



TROMBIA FREE

Electric and
autonomous future
of street cleaning

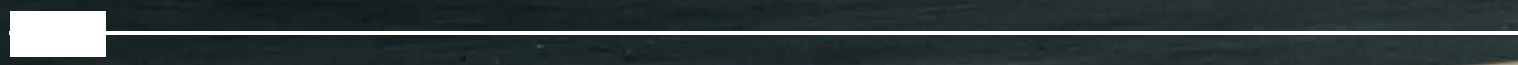
95% of water savings
85% energy savings
100% CO2 savings
Up to 10 000 m2/hour
PM2.5 dust removal
Lifetime cost savings

Welcome to the era of autonomous
and carbon free area cleaning.

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SMART CITIES

Cities of the 2020s will no more be allowed to utilize heavy duty diesel-fueled vehicles in day-to-day maintenance. The smart cities of today need a more efficient, sustainable and greener street cleaning solution.

Emission-free, water-free solutions are required. The sweeper of today must also be above the par in controlling urban air pollution, the fine dust particles rising from the street surfaces to urban air.

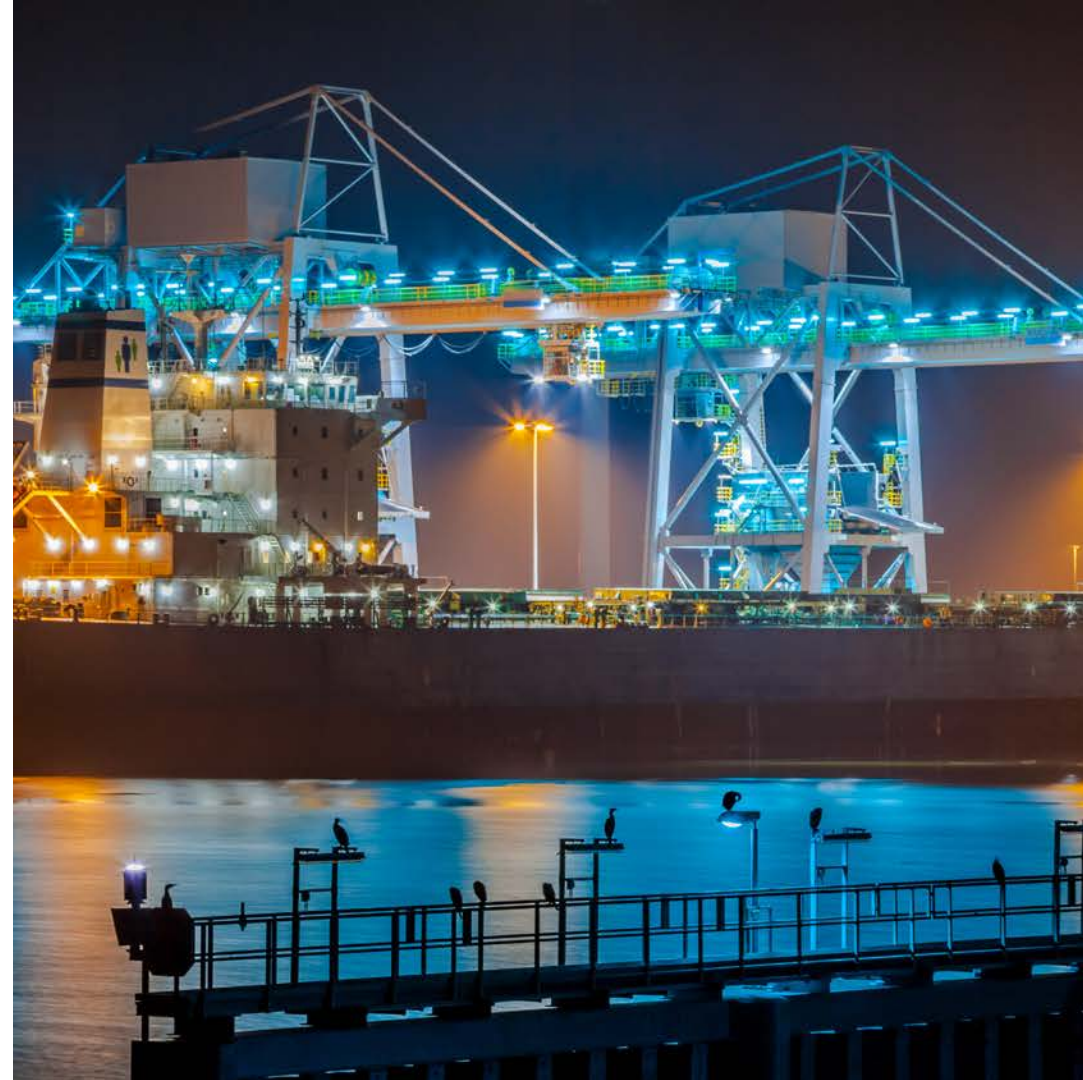
Trombia Free is the solution for cities today.

