2020s
Street cleaning 4.0

Towards carbon free and energy efficient sweeping

Winter Road Congress 2020
Tampere 12.2.2020
Antti Nikkanen, CEO, Snowek Oy

1960s Suction Sweeping

1900s Mechanical Sweeping

SNOWEK TROMBIA SWEEPING REBORN IN BRIEF

Founded in Kuopio, Finland 2011

Focus on R&D and innovation of street cleaning dust control and dust cleaning technologies

- High pressure dust suppression technology - adopted from demolition industries - 2013
- 2014 onwards high focus on PM2.5 and PM10 dust removal technologies
- World’s first sweeper attachments - Trombia - meet the cleaning effectiveness of highest calibre suction sweepers.

1. What is **effective street sweeping** based on the knowledge today?

2. What do we know about **energy-efficiency** of the current suction sweeping technologies?

3. Street cleaning 4.0 - **the paradox of cleaning effectiveness, viability and energy-efficiency**

KwH

/

KM2

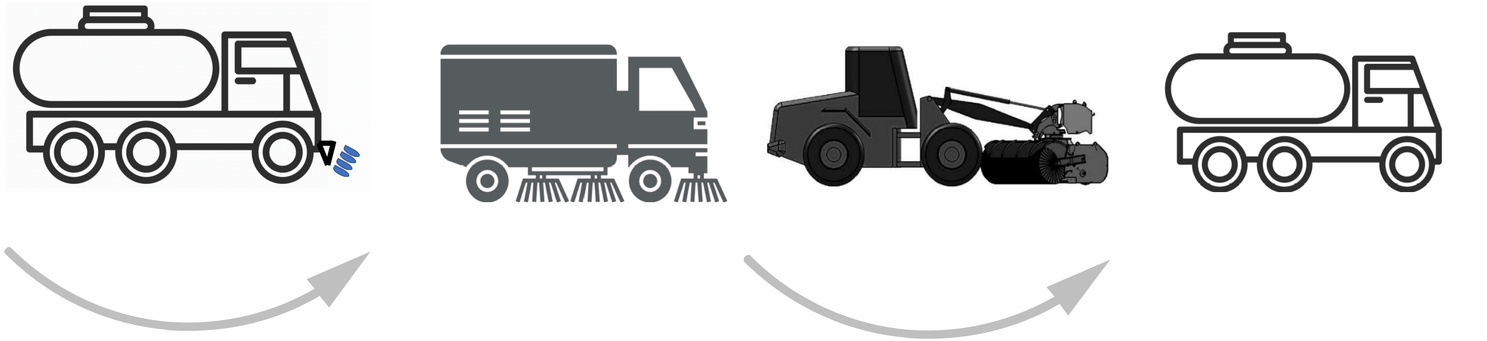
1. What is **effective street sweeping** based on the knowledge today?

3. PM2,5 removing sweeper

Removes 90-95% of PM dust in standard conditions

1. Watering truck

Dust control purposes



4. Pressure washer

Required for longer lasting impact on air quality (Redust, KAPU, VTI, City of Toronto)

