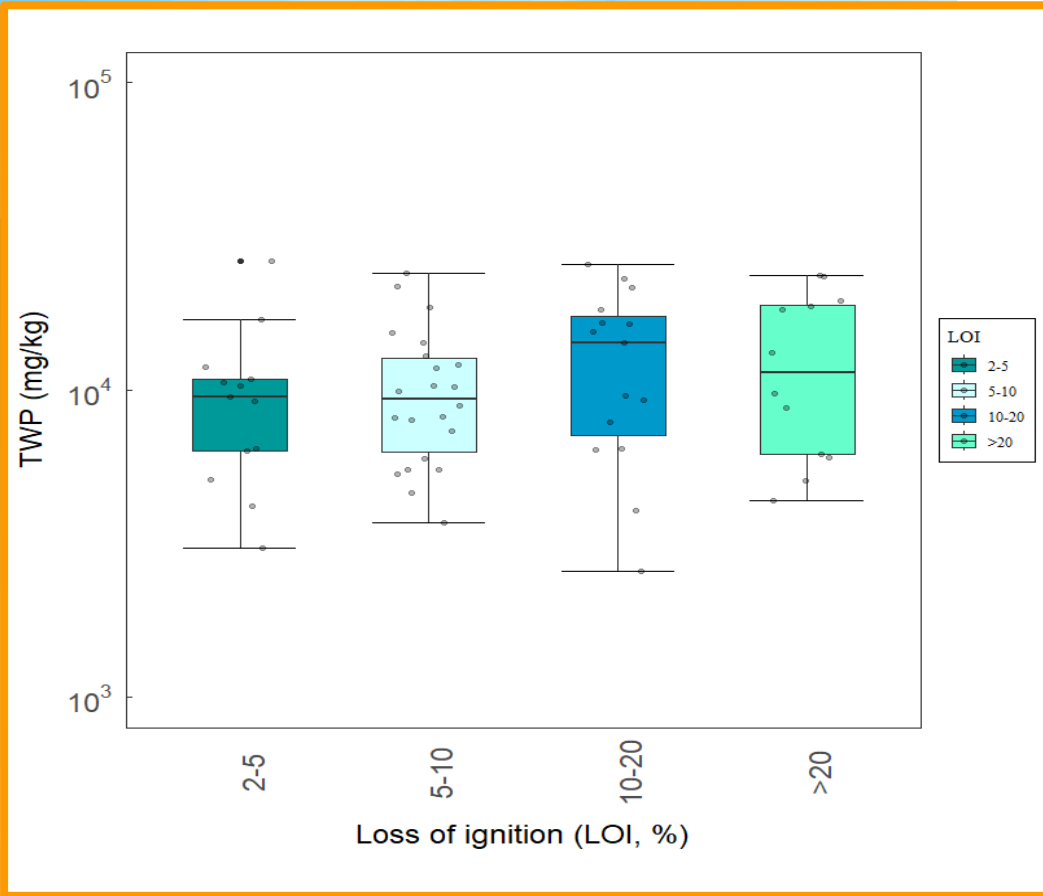


Distanse og dybde

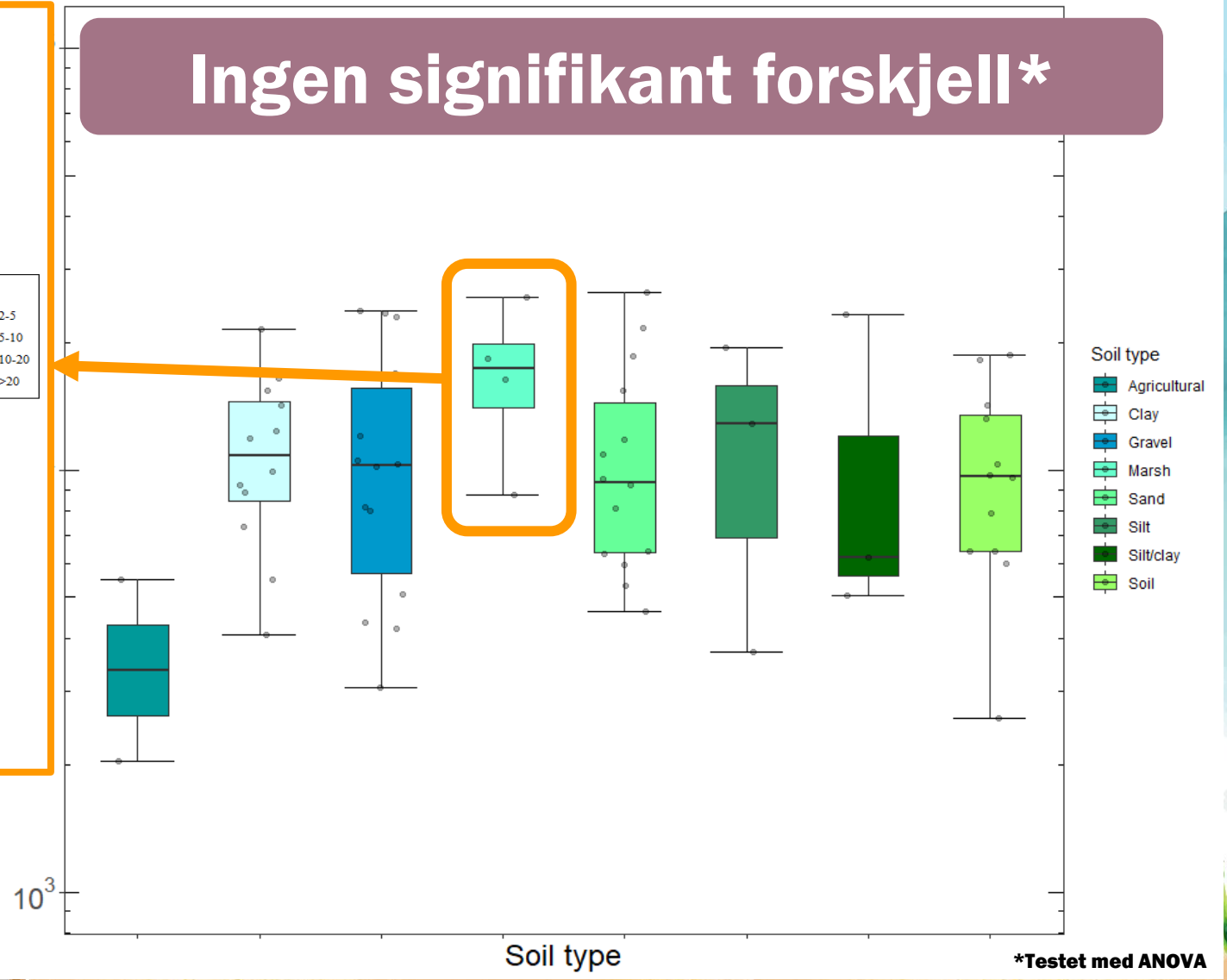


RESULTATER TWP

Jordtyper



Ingen signifikant forskjell*



RESULTATER TWP VS METALLER

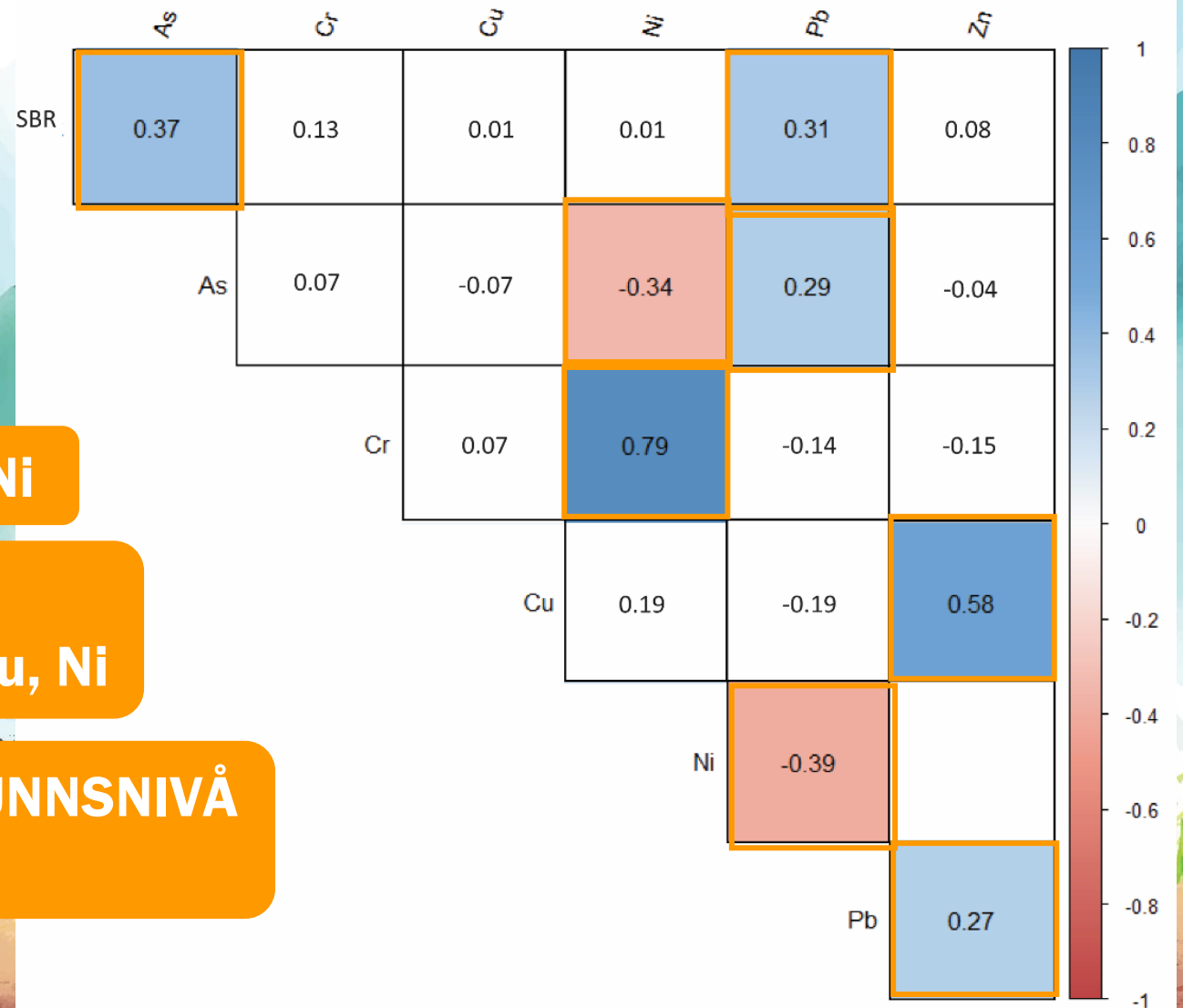
INGEN LINÆRE
SAMMENHENGER MELLOM
TWP OG METALLER

TWP: Zn, Cu, Cr, Pb, As

BREMSE: Cu, Zn, Pb, Ni

GALVANISERTE
STRUKTURER: Zn, Cu, Ni

HØYERE BAKGRUNNSNIVÅ
As, Zn



RESULTATER TWP

Sammenheng
trafikkmengde og
TWP?

Trøndelag:
Lav trafikk (650-14500v/d)
TWP: 2040 til 26400 mg/kg
(11400 ± 6420 mg/kg)

Skullerud E18 (77000v/d):
3700-4900 mg/kg

Motorvei Tyskland (36000v/d)
155-15 900 mg/kg

HVA FORKLARER VARIASJONEN I TWP?

Nedbør 7%

Fartsgrense 7%

80



HVA FORKLARER VARIASJON AV METALLER?

