

Quality control procedure in the participating countries

1. Current activities of QA/QC

In the framework of EANET, following QA/QC activities have been conducted for ten years;

- 1) Inter-laboratory Comparison (ILC) project for wet, dry, inland aquatic and soil;
- 2) Checking ion balance (R_1) and conductivity balance (R_2) values for every monitoring data, and;
- 3) Evaluation of the data completeness (%PCL and %TP).

2. Existing problems to be solved for the improvement of the data quality

1) Observation in the Data Report and the Report on ILC project

The observed existing problems by checking the data report and the report on the ILC project were summarized in the Appendix I.

The Network Center (NC) has to evaluate the monitoring data and to improve their quality. However, the NC can evaluate the data only checking the submitted report and data from the participating country, and it is difficult to grasp actual QA/QC activities in each participating country.

The trends of CV% of reported value under the ILC project from 2001 to 2009 were shown in Figure 1 and 2 as an example for finding existing problems. The deviations of some items indicated decreasing tendency, the deviations of some cations indicated higher CV% and especially, the deviations of electric conductivity and hydronium ion concentration (corresponding to the pH) indicated increasing tendency.

These phenomena can be observed easily; however, the actual cause investigation for solving the problems is difficult only by detailed checking of submitted reports.

2) General QA/QC activities

The QA/QC system in the participating countries should be harmonized by establishing the common quality management system. Since only the requirements for QA/QC were described in the Technical Manuals, it may be difficult to recognize and to harmonize how the data quality should be kept.

The preparation of the Technical Manual on the Establishment of Quality System for EANET can be significant.

3) National Monitoring Plan

The National Monitoring Plan (NMP) of each participating countries were prepared after starting formal phase. The NMP should be reviewed every year and revised if necessary.

The NC is now difficult to grasp current situation of the participating countries because of being kept the NMP unchanged.

When there is a revision in the NMP, the NMP shall be revised immediately and should be submitted to the NC.

4) Implementation of the Technical Mission

The technical mission (TM) has been conducted under the budget of the Ministry of the Environment, Japan (MOEJ). And it could be effective to build the acid deposition monitoring capacity in the participating countries.

In these several years, because of the limited budget of MOEJ, the frequency of the technical mission was decreased and the number of the intended countries could not help being limited.

The potential problems in the laboratories in charge of the EANET monitoring in the participating countries may not be able to be stimulated to maintain and to improve their abilities and their data quality.

Even in the laboratories which have been already regarded as high potential, there might be unrevealed problem.

It may be significant to reconsider the modality of the TM.

5) Implementation of the Inter-laboratory Comparison project

The Inter-laboratory Comparison (ILC) project has been conducted to confirm the abilities of the laboratory in charge of EANET monitoring. The ILC samples for wet samples, dry samples, inland aquatic environment samples and soil samples were prepared.

The wet samples contain all of the mandatory items, however, because of the technical aspect, only the limited kinds of the mandatory items are added to the dry samples.

And, the extraction procedure for the dry samples is not standardized, so that the variation seemed to be caused by the difference of the extraction efficiency was observed.

In the previous implementation of ILC project, the submitted data was evaluated by using the prepared values which was specified by the NC. Using this prepared value, the bias was observed on the statistic data. The possible likelihood value which should be used for the evaluation can be the median of all of the compiled data.

3. Items for the improvement of the quality of monitoring data in EANET

Following items should be reviewed and considered their modality:

1) Selection of the monitoring sites;

The site selection should be done in accordance with the technical manuals. All of the site shall be prepared their regional scale, local scale and on-site scale descriptions. And the sites shall represent the circumstances around the site in each classified region, such as remote, rural or urban site.

The existing monitoring sites should be reviewed their suitability to the requirements.

2) Establishment of the common point of view to the methodology including sampling and measurement;

3) Implementation of the ILC project;

4) Implementation of the technical mission;

5) Establishment of quality management, and;

6) Reporting of the monitoring data.