Applications

SMART INDUSTRY

Industrial seaports, airports and industrial plants have continuous and challenging area cleaning needs. Typically cleaning duties need to be carried out off-hours but with precised cleaning performance and efficiency. Cutting the CO2 emissions of our modern industrial sites is also of highest concern during the 2020s.

Trombia Free is the solution for smart industrial operators indoors and outdoors.



Benefits of Trombia Free

CLEAN AREAS, CLEAN AIR

Harmful PM2.5 particulate matter is the most severe environmental health concern in developed societies. Street and area cleaning plays an important role in combating urban air pollution and drain water pollution in our communities.

Currently used street sweeper vehicles are slow, inefficient, loud and diesel-fueled. They cause significant harm to the planet.

Trombia Free is here to change that.

OPERATIONAL EFFICIENCY

Trombia Free is designed to perform fast with both fine dust removal and heavy duty sweeping.

Thanks to the 2,20 metres wide dust removal width, Trombia Free autonomous sweepers are significantly faster than most currently available sweeping solutions in PM2.5 cleaning.

In addition, the revolution of autonomous sweeping makes operations in continuous duties more efficient and cost-effective.

ENVIRONMENT

Fully electric operations make Trombia Free a quiet and sustainable city cleaning solution long term. Thanks to the waterless Trombia cleaning technology, Trombia Free uses less than 15% of the power compared to diesel-fueled high power street sweepers in the market, but makes no compromises on the performance.

