

Hong Kong Secondary Schools Acid Rain Survey

A territory wide acid rain survey was conducted and completed by the Hong Kong Meteorological Society. Twenty schools participated in the project and submitted rainfall pH data to the Society during the period January 2002 to June 2003. Figure 2 shows the locations of the schools. It can be seen that the schools distribute quite widely over Hong Kong; only the northeastern part of the New Territories and the Lantau Island were not covered.

The twenty schools are:

1. Baptist Wing Lung Secondary School
2. Caritas Chan Chun Ha Field Studies Centre
3. CCC Kwei Wah Shan College
4. Cheung Chau Government Secondary School
5. CNEC Christian College
6. Cognitio College (Hong Kong)
7. Hoi Ping Chamber of Commerce Secondary School
8. Holy Family Canossian College
9. Hong Kong True Light College
10. King's College
11. N.T. Heung Yee Kuk Tai Po District Secondary School
12. N.T. Heung Yee Kuk Yuen Long District Secondary School
13. Po Leung Kuk 1983 Board of Directors' College
14. Queen Elizabeth School Old Students' Association Second School
15. Sing Yin Secondary School
16. St. Mary Canossian College
17. The Methodist Lee Wai Lee College
18. Tin Shui Wai Heung To Middle School
19. Tseung Kwan O Government Secondary School
20. TWGHs Wong Fut Nam College

