

for green roads For road flooding, road flooding, road dust

# The Drainage & Clean system for green roads

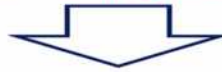


# Necessity of The Drainage & Clean system for green roads

Road pollution sources - road dust, marine and river pollution, water pollution, bad odor reduction



Sources of road pollution: **silt, cigarette butts, fallen leaves**



A lot of **road dust** occurs in cities with concentrated population and vehicles.



Due to climate change, the frequency of heavy rainfall in the fall increases, and fallen leaves are the main cause of **road flooding**.

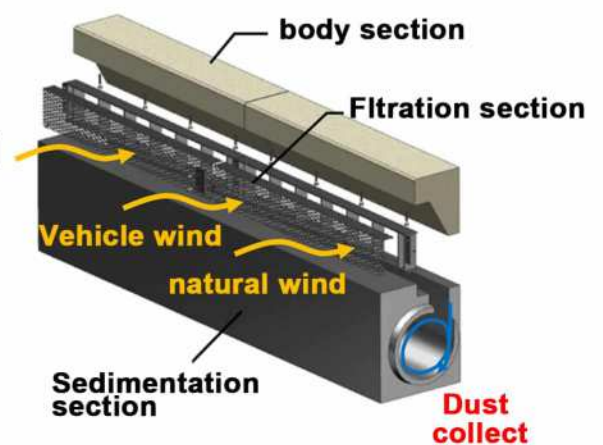


Most of the **ocean's microplastics** flow from roads

- Road pollutants such as silt, cigarette butts, fallen leaves, and trash generate road dust during clear weather, threatening public health. During rainfall, rainwater can clog drains and sewer pipes, causing flooding on roads, or flowing into rivers or the sea, causing environmental disasters, so countermeasures are needed.
- As heavy rains and typhoons become more frequent in the fall due to climate change, fallen leaves are acting as a major factor in causing road flooding, so there is an urgent need to improve the road drainage system.
- To manage road pollution sources, the government is focusing on road cleaning, but there is a severe shortage of cleaning personnel and equipment to manage the entire road that stretches across the country.
- The Drainage & Clean system for green roads is expected to be an innovative alternative to road pollution source management as it can prevent road flooding and environmental pollution caused by fallen leaves and cigarette butts while constantly removing small-sized silt.

# Outline of The Drainage & Clean system for green roads

- **Self-reduction of road pollutant (blown dust) emissions** : Blowing dust is automatically collected using constant vehicle wind and natural wind, and the collected dust is automatically discharged through sewer pipes using rainwater.
- **Road drainage system capable of responding to climate change** : By simultaneously introducing linear and lateral drainage, it effectively prevents rainwater drains and sewer pipes from being clogged by fallen leaves and trash in the fall, and realizes quick road drainage to cope with extreme heavy rains in the fall, reducing disaster costs.
- **Convergence technology** : rapid highway drainage, removal of road dust, prevention of river/marine pollution, prevention of road flooding, prevention of sewer pipe blockage, reduction of dredging costs, road border and vehicle protection, prevention of pedestrian safety accidents, blocking of odors
- **Zero energy, minimal maintenance**
  - ① Does not use electricity (energy) and has no consumables (filters)
  - ② No breakdown as no mechanical devices are used
  - ③ Automatically discharges collected dust, no collection personnel required
- **Korean road infrastructure**
  - ① Comply with regulations and guidelines for domestic road facilities
  - ② Does not impede pedestrian and vehicular traffic



**General road drainage system**



**The Drainage & Clean system for green roads**

- Procurement Innovation Products (Ministry of Land, Infrastructure and Transport in South Korea, No. 2022-337)
- 2019 Ecothon Fine Dust Award (Ministry of Environment), 2022 Digital Innovation Award (Korea Times), 2024 Win-Win Honors (Ministry of SMEs and Startups)
- Ministry of the Interior and Safety (MOIS), Selected as an excellent local government case for the seasonal management system

# Performance/Effectiveness of The Drainage & Clean system for green roads

## A clean city without worrying about fine dust

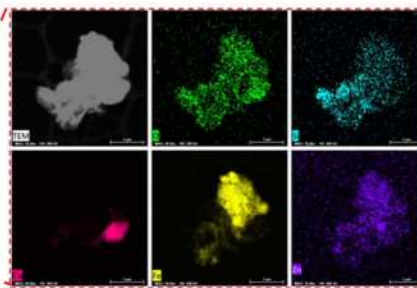
- Performance of 1m per day: Automatically captures 350mg of fine dust and 88mg of ultrafine dust
  - Dust suction vehicle : Captures 51.4 mg of fine dust when driving 1m, equivalent to the effect of operating a dust suction vehicle 7 times a day.
  - Detection of large amounts of major fine dust components such as iron, zinc, and calcium in collected dust
- After applying the system, road dust emissions were reduced by 47%
  - CLEAN AIR CONSERVATION ACT- Article 17 Air Pollutant Emission Survey Act (KCL's evaluation)
- Effectively removes 90.18% of silt from the road from the side drain during spray cleaning
  - Only 17.83% of drains on general roads are removed when cleaned with water, a 5-fold improvement.