4. Items expected to be discussed in SAC11

- 1) Starting to prepare the technical documents on Quality Management under the EANET project
- 2) Starting to prepare the technical documents with detailed instructions on data reporting procedure and formats.
- 3) Reconsideration on the modality of Inter-laboratory Comparison project and the Technical Mission especially focused on the quality management and capacity building.

Appendix I

Observation in the Data Report and Report on the Inter-laboratory Comparison Project

CAMBODIA

Phnom Penh / Department of Pollution Control (KH01)

➤ Data Report

- ✓ The sampling interval was described as “weekly”. However, actual sampling intervals in 2009 were varied from 7 days to 49 days. On the other hand, the sampling intervals in 2010 were almost 1 week. The NC expected Cambodia to keep the actual sampling intervals as in 2010.
- ✓ The definite precipitation was calculated as the reduced precipitation using the amount of the sample.
- ✓ The number of the samples whose pH were higher than 6 was 25 out of 30 valid samples. The measurement of bicarbonate ion was recommended, since most of the ion valance values were outlier.

➤ ILC Report

- ✓ Only the calibration line of Na^+ was attached.

CHINA

Haifu and Jinyunshan / Chongqing Institute of Environmental Science(CN04)

➤ Data Report

- ✓ There was no description of flag and remark. The amount of the information was insufficient.
- ✓ The ratio of the collected mass precipitation against the measured precipitation by rain gauge (M/R%) were fairly good.

➤ ILC Report

- ✓ Water bath or any other suitable temperature controller was not used for the measurement of pH and EC.
- ✓ The target peaks on the submitted chromatogram were too small to identify.
- ✓ The M/R% values were not so good (50 - 70 %)

Shizhan and Jiwozi / Xi'an Environmental Monitoring Station (CN03)

➤ Data Report

- ✓ There were blank columns in the submitted data format. If the measurement of F^- was not conducted, “0.0” should be described in the column.
- ✓ The number of the samples whose pH were higher than 6 was 30 out of 31 valid samples. The measurement of bicarbonate ion was recommended, since the ion balance for most of the samples using the estimated concentration of bicarbonate ion were fairly good.
- ✓ It was found that there were no data from January to March because of the bad condition of the road to access the sampling site. If this situation would usually occur, it must be needed to take some measure.

- ✓ The measurement of bicarbonate ion was recommended, since the actual ion balance for most of the samples were not so good

➤ **ILC Report**

- ✓ Water bath or any other suitable temperature controller was not used for the measurement of pH and EC.
- ✓ The target peaks on the submitted chromatogram were too small to identify.

Hongwen and Xiaoping / Xiamen Environmental Monitoring Station (CN02)

➤ **Data Report**

- ✓ When it was no precipitation, the column should be described as "0.0".

➤ **ILC Report**

- ✓ There was no description about the detailed information of standard solutions.
- ✓ The pH and EC were measured without using water bath for the temperature control.
- ✓ There was no description about the column oven temperature for the measurement of cations.

Xiangzhou and Zhuxiandong / Zhuhai Environmental Monitoring Station (CN01)

➤ **Data Report**

- ✓ Since the columns of the sample amount were blank and there were no description of Method code for the precipitation amount, it was hardly identified how the precipitation amounts were calculated (or measured).

➤ **ILC Report**

- ✓ The range of the calibration standard solution concentration was slightly high at Xiangzhou, even for the measurement of actual samples.

INDONESIA

Jakarta / Analysis Division, Meteorological and Geophysical Agency (BMG)(ID02)

➤ **Data Report**

- ✓ The sample numbers were only described on the samples which were collected.
- ✓ There was a notice on the sample #10 as "Malfunction". It should be described what kind of malfunction has occurred.
- ✓ The columns of the sample amount were blank.