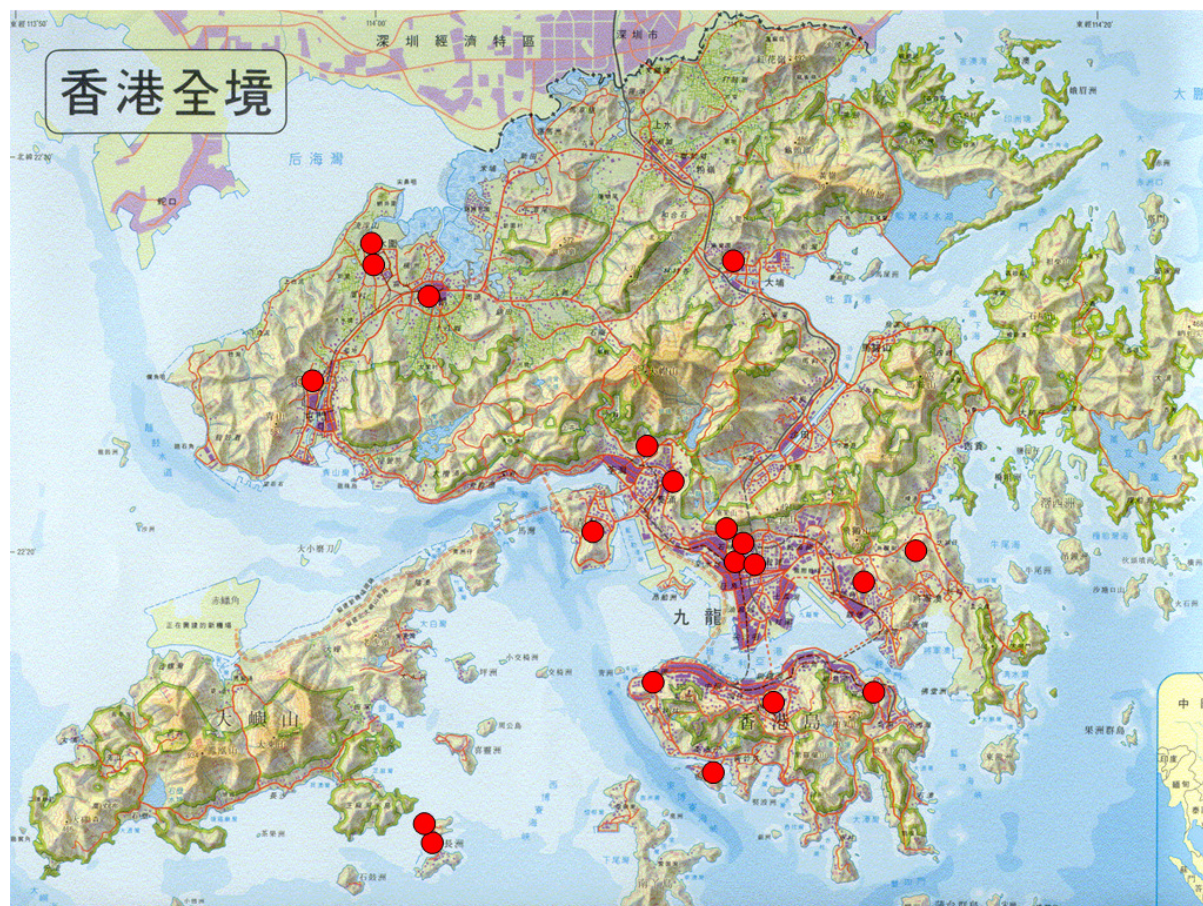


Figure 2. Location of participating schools

A total of 748 counts of pH data were collected. The minimum of the pH is 3.4, the average is 5.7 and the maximum is 7.2. Natural rainwater is slightly acidic with a pH of 5.5, as a result of absorbing ambient carbon dioxide to form weak carbonic acid. Typically, precipitation is considered as ‘acid rain’ when the pH value is lowered than 5. The number and percentage occurrence of the pH data as a function of pH ranges is listed in Table 1. The percentage occurrence is plotted in Figure 3. By far, most of the measured pH values (84%) were between 5 and 6, and that is the pH value we expect for natural rain water. Only 14% had pH values lower than 5. On the high side, only 2% of the pH values were higher than 6.

pH range	Number of Counts	Percentage
3 to 4	17	2%
4 to 5	91	12%
5 to 6	626	84%
6 to 7	13	2%
7 to 8	1	0%

Table 1. Number and Percentage of occurrence of pH values measured as a function of pH ranges

