Supporting Information

S1 Distribution of *Legionella* in water

Previous research (Ajibode et al., 2013, Johnson et al., 2018) found that the concentrations of some pathogenic bacteria in reclaimed water are the highest in summer. And the incidence of legionellosis also peaks in summer (Phin et al., 2014). The concentrations of *Legionella* bacteria in China were obtained by literature review, and the results were shown in Table S1 and Fig. S1 including the effluent from the water recycling plant, which can be directly used for road cleaning and irrigation, and the reclaimed water receiving water (rivers, lakes, and fountains). However, the concentration data of *Legionella* in China is relatively scarce. This work used all of the average and single point data from all literatures as a big concentration distribution for evaluation. To avoid large error, the triangular distribution was used for the *Legionella* concentration (Zadeh, 1965; Guyonnet et al., 1999; Shakhawat et al., 2006). The median concentration of *Legionella* in the related waters in China was 25.00 GC/mL, the upper 95% value was 468.2 GC/mL, and the lower 95% value was 0.52 GC/mL, which was used as the parameters in the triangular distribution.

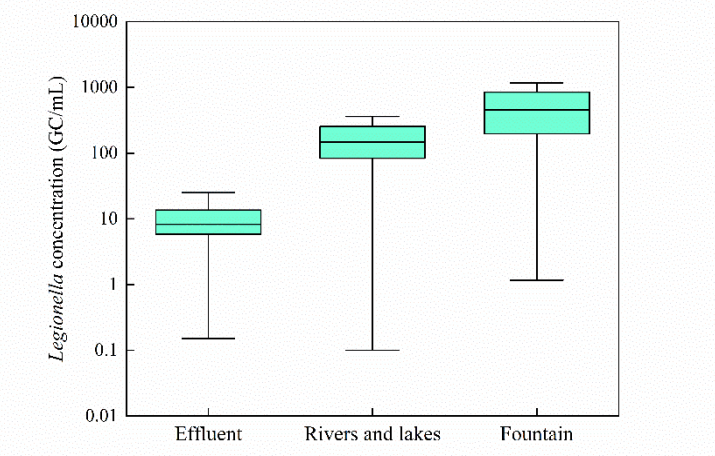

Fig. S1 Concentrations of *Legionella* in water bodies of China

Table S1 Concentrations of *Legionella* in water of China and their references

Pathogen	Source	Concentration (GC/mL)	reference
Legionella	Effluent of water reclamation plants	13.54	(Zhang et al., 2016; Shi et al., 2021)
		1.08	
		7.07	
		72.93	
		12.76	
		20.8	
		8.25	
		8.63	
		6.82	
		67.33696	
		126.4674	
		179.0761	
		168.6957	
		0.15	
		25	
		5.8	
		2.9	
	Surface water	0.1	(Liu et al., 2006)
		100	
	Lake water	255	(Wang et al., 2011)
		254.968	
		255.162	
	Fountain	392	(Zhang et al., 2014)
		1.17	
		519	
		1170	
	Natural water	360	(Zhen et al., 2007)
		100	
		2	

S2 Respiratory minute volumes of Chinese

Respiratory minute volumes (RMV) is related to age and gender. Respiratory rate of different groups is shown in Table S2. Saturated water vapor is related to temperature, and the ambient temperature during the daytime for the three scenarios in China is basically 30℃, and the corresponding saturated water vapor is 30.3 mL/m^3.

Table S2 Table of respiration minute volumes of different groups

RMV (L/min)	General population	Age groups		
		0–18	19–44	⩾ 45*
Average	10.9	9.7	11.1	11.1
Male	12.5	–	–	–
Female	10.1	–	–	–

Notes: *: RMV of group over 45 years old refers to RMV of group between 45 to 59 years old

S3 Relative humidity increment

Relative humidity increment of RC

A model was built to simulate the increase in relative humidity on the pavement during road cleaning. In general, a sprinkler with a capacity of 5 tons can operate for 20–40 min and two jets of water are generally sprayed from the left and right sides of the vehicle. Then the flow rate of 1–2 L/s of one spray port can be derived. The experimental simulation used a water gun with an adjustable flow rate in this range to spray the road under the condition of basically no wind (wind speed < 1 m/s), and it was found that the relative humidity increased slightly on the pavement and the flow rate within 1–2 L/s had little effect on it, and the distance is the main factor affecting the water vapor concentration.