2. Mechanical sweeping

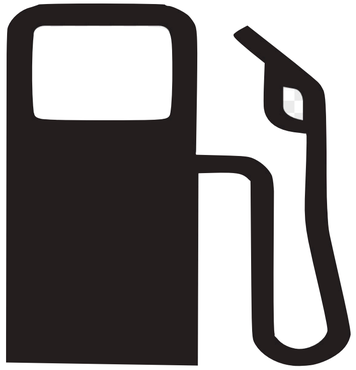
Sand and coarse materials

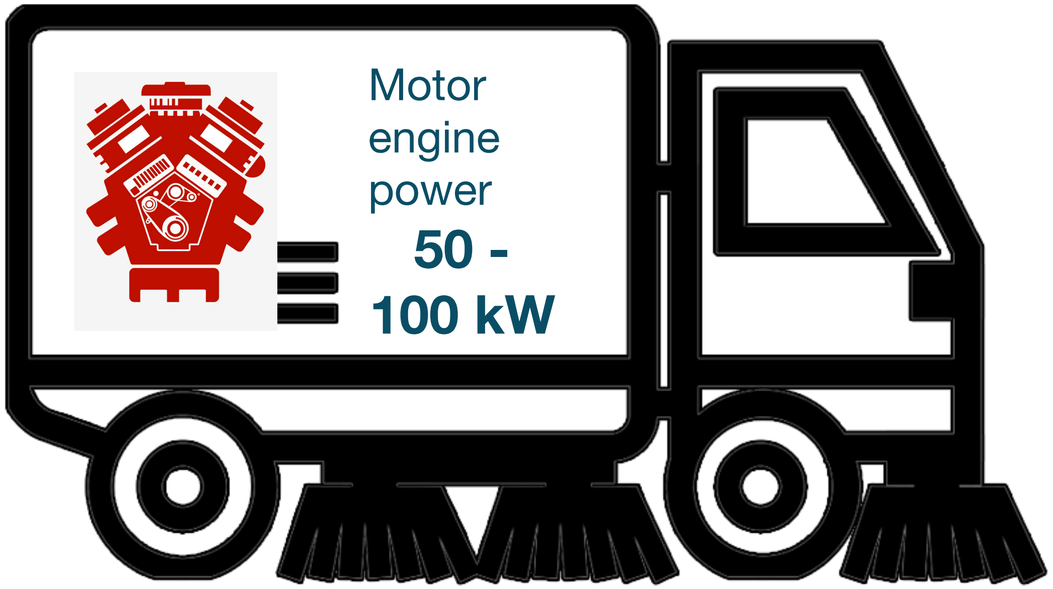
2. What do we know about **energy-efficiency** of the current suction sweeping technologies?

Diesel fuel consumption

20 - 40 l / h

(20 l = 66kwh usable energy.)





PM-dust removal
speed
1 km/h

PM-dust removal
width
60 cm

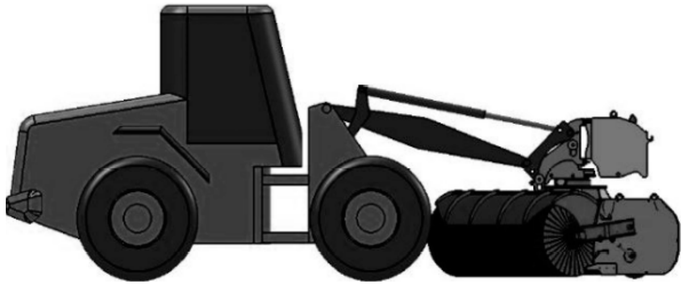
0,3 - 0,6 km2 cleaned street in one hour

50 - 70 kg CO2/km2

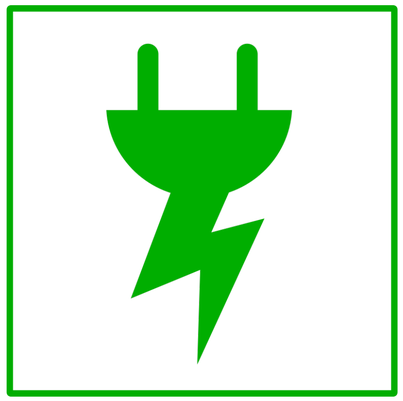
Even a modern and optimized fleet of today’s Nordic city eats enormous amount of power