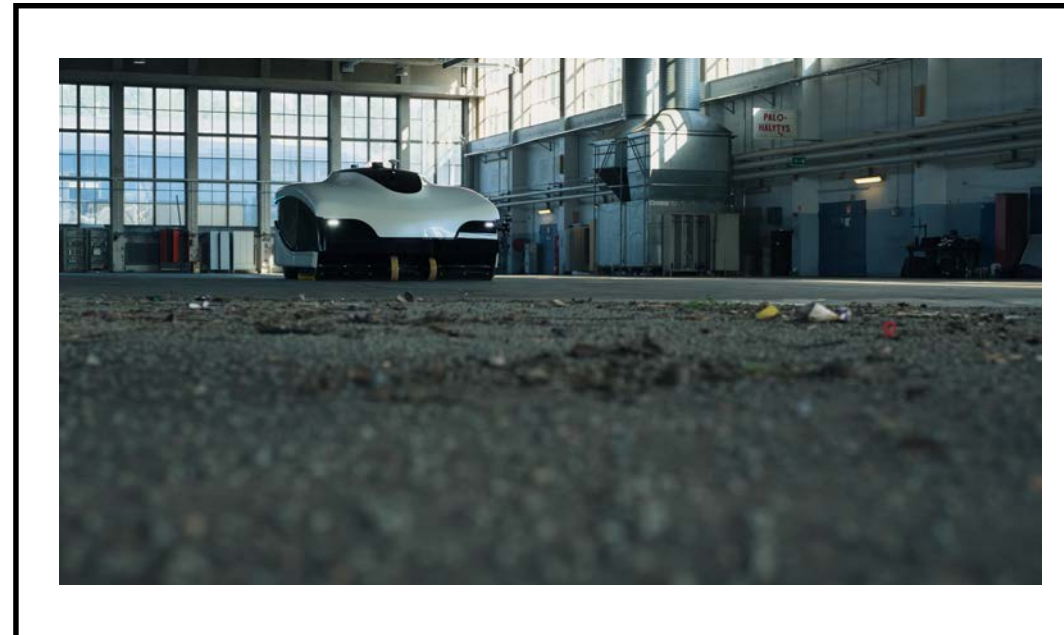
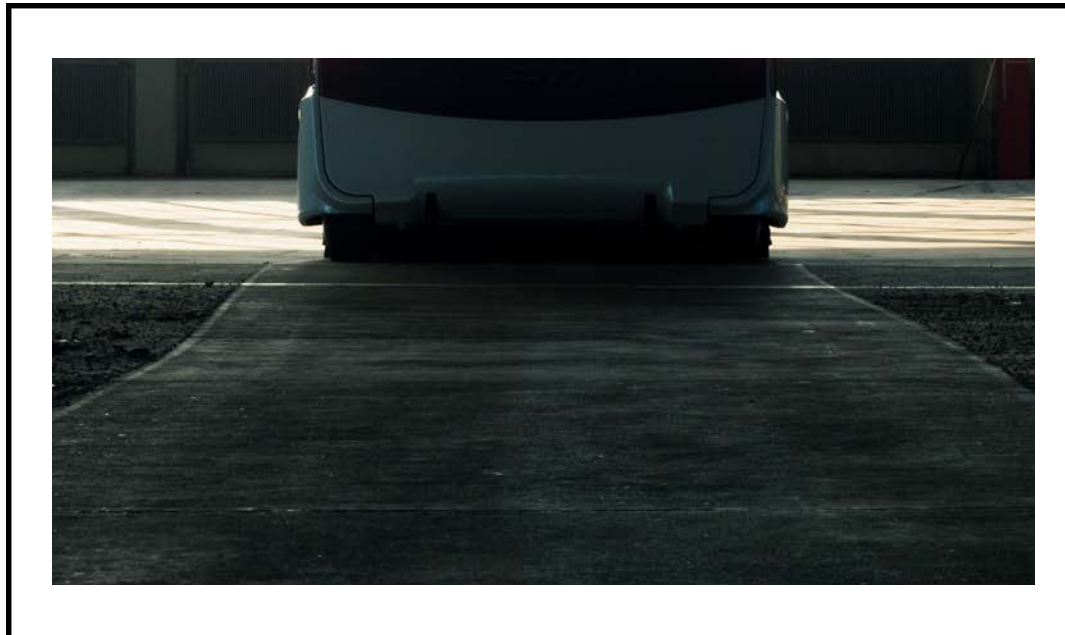
Saving 85% of the energy and 95% of water required for street cleaning, Trombia Free is the right choice for our planet.

SUPERIOR SWEEPING PERFORMANCE

What comes to sweeping performance, Trombia Free is second to none against any human-driven or diesel-fueled high power street cleaning vehicle. Trombia Free's base technology - Trombia - was PM2.5 certified in 2017 according to the highest standards of the EUnited PM Test.

Trombia Free's high performance broom there again, is designed to help you with all the heaviest duties, such as spring clean-up, stormwaste and autumn leaves pick-up.

Cleaning performance of PM2.5 dust and heavy debris



Sweeping
technology
PM-certified



Trombia Free is based on a globally patented Trombi[a] sweeping technology that has been certified according to the highest European standards of PM2.5 dust cleaning.