Since the sidewalk has a width (assuming a width of 3 m), the study detected relative humidity at points of different widths and longitudinal distances from the sputtering point. However, in order to simplify the model, the data measured at all different width were collapsed to the longitudinal, and was considered as part of the humidity distribution at the longitudinal points. The default water humidity distribution is symmetric on both sides of the sputtering point. The humidity increment distribution is shown in Fig. S2. The abscissa 0 corresponds to the sputtering point where the sprinkler jets water hit the roadside. The plus and minus signs only indicate the directions. The horizontal lines from top to bottom in the box diagram correspond to the upper 95%, upper 75%, median, lower 75% and lower 95% values of the data.

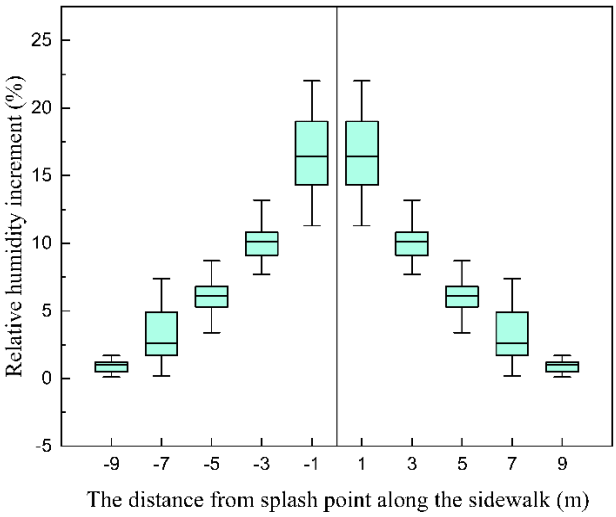

Fig. S2 The distribution of relative humidity increments at different sputtering point distances

Relative humidity increment of greenfield irrigation and landscape fountain

Some greenfields and stable ornamental fountains were chosen for field measurements. The background relative humidity was measured at a place far enough away from the greenfield or fountain (about 100 m) to ensure that the water aerosols could not reach. Then the temperature, wind speed and humidity were measured at random points on the sidewalk in the spray area. A total of 581 sets of data for greenfield irrigation and 3200 sets of data for landscape fountains were measured with temperature at 30℃ ± 3℃ and wind speed less than 1.5 m/s. Cumulative probability of relative humidity increment for greenfield irrigation and landscape fountain were shown in Fig. S3.

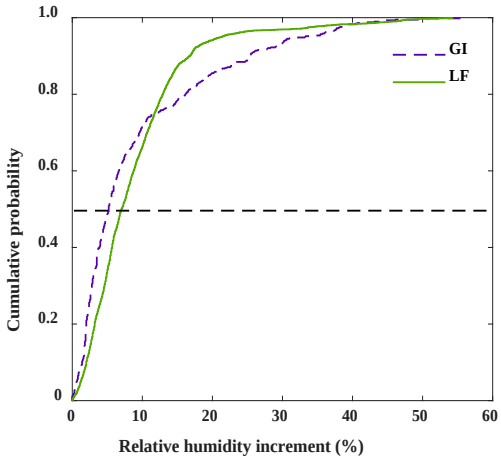

Fig. S3 Frequency distribution of relative humidity increment for greenfield irrigation

S4 Water-to-air partitioning coefficient

The k value fitting curves of the three exposure scenarios (road cleaning, greenfield irrigation, landscape fountain) are shown in Fig. S4.