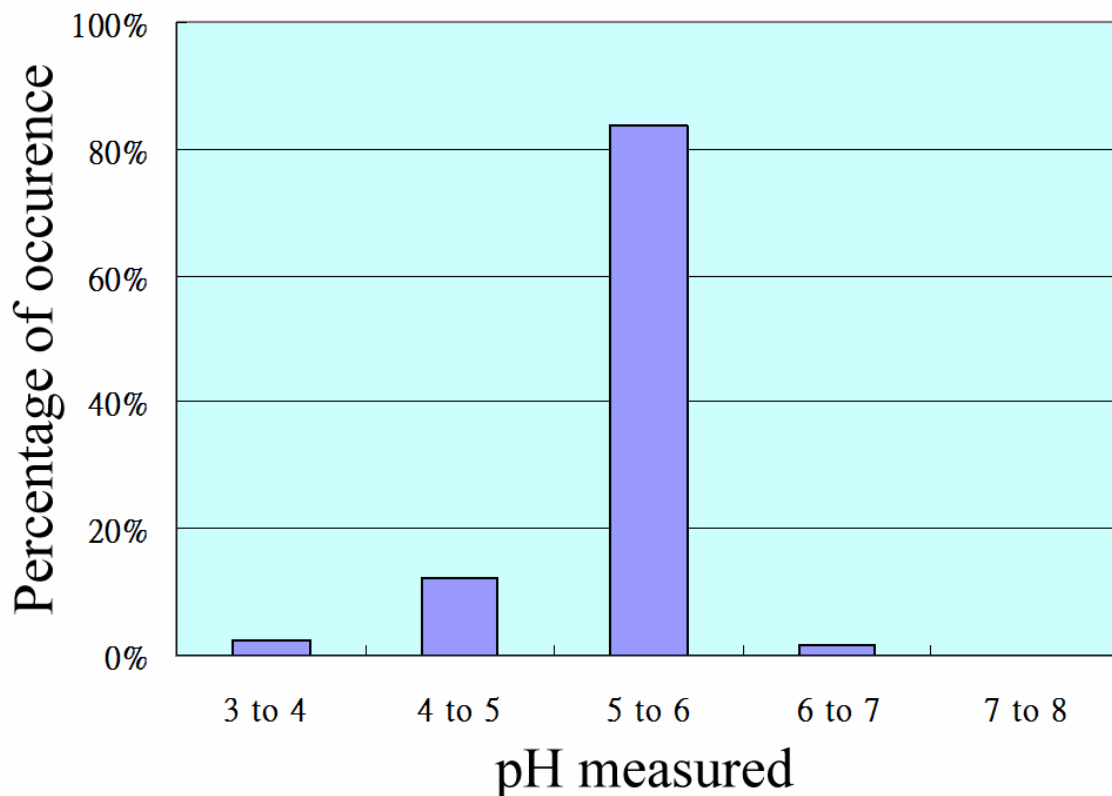


Figure 3. Percentage of occurrence of pH values measured as a function of pH ranges.

Using standard statistical test, we found that the distribution of the recorded pH values is significantly different from a normal distribution (around 5.5), and skews towards lower, more acidic values. This finding shows that, strictly speaking, Hong Kong does have an acid rain problem, but it appears that the problem is not serious.

Figure 4 shows the pH values recorded by all the schools as a function of time. Seasonally, it appears that lower pH values are observed in *winter and spring*. The lowest pH values for the entire study were recorded in the first four months of 2002, and pH values recorded in the first three months of 2003 are lower than those recorded between May and June of 2003 (not much data was taken during April 2003 because of SARS). There are many possible reasons for this. It is possible that the acidity of the rain in spring 2002 is really more acidic than spring 2003 or that the students who took the data had changed between 2002 and 2003 and different students could have judged the pH values differently. On the other hand, the difference may also be related to the very different rainfall amount during these periods. Records from the Hong Kong Observatory showed that 268.3 mm of rain was recorded in the first three months of 2002 (nearly twice the normal amount), while only 75.4 mm was recorded in the first three month of 2003 (about half the normal amount). With four times more rain, it is not surprising that there are many more data points in the early part of 2002 than in 2003.

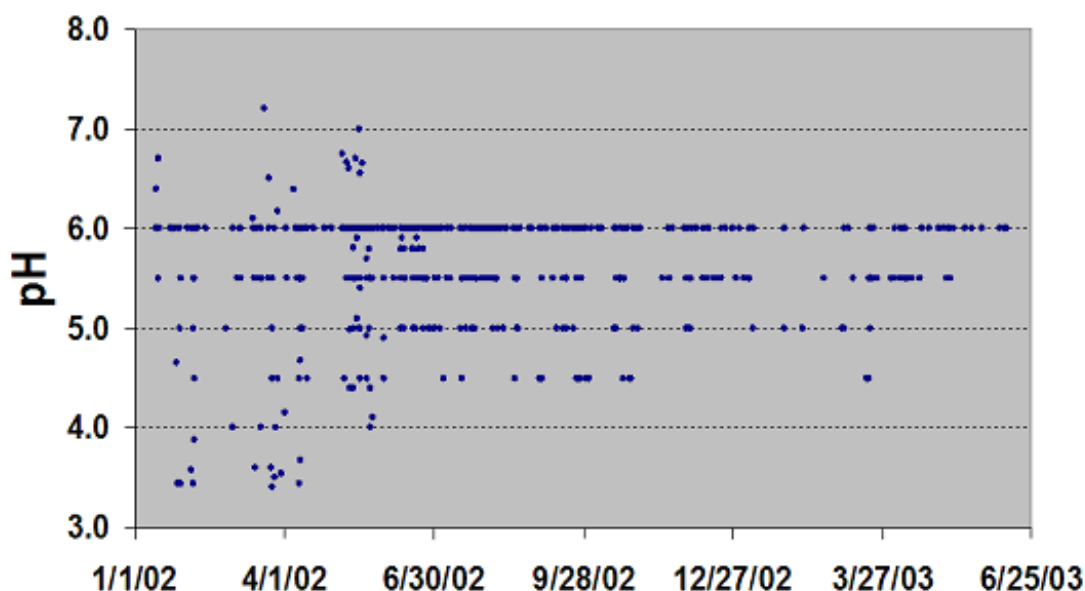


Figure 4. Time series of the pH values.