TROMBIA FREE PERFORMANCE

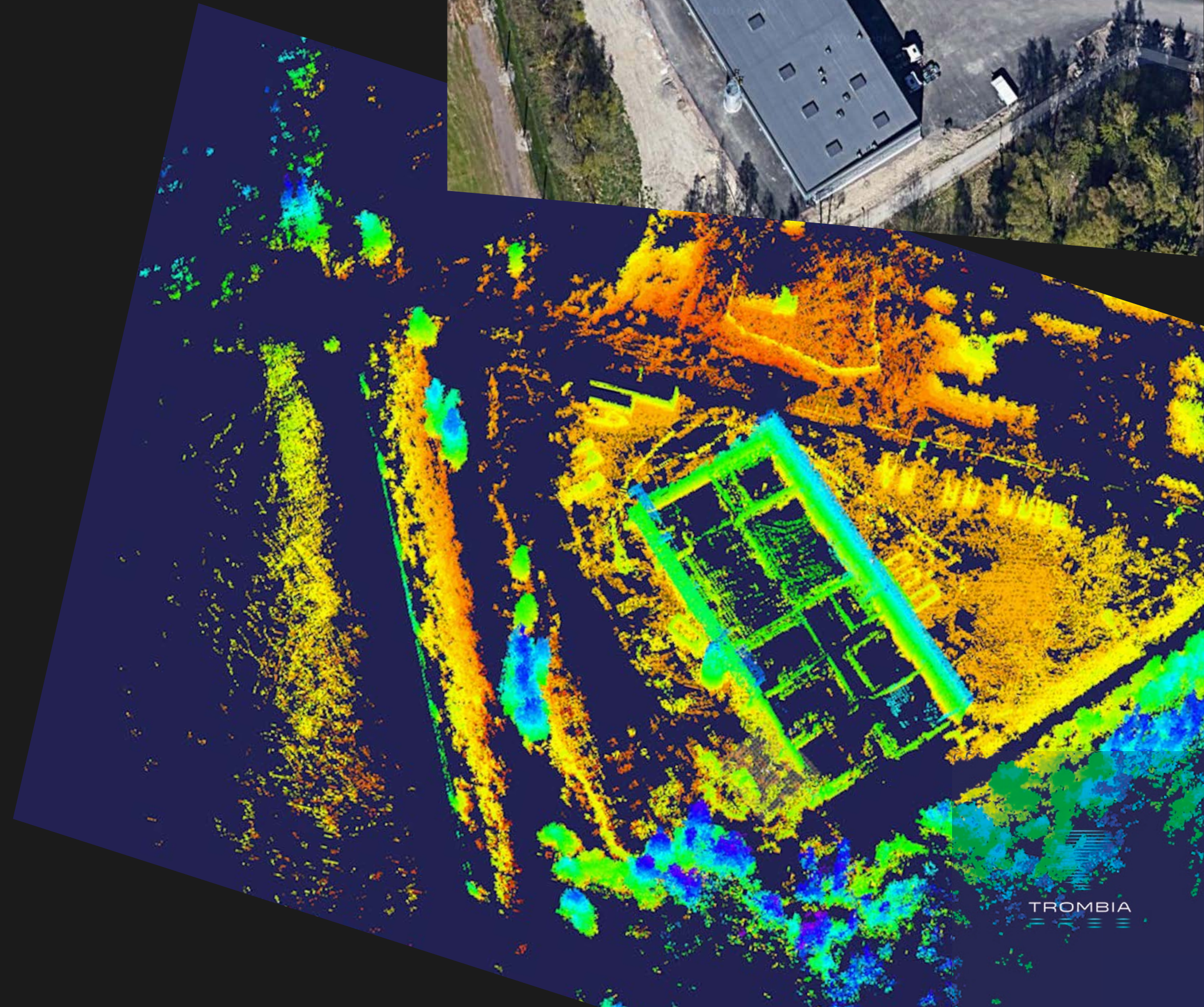
All weather autonomous

Trombia Free's lidar & GPS -based machine vision technology is designed to provide millions of observations of each object, which makes it safe in all circumstances.