Collect of 350 mg/m per day



inside drain



EDX component analysis



Test report from an accredited institution

## Comparison of road dust reduction technologies

- Existing water sprinkler trucks and clean road systems dry again within 2-3 hours after spraying, and flying dust regenerates

	Cleaning truck (watering)	CleanRoad system	The Drainage & Clean system for green roads
installation cost	200 Million won/unit	2.03 billion won/km	600 million won/Km
cleaning cycle	1 time	2 to 4 times	Always
annual maintenance fee	63.2 million won	70 million won	0
Operating costs for 20 years	1.76 billion won/unit	3.43 Billion won/Km	600 million won/Km
Fine dust reduction effect	PM10 51.4 mg/m captured	PM10 concentration reduction: 30%	PM10 350 mg/m, PM2.5 88 mg/m (30 km road) 37.5% reduction (60 km road) 92.0% reduction



Cleaning truck



Clean road system

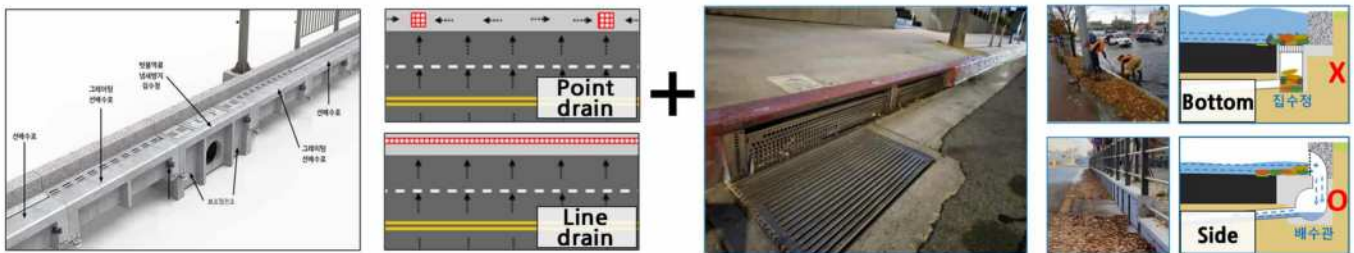


The Drainage & Clean system for green roads

# Performance/Effectiveness of The Drainage & Clean system for green roads

Korea's first rapid drainage system capable of responding to climate change

- Implementing both side drainage and linear drainage simultaneously ensures rapid road drainage even when there are many leaves on the road in autumn
- The existing bottom drainage(street gutter) method easily clogs the rainwater inlets and sewers with leaves and debris, causing flooding.
- By preventing clogging of rainwater inlets and sewers caused by leaves and debris through side drainage and achieving rapid drainage through linear drainage, it is possible to cope with extreme rainfall ▶ Reduction of dredging costs and disaster response costs

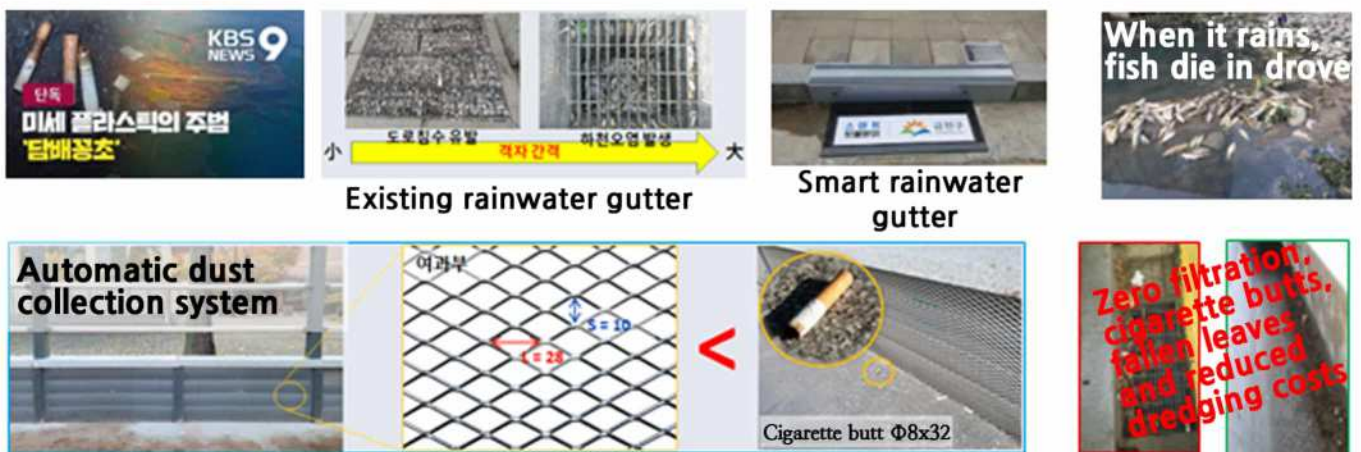


Linear drainage system in Korea



## Preventing microplastics (cigarette butts, trash) river/marine pollution

- Prevent water pollution and clogged sewer pipes by blocking cigarette butts and fallen leaves from entering through rainwater drains
- The dense grating installed on the side does not damage the vehicle, blocks 100% of the inflow of cigarette butt-sized trash, and discharges 1,570 g/km (of which 259 g of fine dust) of pollutants per day into the river