Trafikkmengde 12%

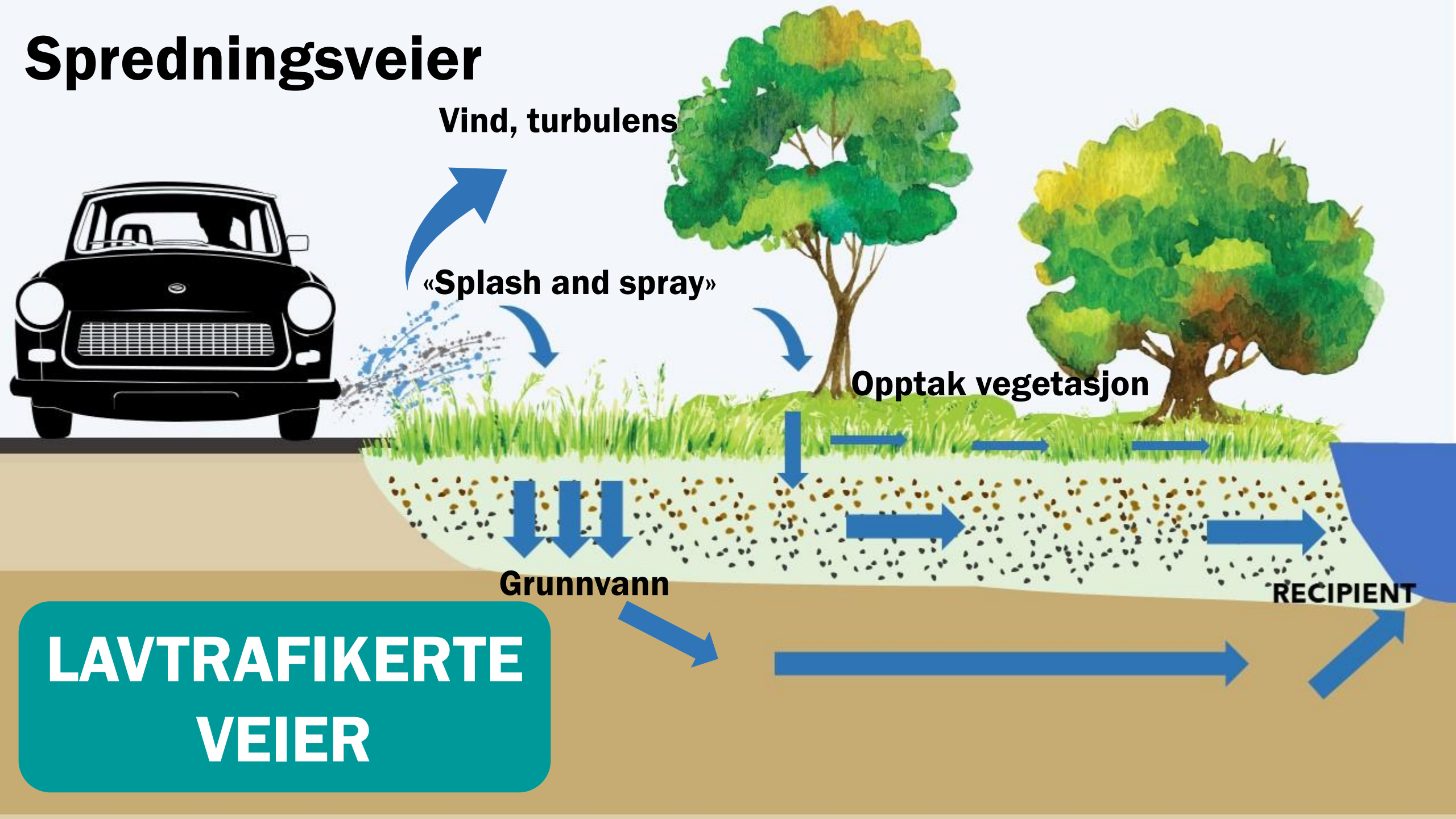
Jordtype 28%

Grøfteprofil 16%

Organisk innhold 10%



Spredningsveier



Vind, turbulens

«Splash and spray»

