

# Surveillance and evaluation of open fountains for Legionella risk

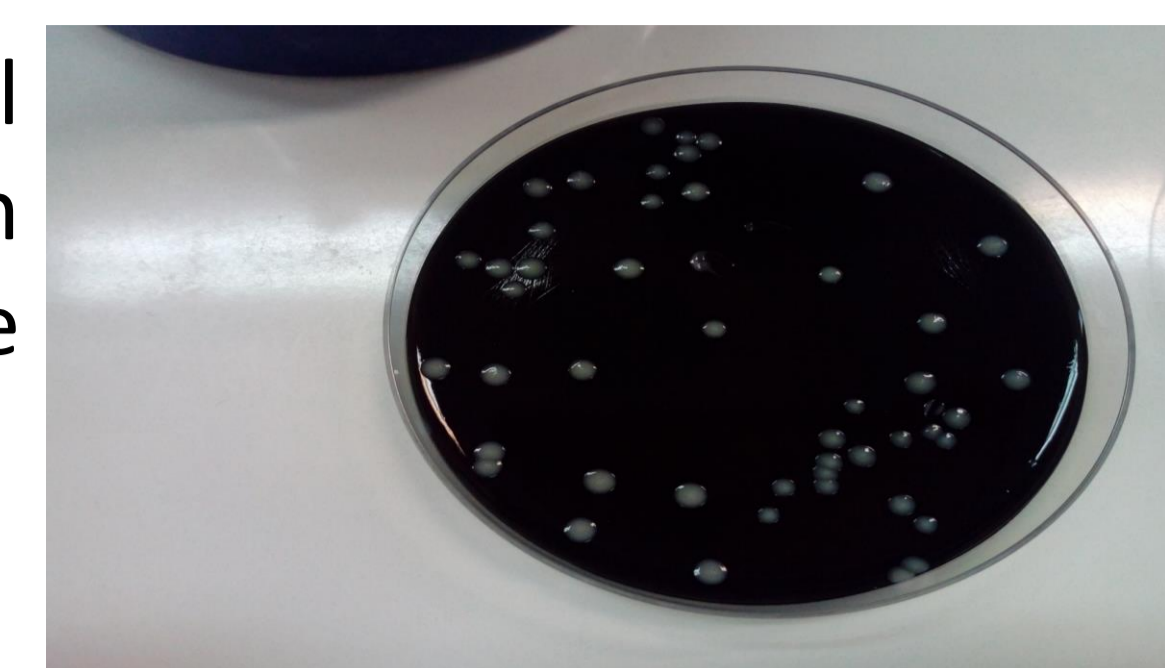
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## INTRODUCTION

Several legionellosis cases have been associated with fountains. Design, maintenance, operation and disinfection of water are critical in order to keep *Legionella spp* within acceptable limits in fountains. Parameters such as temperature, corrosion, transient operation can favor the proliferation of *Legionella spp*. Several researchers propose to regularly inspect and evaluate the operation of the foundation system.



## AIM

The aim of this study was to inspect Patras' fountains based on the questionnaire concerning water spectacles, as recommended by the National Public Health School, for presence or absence of *Legionella spp* and to analyse the Legionella concentrations in one year.

## MATERIAL AND METHODS

There are 15 fountains in open space mainly in squares in Patras. All use water from network and none has special filtration. 13 fountains jets water into the air to supply it into the basin and the other two pour it. The fountains operate 24 hours per day. Most of the water in aerosols evaporates quickly, leaving airborne particulate matter, which when they are small enough to be inhaled are able to enter the respiratory airways and cause legionellosis. To check for *Legionella* infection risk and the proper functioning of the fountains that affect the presence of Legionella, inspection and sampling were performed in dry and wet period. The questionnaire, as recommended by the National Public Health School, was chosen for fountains' evaluation. All fountains were evaluated for in the wet and dry period and fountains' function was classified, according to their score, into three categories: satisfactory (total negative score: 0 to -2), partly satisfactory (total negative score: -3 to -5) and inadequate (total negative score below -6). Two samplings took place in each period. At the same time, water and air temperature, ph, humidity and residual chlorine were measured. For analysis ISO 11731: 2017 "Water quality – Enumeration of Legionella" was implemented.