Suction sweeper with high pressure washer and 2.5m wide suction width

Dump truck



Mechanical sweeping device with advanced integrated dust control



One hour of effective sweeping we will need

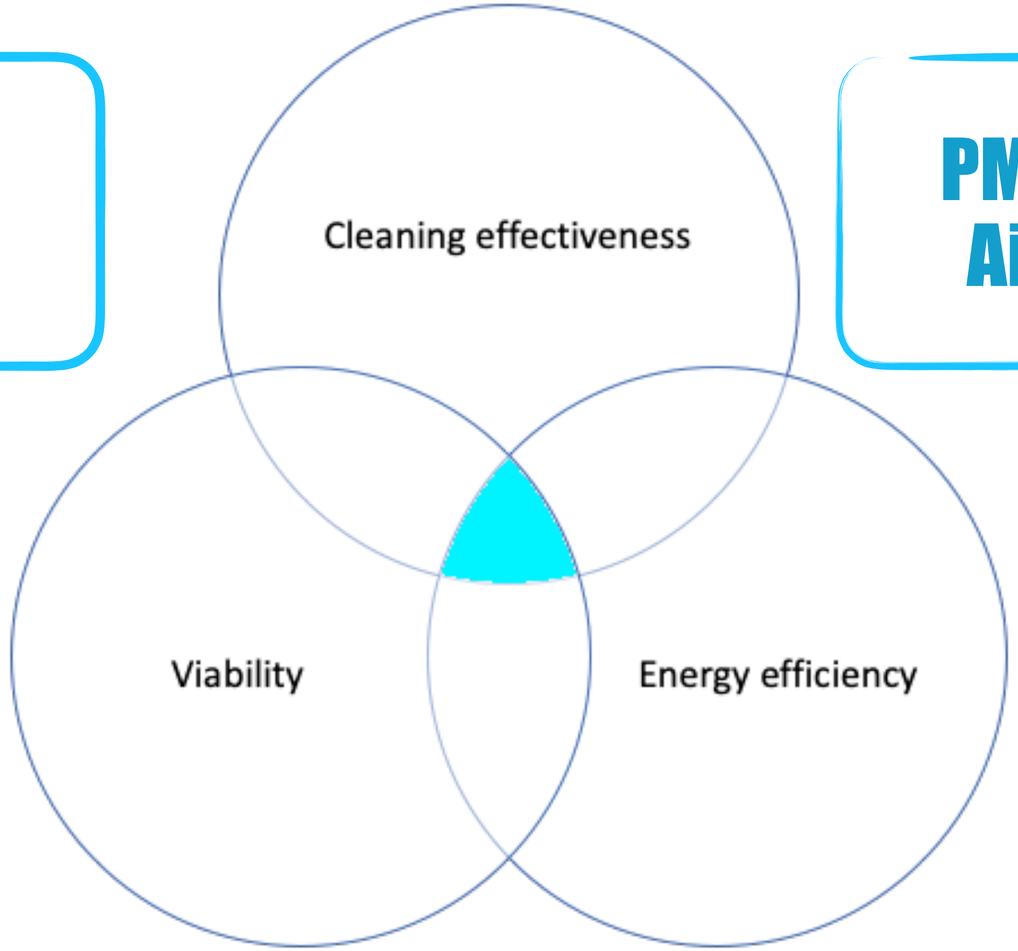
65 l + / h diesel fuel

= over 215 kwh power input

Street cleaning 4.0 -
The paradox of cleaning effectiveness, viability and energy-efficiency