When a new sweeping project is started, the operational site is scanned and an accurate point-cloud data observation is mapped into the Trombia Free memory. During sweeping the accurate object sensing will stop the device whenever a non-sweepable object is found on the path.

The advanced algorithms operate accurately both indoors and outdoors, as well as in the transition between.

Most critically, Trombia Free's point cloud algorithm filtrate the noise generated by changes in weather conditions or surroundings, making the localisation accurate in all weather conditions from rain to storm to snowfall.





Technical specifications

Dimensions	
Width	230 cm (7,55 ft)
Length	352 cm (11,55 ft)
Height	150 cm (4,92 ft)
Weight	2600 kg (5732 lbs)
Hopper	1.8 m3 (2.35 yd3)



Technical specifications



Performance	
Sweeping width	220 cm metres (7,21 ft) up to 300 cm with 2 gutter broom
PM2.5 dust removal width	220 cm metres (7,21 ft)
Sweeping speed (radio)	1 - 10 km/h (0.6 - 6 mph)
Sweeping speed (autonomous)	1 - 6 km/h (0.6 - 3.75 mph)
Broom floating	30 cm vertical float 10 degrees horizontal float
Battery capacity	45,6 kwh lithium-ion (Single Package) 91,2 kwh (Double Package)
Autonomy (EN 15429)	8.5hr (Single Package) 17hr (Double Package)
Autonomy (Continuous full-power sweeping)	4 hr (Single Package) 8 hr (Double Package)
Charging time (0 - 100%)	5 hours (High power plug) 15 hours (230V Mains plug)