Spatially, lower pH values are more often found on the western side of Hong Kong. Tin Shui Wai and Tuen Mun each had more than 20 days with rainfall pH values lower than 5, Lam Tin and Tseung Kwan O had 12 days, Kwai Chung had 7 days, Hong Kong West had 2 days while Cheung Chau and Kowloon had none.

To clearly show the spatial variations, the lowest pH value recorded at each site is shown in Figure 5; the average pH value recorded at each site is shown in Figure 6. Red colour is used to depict pH values lower than 5.

Figure 5 shows that, Hong Kong West has one red figure. Tseung Kwan O & Lam Tin has two red figures, Kwai Chung has 2 red figures, Tin Shui Wai and Tuen Mun has 5 red figures. The maximum acidity recorded (between 3 and 4) is indeed very acidic.

Figure 6 shows that in average term, Tin Shui Wai, Tuen Mun, Tseung Kwan O & Lam Tin has acid rain. On average, most of the districts in Hong Kong do not have acid rain problem.

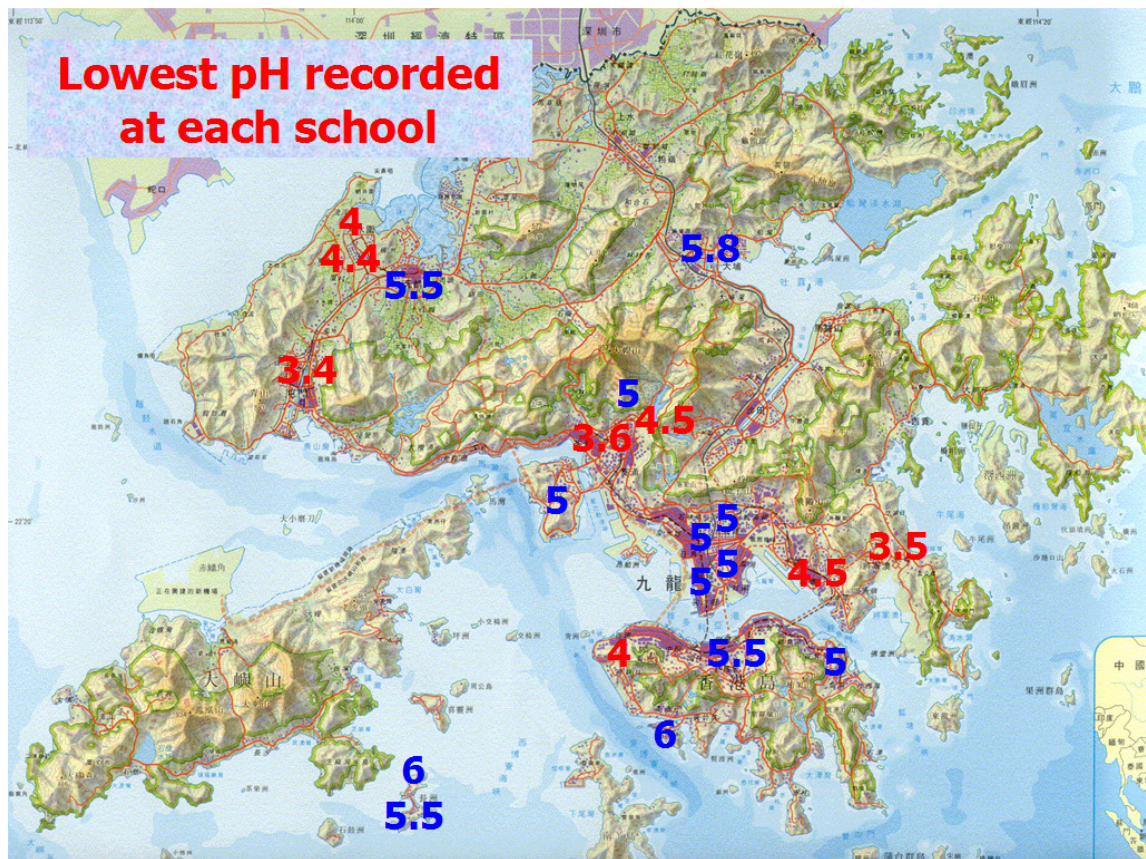


Figure 5. Lowest pH value recorded at each school.

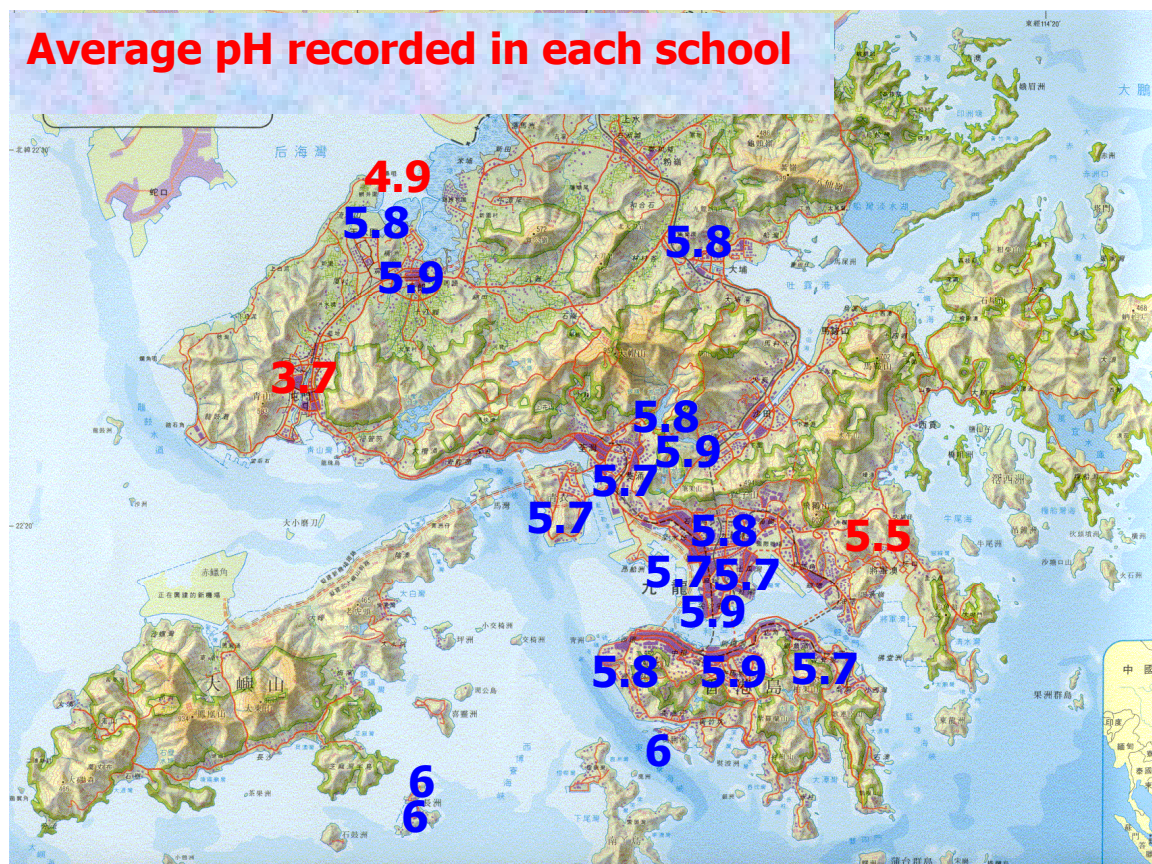


Figure 6. Average pH value recorded at each school.