Speed
Efficiency

PM2.5-PM10
Air quality



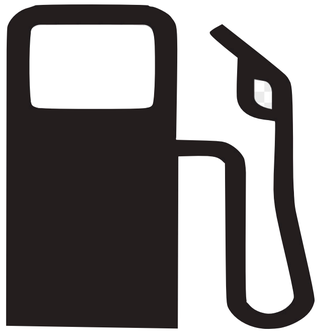
Cost,
Adaptability
Infrastructure

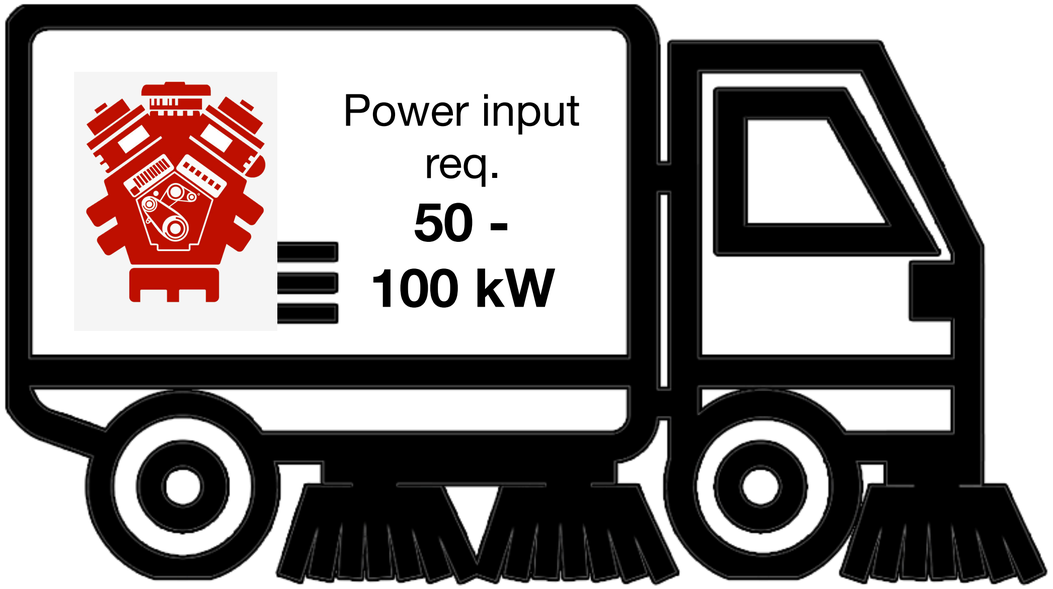
KwH
/
KM2

Approach I: Let’s swap the engines of our current fleet

KwH / day

<u>400 - 800 KwH</u>





Efficient PM removal speed

1 km/h

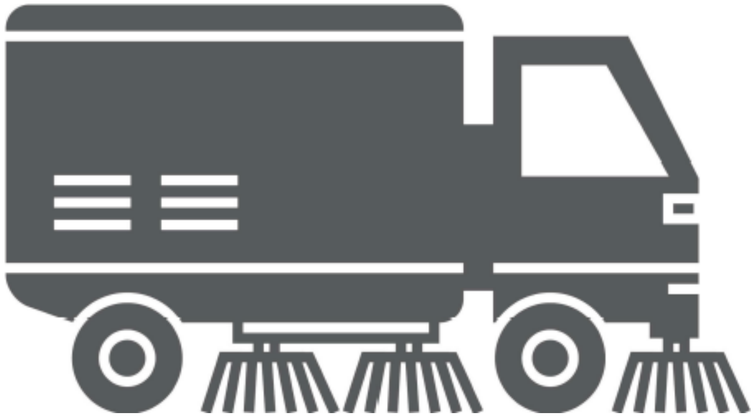
PM2.5 Suction width

<u>60 cm</u>

Cost of one battery pack for 8h workday, 200 000 - 350 000 eur, in manufacturing

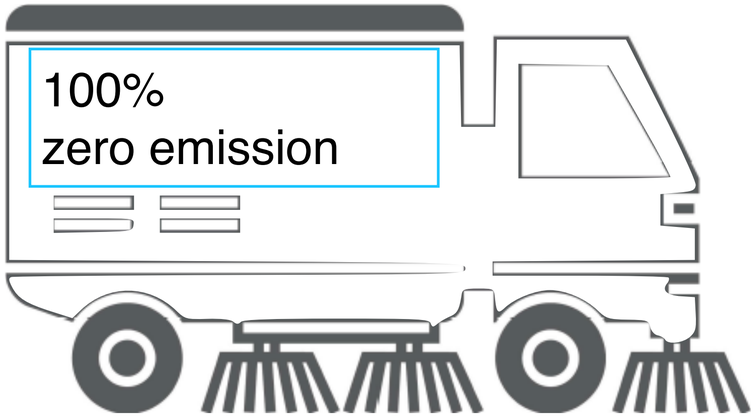
Approach II: We already found an electric sweeper

SuperSweeper Pro Diesel



- PM2.5 Dust removal 0,6km2/h
- PM2.5 Removal efficiency 90-95%
- Engine power **55kw-100kw**

E-SuperSweeper Pro



- PM2.5 Dust removal ____
- PM2.5 Removal efficiency ____
- Electric motor power **9kw**

Approach III: Rethink.

- Shift from *”vehicle-by-vehicle thinking”* to ”kwh / km2” solution thinking
- Radically more energy-efficient cleaning technologies
- Merge those technologies with the existing infrastructure

KwH

/

KM2

Thank you!

Antti Nikkanen
antti.nikkanen@snowek.fi
@AnttiNikkanen

IFAT 2020 - EXPO
Münich 4.5. - 8.5.2020

Expo booth 430. KwH / Km?