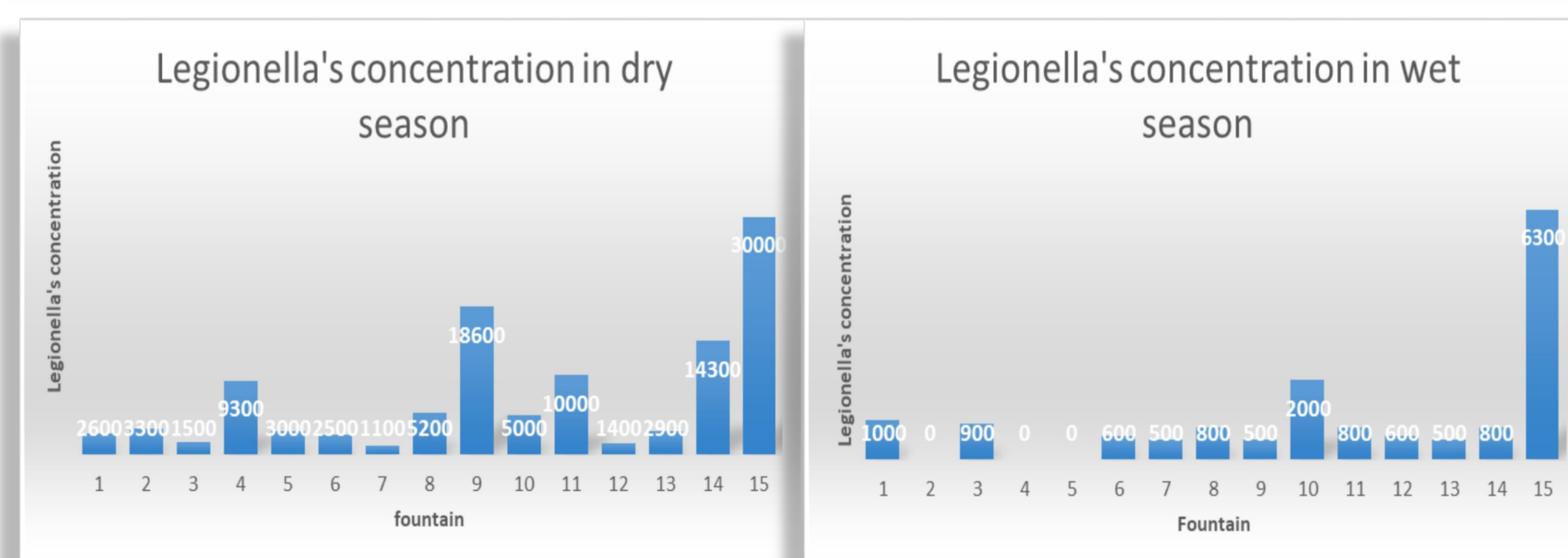