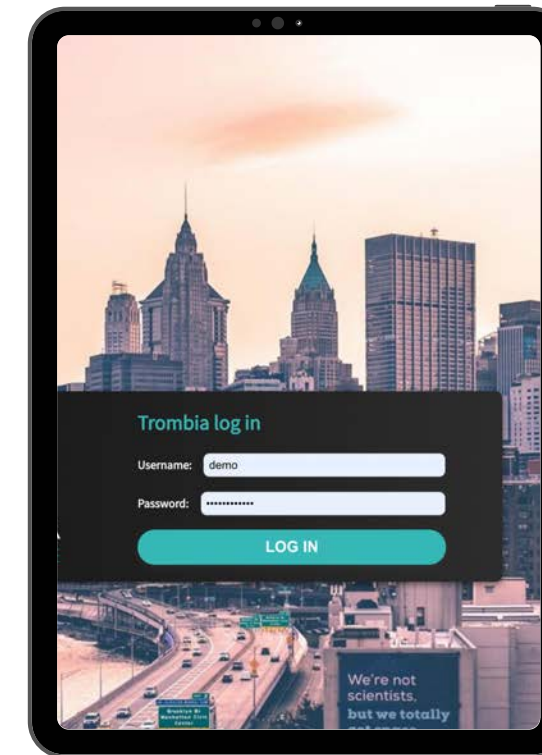
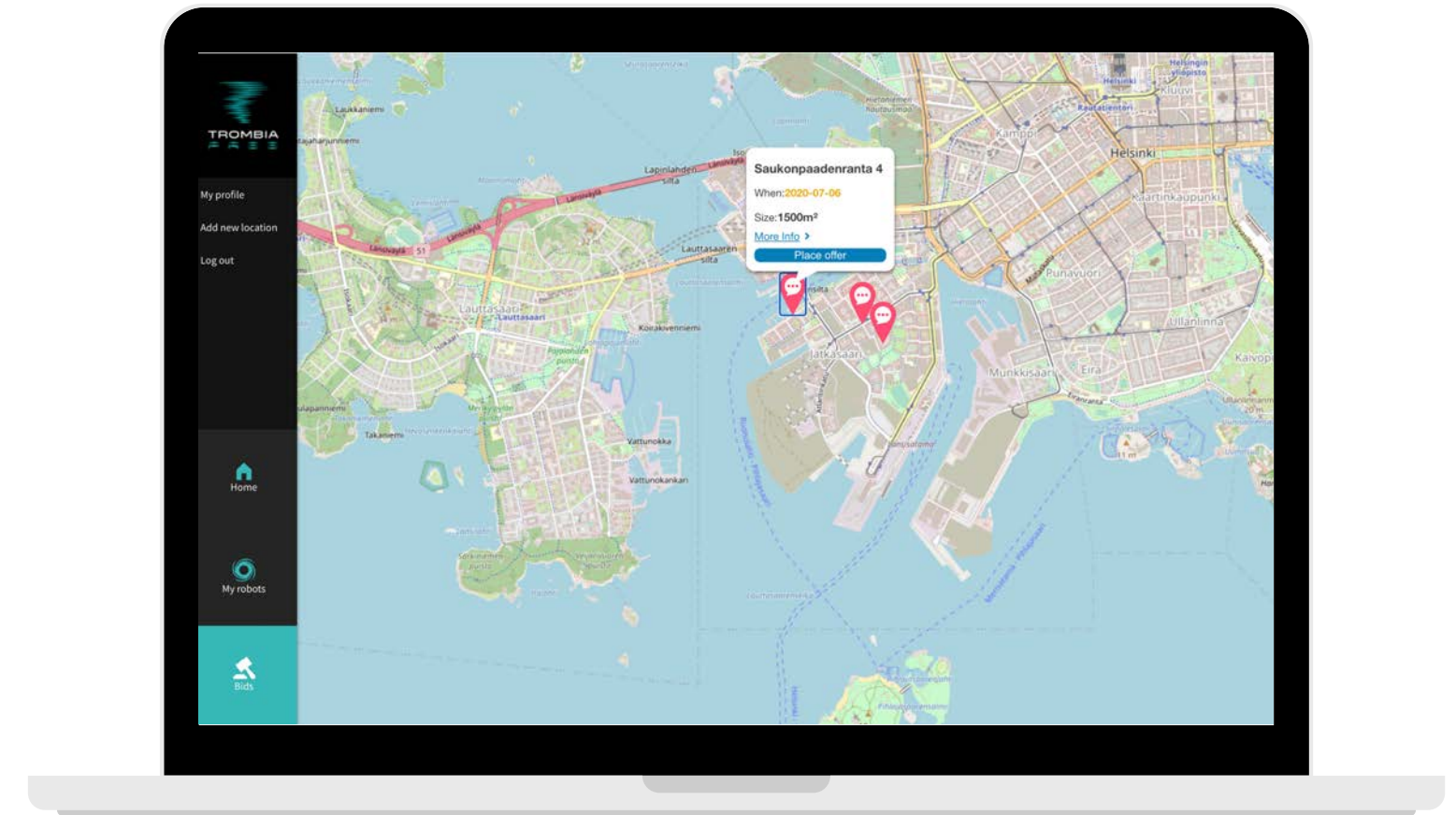
Technical specifications

Environmental impact	
CO2 Emissions	0 CO2 kg / sweeping hour
CO2 Savings per 1000m2	32,5 kg / 1000 m2*
Water consumption	0,6l – 0,8l / min
Water savings per 1000m2 cleaned	150+ liters / 1000m2
PM2.5/PM10 dust removal capability	Up to 96%**