➤ **ILC Report**

- ✓ The separation of the peaks was not so sufficient.
- ✓ The peak shape was slightly broad.
- ✓ The analysis time was relatively short.
- ✓ The pH and EC were measured without using water bath for the temperature control.

Serpong / Environmental Management Center (EMC)(ID01)

➤ **Data Report**

- ✓ The concentrations of potassium ion, calcium ion and magnesium ion were considerably low and it seemed that these concentrations could be below detection limit.
- ✓ The columns of the sample amount were blank.
- ✓ If there was no precipitation, the column should be described as "0.0".

Kototabang**➤ Data Report**

- ✓ It was found that some nitrate ion concentration was recorded as 0.001, however the detection limit in the laboratory was 0.124.
- ✓ The nitrate ion seemed to be analyzed inappropriately.
- ✓ It was found that some ammonium ion concentration was recorded as 0.0001. This might be same as above.

Bandung / Indonesia National Institute of Aeronautics and Space (Lapan)(ID03)**➤ Data Report**

- ✓ The sample which was collected in November was analyzed on January 13th.
- ✓ The description of "0.0" should be described when there was no precipitation.

➤ ILC Report

- ✓ The EC value of the pure water was relatively high.
- ✓ The pH was measured without using water bath for the temperature control.
- ✓ The curve fitting for the calibration line of anion, potassium ion and calcium ion was not so good.

Maros**➤ Data Report**

- ✓ The columns of the sample amount were blank.
- ✓ The description of "0.0" should be described when there was no precipitation.

JAPAN**Rishiri, Sapporo / Institute of Environmental Sciences, Hokkaido (JP01)****➤ ILC Report**

- ✓ The pH and EC were measured without using water bath for the temperature control
- ✓ The concentration of the calibration standard solution seems to be higher than the actual concentration of the samples.

Ochiishi, Ogasawara, Sado-Seki, Tappi and Tokyo / Asia Center for Air Pollution Research (JP09)

There is not so much assignment.

Happo / Nagano Research Institute for Health and Pollution (JP03)**➤ ILC Report**

- ✓ The lowest concentration standard solution seems to be a little bit high for the measurement of low concentration sample.

Ijira / Gifu Prefectural Research Institute of Health and Environmental Science (JP04)**➤ ILC Report**

- ✓ Unstable baseline was observed on the chromatograms of anion.

Yusuhara / (JP01)

There is not so much assignment.

Hedo / Okinawa Research Institute of Health and Environment (JP08)

➤ ILC Report

- ✓ The highest concentration calibration standard solution, especially for chloride ion, should be much higher than current one.

LAO PDR

Vientiane / Environment Quality Monitoring Center, Environment Research Institute (LA01)

➤ ILC Report

- ✓ The pH and EC were measured without using water bath for the temperature control.
- ✓ The column oven does not use for operating ion chromatograph.

MALAYSIA

Petaling Jaya / Division of Environmental Health, Department of Chemistry (DOC)(MY01)

➤ Data Report

- ✓ The calculated ion balance was considerably bad. Especially, when the ammonium ion concentration was low, the ion balance become worse than the others.
- ✓ It was difficult to recognize how much amount of the sample was required to analyze all items.

➤ ILC Report (for all sites in Indonesia)

- ✓ The pH and EC were measured without using water bath for the temperature control.
- ✓ The condition of baseline for the anion chromatogram was not good.

Tanah Rata / Division of Environmental Health, Department of Chemistry (DOC)(MY01)

➤ Data Report

- ✓ The cation concentrations were relatively low.

Danum Valley / Division of Environmental Health, Department of Chemistry (DOC)(MY01)

➤ Data Report

- ✓ The pH and EC was not measured when the collected amount was less than 70 g.

Kuching / Division of Environmental Health, Department of Chemistry (DOC)(MY01)

➤ Data Report

- ✓ Many magnesium ion concentrations were below the detection limit.