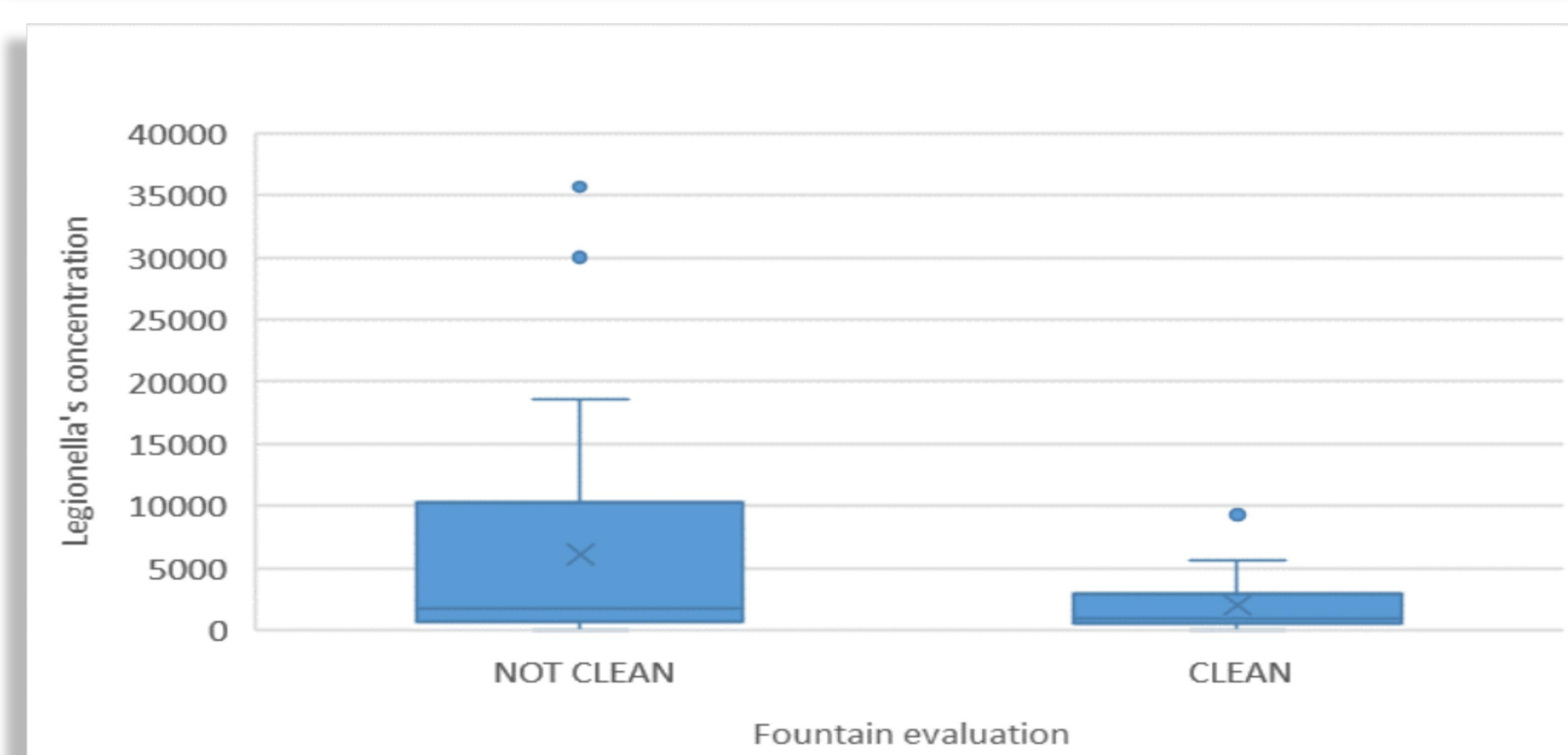
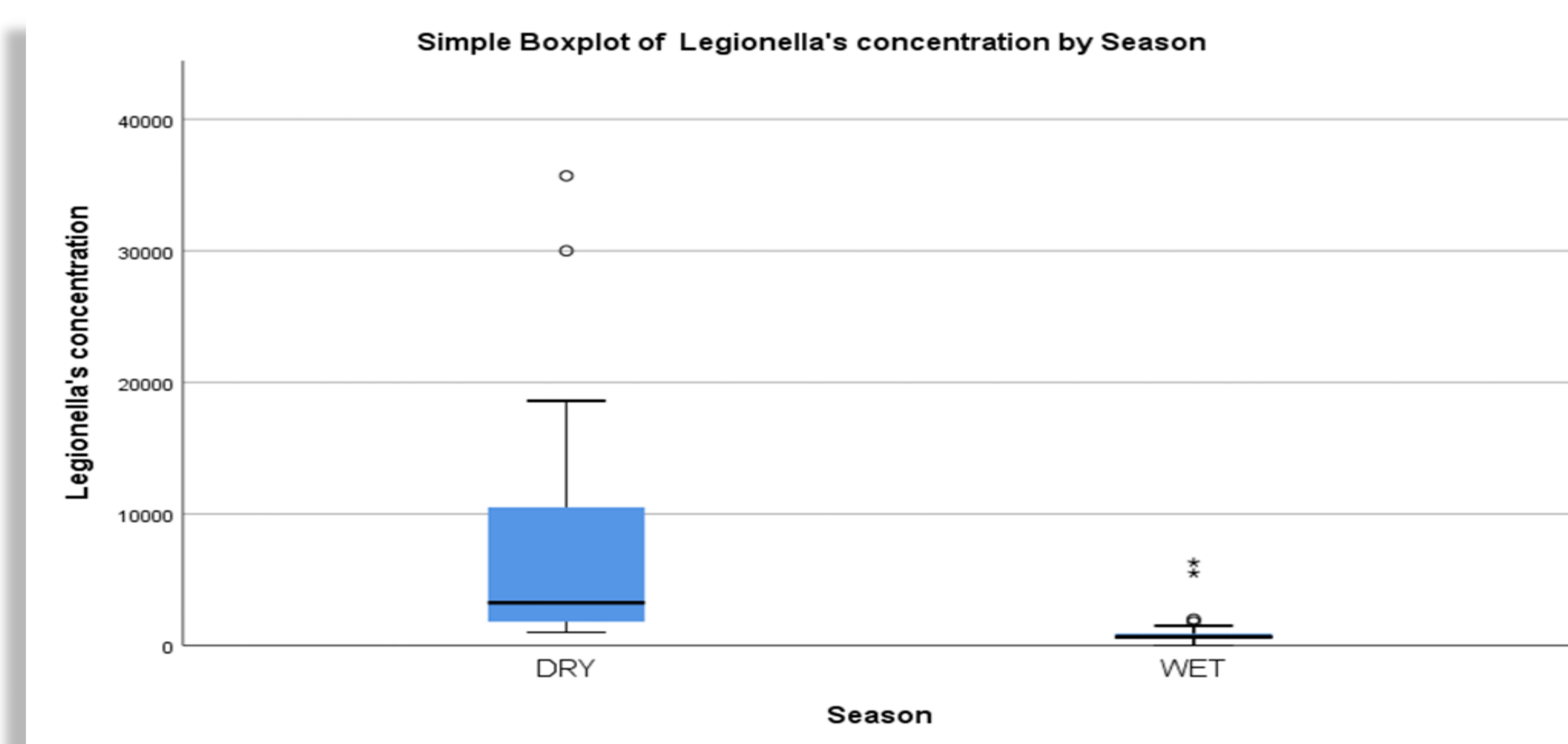