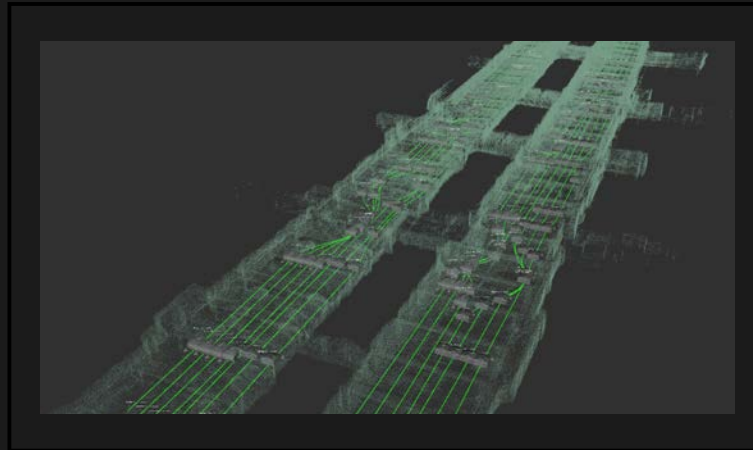
Operations platform

Monitor real-time
Manage the fleet
Bid and invoice sweeping contracts



How does it work?

MANAGING A NEW SWEEPING SITE



MAPPING

HUMAN-ASSISTED

Each new sweeping site and task is mapped in the Trombia Free memory on the first working day.

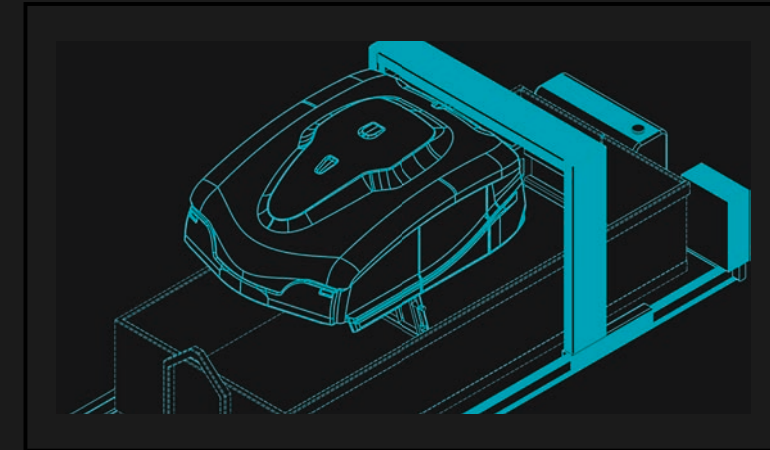
After mapping the sweeping trajectory is recorded via remote control waypoint system or with an on-site radio mode.



SWEEPING

AUTONOMOUS

Sweeping duties are carried out fully autonomously. The Trombia Free pods are capable of completing their assigned sweeping duties according to recorded instructions. Via the remote operations system or on-site radio you can monitor and assist the Trombia Free pod to solve any unexpected challenges that the pod may encounter.