# Performance/Effectiveness of The Drainage & Clean system for green roads

## Reduce rainwater odor and safety complaints

- Prevention of safety accidents involving high heel shoes, strollers, electric quick boards, and wheelchair wheels
- Prevention of Safety Accidents Involving High Heeled Shoes, Baby Strollers, Electric Scooters, and Wheelchair Wheels
- Prevention of damage caused by pedestrians or vehicles
- Prevent slipping accidents when it rains



- A highly durable odor prevention system that completely blocks odors under normal circumstances and is easy to open even in small amounts of rain
- Odor blocking performance over 99% (existing 95%)
- Open/close test (durability) : 50,000 times (existing 5,000)
- Durability : More than 20 years (existing 2 years)



## Installation cases (as of 2023)



Suseong-gu, Daegu (Dongil Elem. School)



Yeonsu-gu, Incheon (Gyeongwon-daero)



Seo-gu, Incheon (Bongsu-daero)



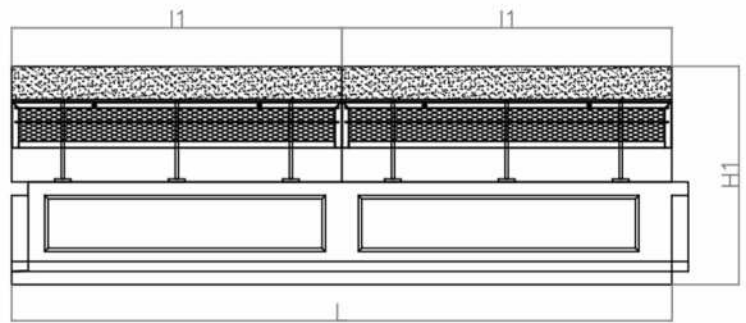
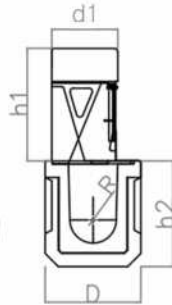
Buk-gu, Daegu (Sincheondong-ro)

Jung-gu, Incheon (Incheon Port)



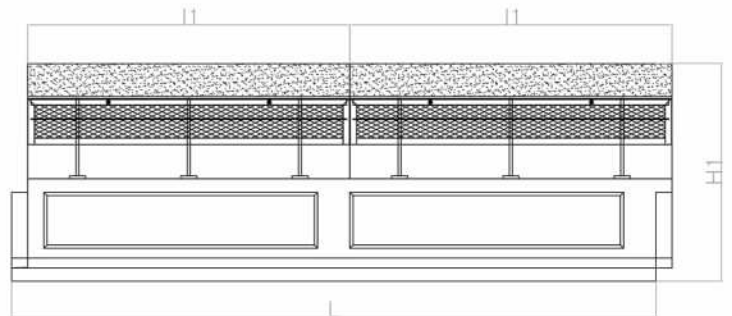
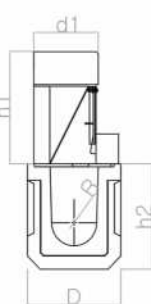
Seo-gu, Incheon (Gyeongmyeong-daero)

# Standard of The Drainage & Clean system for green roads



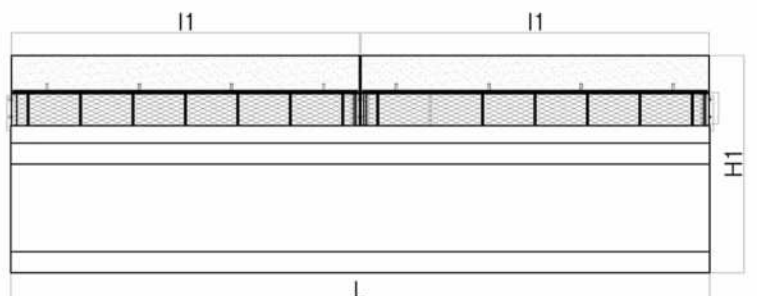
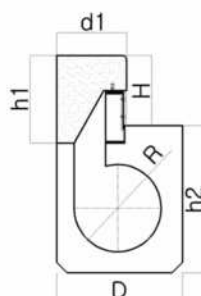
Model	h1	h2	H1	D	d1	R	L	l1
ADC-2M20GC	350	320	660	290	200	140	2000	1000

\* Same cross-sectional area as a rainwater pipe with a diameter of 200mm



Model	h1	h2	H1	D	d1	R	L	l1
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Model	H	h1	h2	H1	D	d1	R	L	l1
ADC-1M20G	200	250	360	560	360	200	250	2000	995
ADC-1M25G	250	300		610					

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