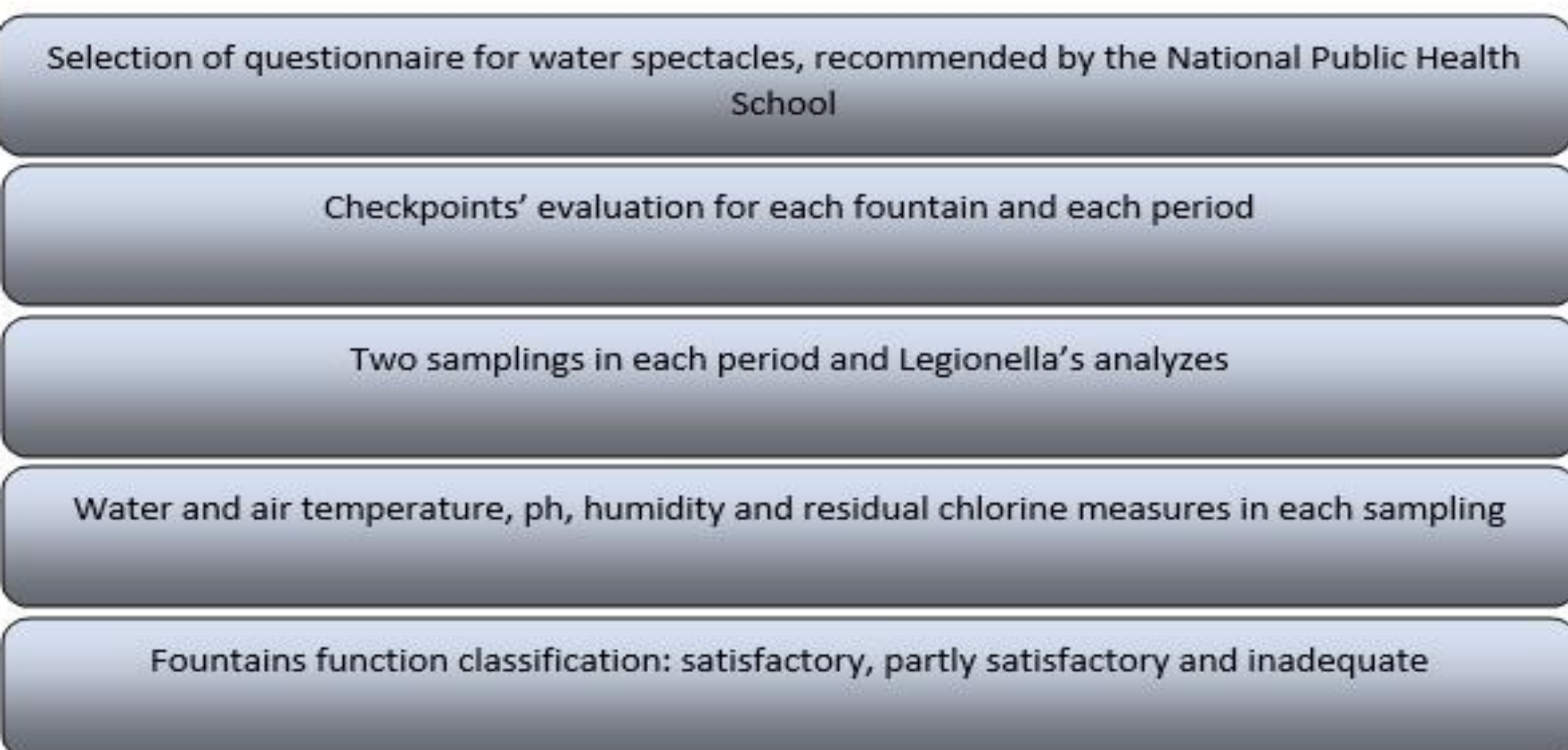