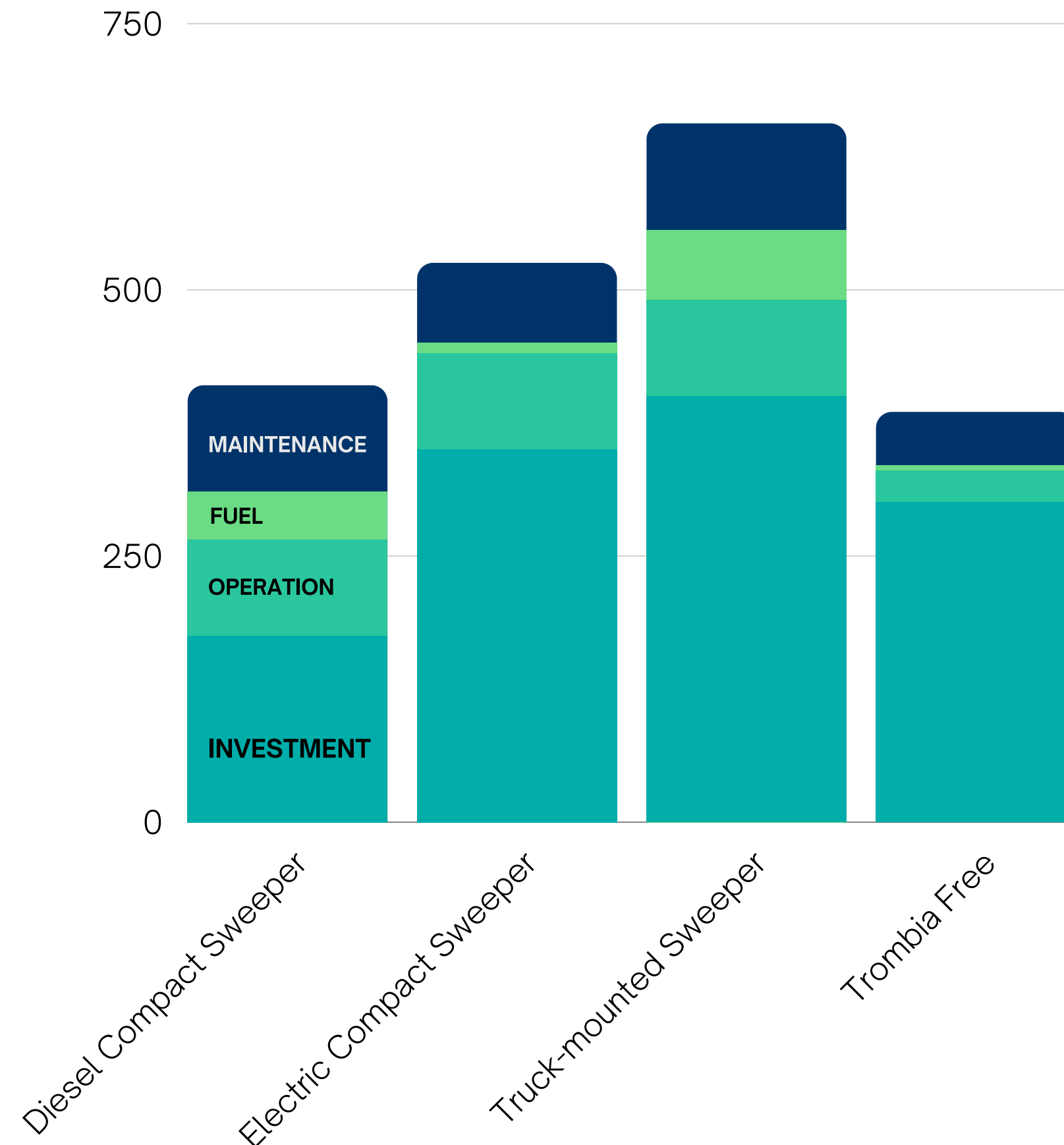


LOGISTICS

OPTIMIZED

Disposal and transportation logistics are implemented with a semi-autonomous method that will integrate to your existing logistics and area maintenance fleet. Options such as demountable skip and container dumping, autonomous cassette and docking systems as well as autonomous lift and dump mechanisms are introduced to Trombia Free units for specific applications.

'000 EUR



Lifetime cost of operation¹³

Trombia Free's powerful sweeping technology and cutting edge energy-efficiency make Trombia Free pods the most cost-efficient, sustainable and green method to clean modern cities and industrial sites.

When considering a city sweeper vehicle investment depreciated in 2000 efficient operating hours, comparable lifetime costs for 2000 operating hours can be estimated.

Automation brings increasing benefits in continuous and daily upkeep sweeping duties. During these 2000 hours, Trombia Free sweeping pods cover significantly larger area compared to existing sweeping solutions. Your operations per square meter can be up to 15 times more cost effective compared to any existing sweeping solution.

Want to know more? Contact us at www.trombia.com

*Note, Trombia Free market pricing to be revealed in due course during 2021. Calculations presented according to the current manufacturer estimates.





Safety

LIDAR | GPS | SAFETY STOP | VIRTUAL BUMPER

Trombia Free's machine vision detects objects ahead based on the advanced lidar-technology.

The virtual bumper system, that stops the device, can be implemented according to the specific location and application and their safety requirements.

The safety stop mechanisms activate the full-brake system when connection to controlling operator platform is lost.







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