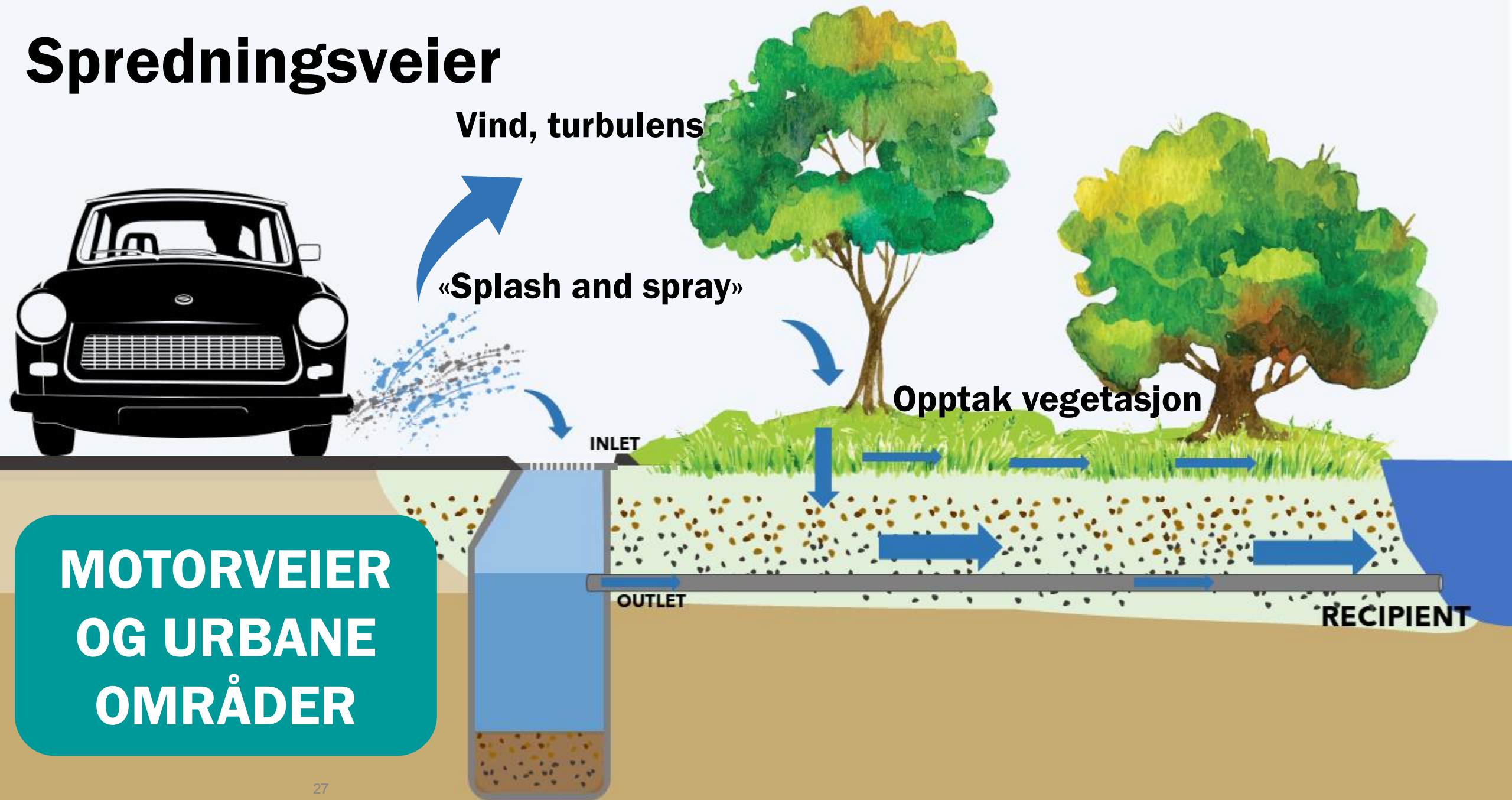
Opptak vegetasjon

Grunnvann

RECIPIENT

LAVTRAFIKERTE
VEIER

Spredningsveier



**MOTORVEIER
OG URBANE
OMRÅDER**

Oppsummering

- **Trafikkmengde alene er ikke en god indikator på hvor det er mest TWP**
- **Grøfter kan være gode til å holde tilbake TWP**
- **...men hvordan påvirkes grøftesystemene av økende konsentrasjon av TWP?**
- **Bør høye konsentrasjoner TWP og utlekkingsstoffer fra TWP også vurderes ifht klassifisering av forurenset grunn/deponering av masser?**

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High levels of tire wear particles in soils along low traffic roads

Elisabeth S. Rødland^{a,*}, Lene S. Heier^b, Ole Christian Lind^c, Sondre Meland^d

^a Norwegian Institute for Water Research, Økernveien 94, 0579 Oslo, Norway
^b Norwegian Public Roads Administration, Construction, Postbox 1010, N-2605 Lillehammer, Norway
^c Norwegian University of Life Sciences, Faculty of Environmental Sciences and Natural Resource Management, P.O. Box 5003, NO-1432 Ås, Norway

HIGHLIGHTS

- High levels of tire wear particles (0.2–2.6 % d.w.) in soils along low traffic roads
- Positive correlation between tire wear particles, traffic speed and precipitation
- Positive correlation between metals, traffic density and organic matter
- No correlation between tire wear particles and metals
- No vertical or horizontal gradient found for tire wear particles or metals

GRAPHICAL ABSTRACT

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Metals
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ABSTRACT

Traffic pollution has been linked to high levels of metals and organic contaminants in road-side soils, largely due to abrasion of tires, brake pads and the road surface. Although several studies have demonstrated correlations between different pollutants and various traffic variables, they mainly focused on roads with medium to high traffic density (>30,000 vehicles per day). In this study we have focused on investigating tire wear particles and road-related metals (zinc, copper, lead, chromium, nickel, and the metalloid arsenic) in the soils of low traffic roads in rural areas (650–14,250 vehicles per day). Different explanatory factors were investigated, such as traffic density, speed, % heavy vehicles, organic matter content, annual precipitation, soil types and roadside slope profiles. The results show high levels of tire wear particles, from 2000 to 26,400 mg/kg (0.2–2.6 % tire wear in d.w. soil), which is up to five times higher compared to previously reported values in roadside soils of high traffic density areas. A weak but significant correlation was found between tire wear particles, traffic speed and the annual precipitation. No significant relationship was found between tire wear particles metals. The concentrations of metals were comparable to previous studies of high traffic areas of Norway, as well as both urban and rural soils in other countries. For the metals, all factors together explained 45 % of the variation observed, with traffic density (11 %) and organic matter content (10 %) as the most important single variables. The analysis of tire wear particles in soils using Pyrolysis Gas Chromatography Mass Spectrometry is challenging, and the results presented demonstrate the need for pretreatment to remove organic matter from the samples before analysis.

* Corresponding author.
E-mail address: elisabeth.rodland@niva.no (E.S. Rødland).

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**Takk for
oppmerksomheten!**