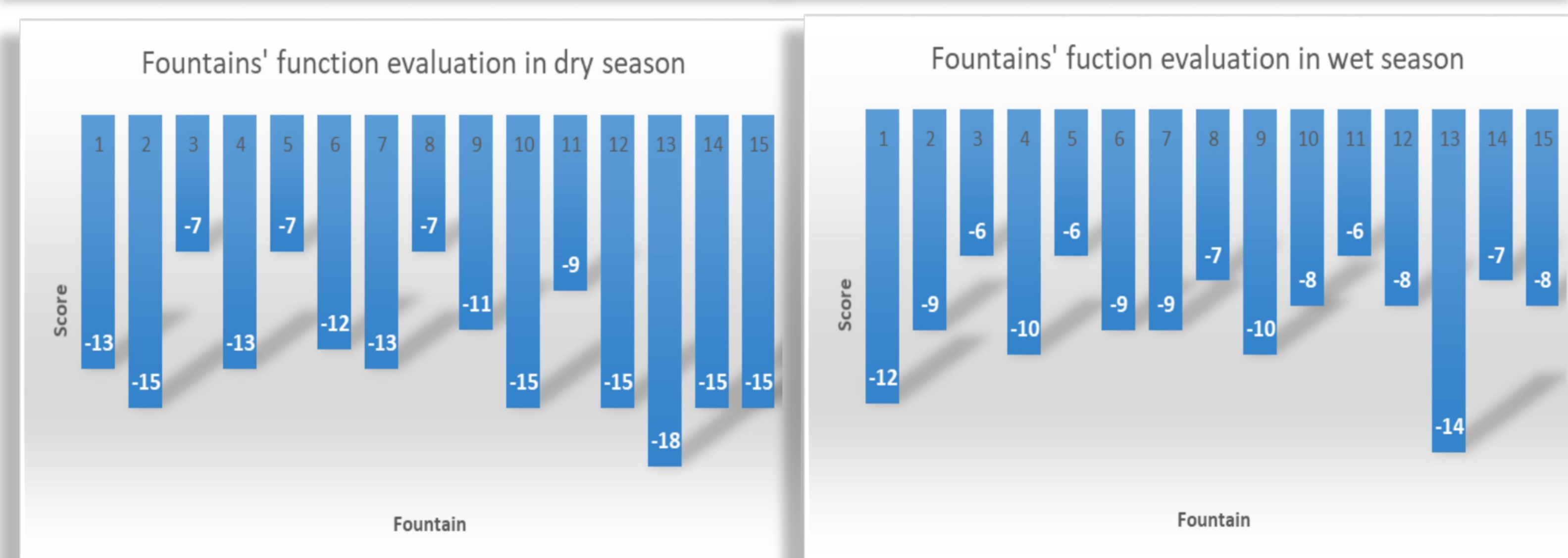