MONGOLIA

Ulaanbaatar and Terelj / Central Laboratory of Environmental Monitoring (CLEM)(MN01)

➤ Data Report

- ✓ The sampling period was sometimes varied. The sampling period in this site was daily.
- ✓ When the sample amount was less than 30 g, only the flag 783 was described and the analysis did not carried out. It is recommended that the sample should be diluted with pure

water and analyzed.

➤ **ILC Report**

- ✓ There was no description on the information about the standard solution for EC measurement.
- ✓ The column oven does not use for ion chromatograph.

MYANMAR

Yangon (Kaba Aye) / Department of Meteorology and Hydrology (DMH)(MM01)

➤ **Data Report**

- ✓ The pH values of most of the samples were higher than 6. The measurement of bicarbonate ion was recommended.

➤ **ILC Report**

- ✓ The water bath does not use for the EC measurement.
- ✓ The EC of pure water was relatively high.
- ✓ The calibration line and the chromatograms were not submitted.

PHILIPPINES

Los Banos and Metro Manilla / Environmental Management Bureau - Central Office (EMB-CO)(PH01)

➤ **ILC Report**

- ✓ The column temperature for ion chromatograph was varied between 30 - 60 degC.
- ✓ The EC value of the standard solution was different from the theoretical values written in the manual.
- ✓ The peak shape of std2 for anion was not so good. This was assumed that the improper adjusted condition of the suppressor or degradation of the analytical column.

Sto. Tomas / Environmental Management Bureau - Cordillera Administrative Region (ENB-CAR)(PH02)

➤ **Data Report**

- ✓ Nevertheless the sample amount was 0, there were many data with actual precipitation values observed by rain gauge.

➤ **ILC Report**

- ✓ The peak shape of Std1 for anion was not so good.
- ✓ This was assumed that the improper adjusted condition of the suppressor or degradation of the analytical column.

REPUBLIC OF KOREA

Kanghwa, Jeju and Imsil / National Institute of Environmental Research (KR01)

➤ **Data Report**

- ✓ In spite that the monitoring would be conducted daily, the sampling seemed to be

implemented event based.

- ✓ No data was reported except the event data. The completeness could not help being reduced.

➤ **ILC Report**

- ✓ ILC report in 2010 is not submitted.

RUSSIA

Mondy, Listvyanka and Irkutsk / Limnological Institute, Academy of Sciences, Siberian Branch (LI/RAS/SB)(RU01)

➤ **Data Report**

- ✓ The concentration with flag as below detection limit exceeded the DQO value.

➤ **ILC Report**

- ✓ The injection volume of 3000 ·L for anion analysis supposed be excess amount.
- ✓ The pH and EC were measured without using water bath for the temperature control.
- ✓ Many data were measured at out of range of the calibration line.

Primorskaya / Primorsky Center for Environmental Monitoring (PCEM)(RU02)

➤ **ILC Report**

- ✓ The pH and EC were measured without using water bath for the temperature control.
- ✓ The result of curve fitting for anion was not so good.
- ✓ Many data were measured at out of range of the calibration line.

THAILAND

There is not so much assignment.

Ha Noi and HoaBinh/ Environmental Laboratory - Center for Environmental Research (VN01)

➤ **ILC Report**

- ✓ The intercept of the calibration line for calcium ion and magnesium ion were apart from the origin point.

VIET NAM

Da Nang / Mid-Central Regional Hydro-Meteorological Center (VN02)

➤ **ILC Report**

- ✓ The pH of the blank water was a little bit high, 6.49.

Cuc Phuong / Sub-Institute of Hydro-Meteorology and Environment of South Viet Nam (VN03)

➤ **ILC Report**

- ✓ The EC of the pure water was higher than 0.15 mS/m.
- ✓ The pH and EC were measured without using water bath for the temperature control.