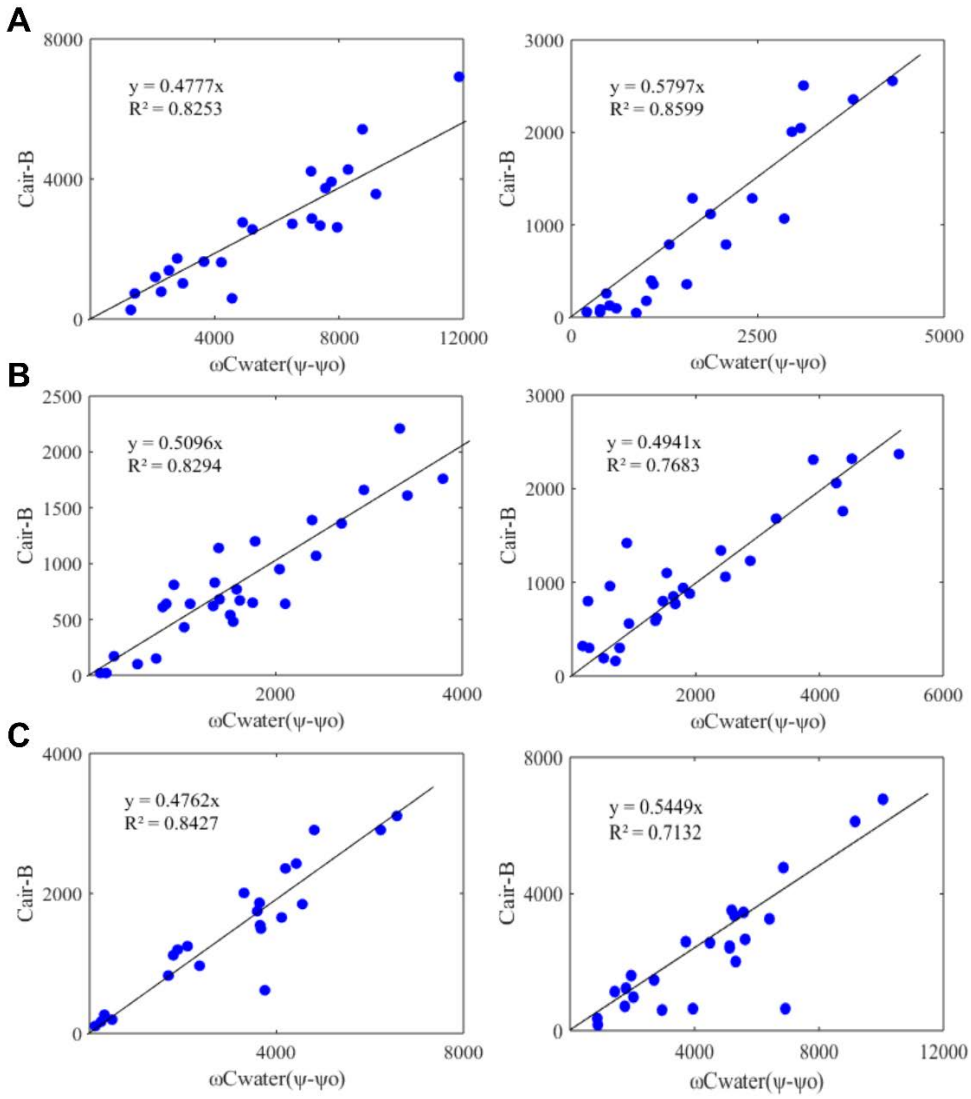

Fig. S4 k value fitting curves of three exposure scenarios. A: road cleaning, B: greenfield irrigation, C: landscape fountain

The results indicate that there is a significant correlation (person correlation, $p < 0.01$) between the concentrations of microorganisms in air and water. Therefore, the concentrations of microorganisms in the air can be estimated indirectly by measuring humidity and their concentrations in the water. The k value may be affected by the structure of nozzle and the flow

rate. However, water-to-air partitioning coefficient of the three exposure scenarios ranged from 0.4762 to 0.5797. One-way ANOVA analysis showed that there was no significant difference between them ($p > 0.05$). Therefore, water-to-air partitioning coefficients of the three exposure scenarios is the average value of 6 experiments.

$$k = \frac{0.5096+0.5797+0.5449+0.4777+0.4762+0.4941}{6} = 0.5137 \pm 0.041 \ , \qquad \text{(S1)}$$

The results showed that the distribution of microorganisms can be inferred from the distribution of relative humidity increments. At the same time, it is also found that the concentration of pathogenic microorganisms in water that are atomized into aerosols and distributed in the air is about half of the theoretically assumed concentration.

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