Fig. 1: Agias Sofias fountain



## RESULTS

All samples from dry season were *Legionella spp*. positive and exceeded the limit of 1,000CFU / lt. 80% of the samples from wet period, were *Legionella spp*. positive, while 20% of samples exceeded the limit of 1,000 CFU/lt. Concentration of *Legionella spp*. varied with the season (Mann-Whitney test, p<0.001). Statistically significant positive correlation between the concentration of *Legionella spp* and water temperature, humidity and air temperature was found (r=0.728 p<0.001, r=0.589 p<0.001, r=0.611 p<0.001, Pearson test). Water temperature influences presence and concentration of *Legionella spp*. Residual chlorine's value below 0.4-0.7 mg/lt in conjunction with the incorrect operation allows the bacterium to proliferate uncontrollably.

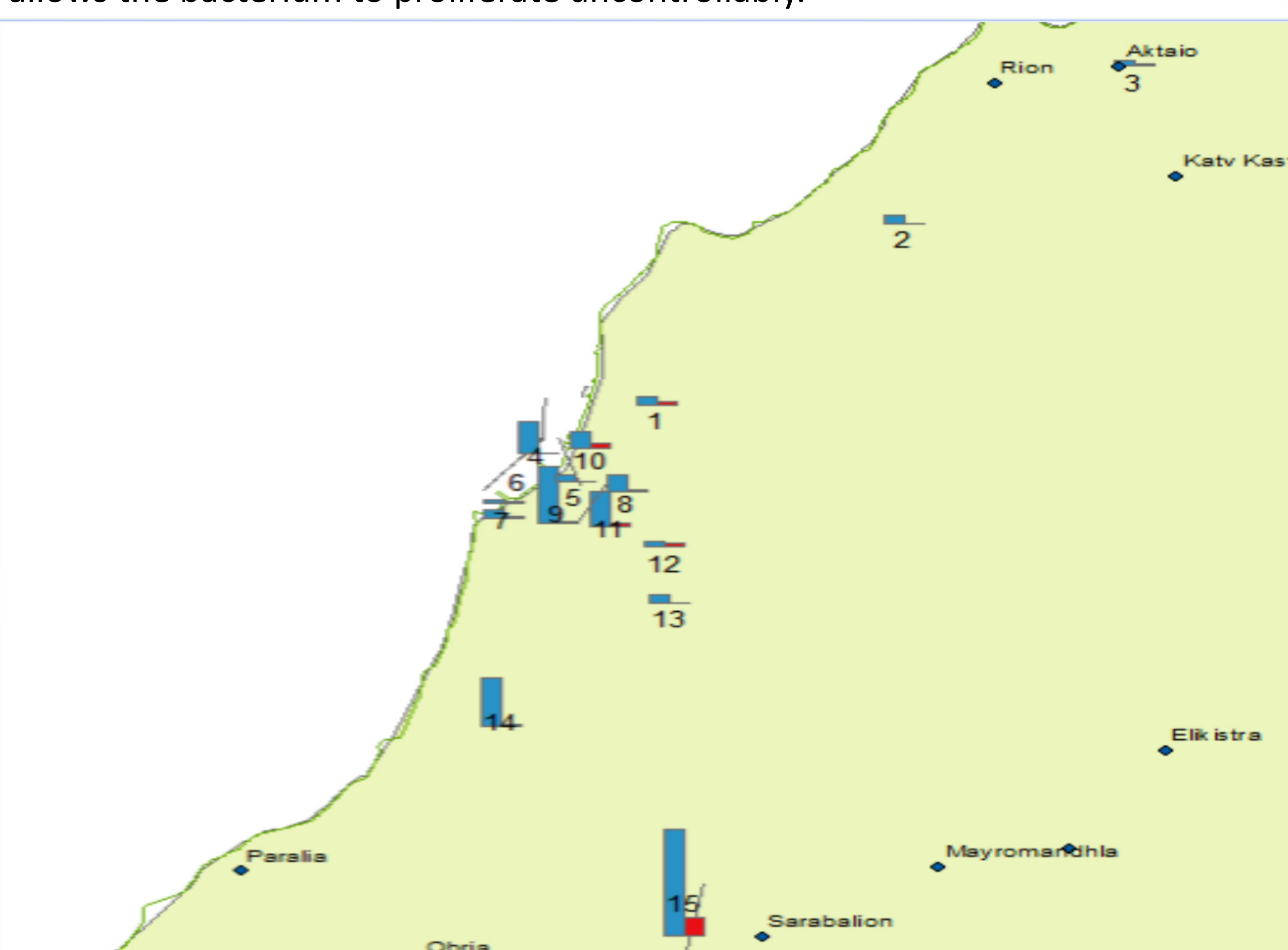
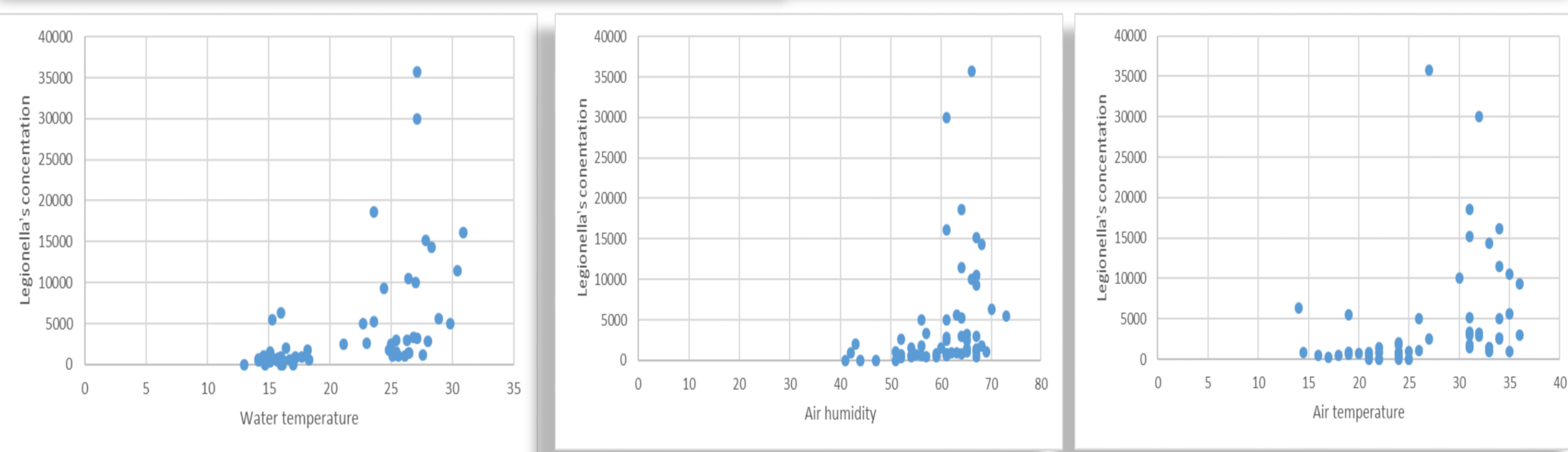


Fig. 2: Fountains location and Legionella's concentrations in dry (blue) and wet (red) period on a GIS map

## CONCLUSIONS

Microbiological analyses and completion of the checklist must be carried out at regular intervals by the competent authorities. In case that the score is low, and function is considered inadequate, or *Legionella spp's* concentrations exceeds the limits, appropriate measures should be implemented. Special attention should be paid to disinfection of fountain water. The concentration of the residual biocidal product should be between the limits (0.4 – 0.7 mg / l if chlorine is used). Fountains should be treated as a potential and suspected source of Legionella infection for city inhabitants.

## REFERENCES

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