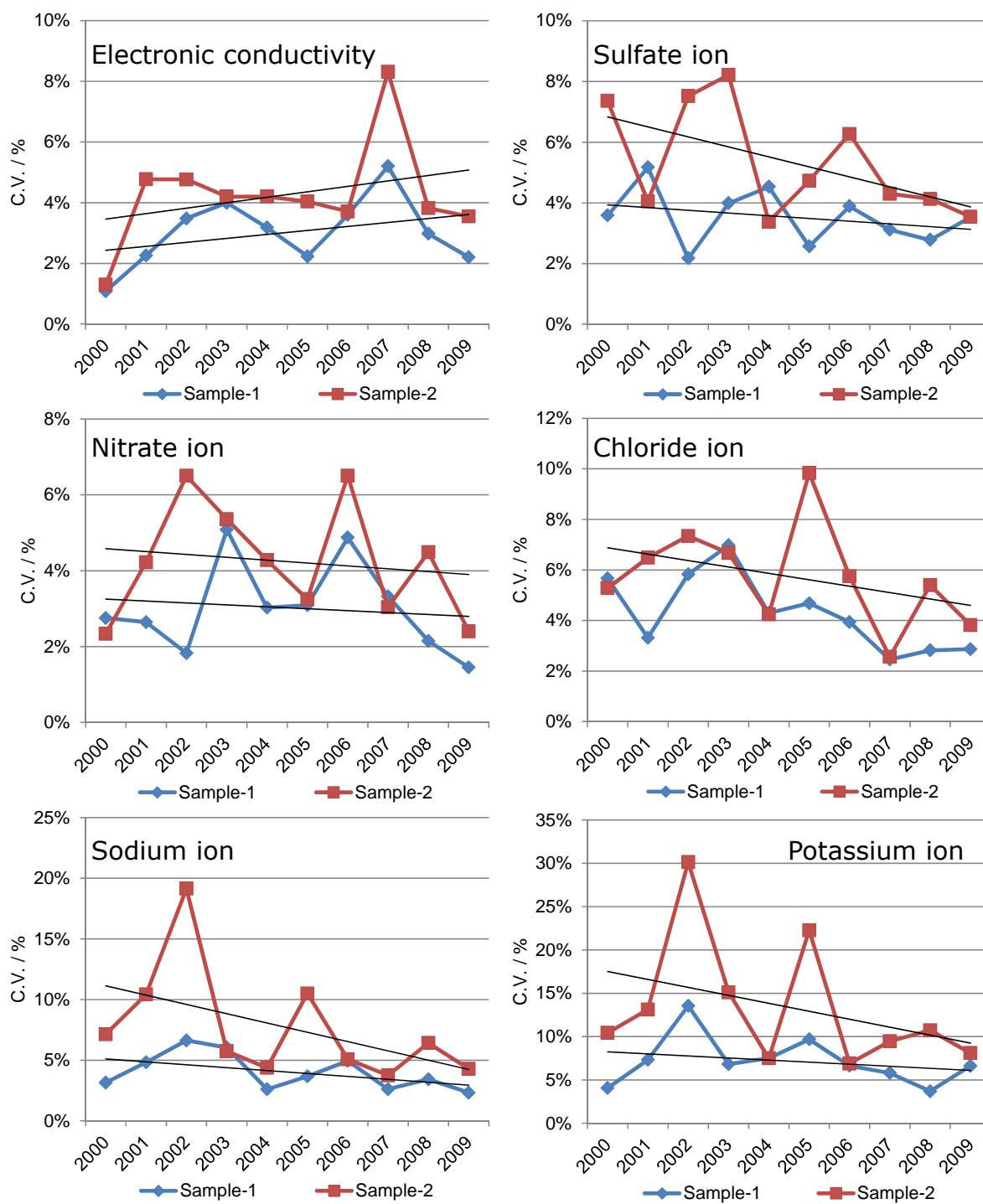


Figure 1 Trend of coefficient of variation of analytical results (1)

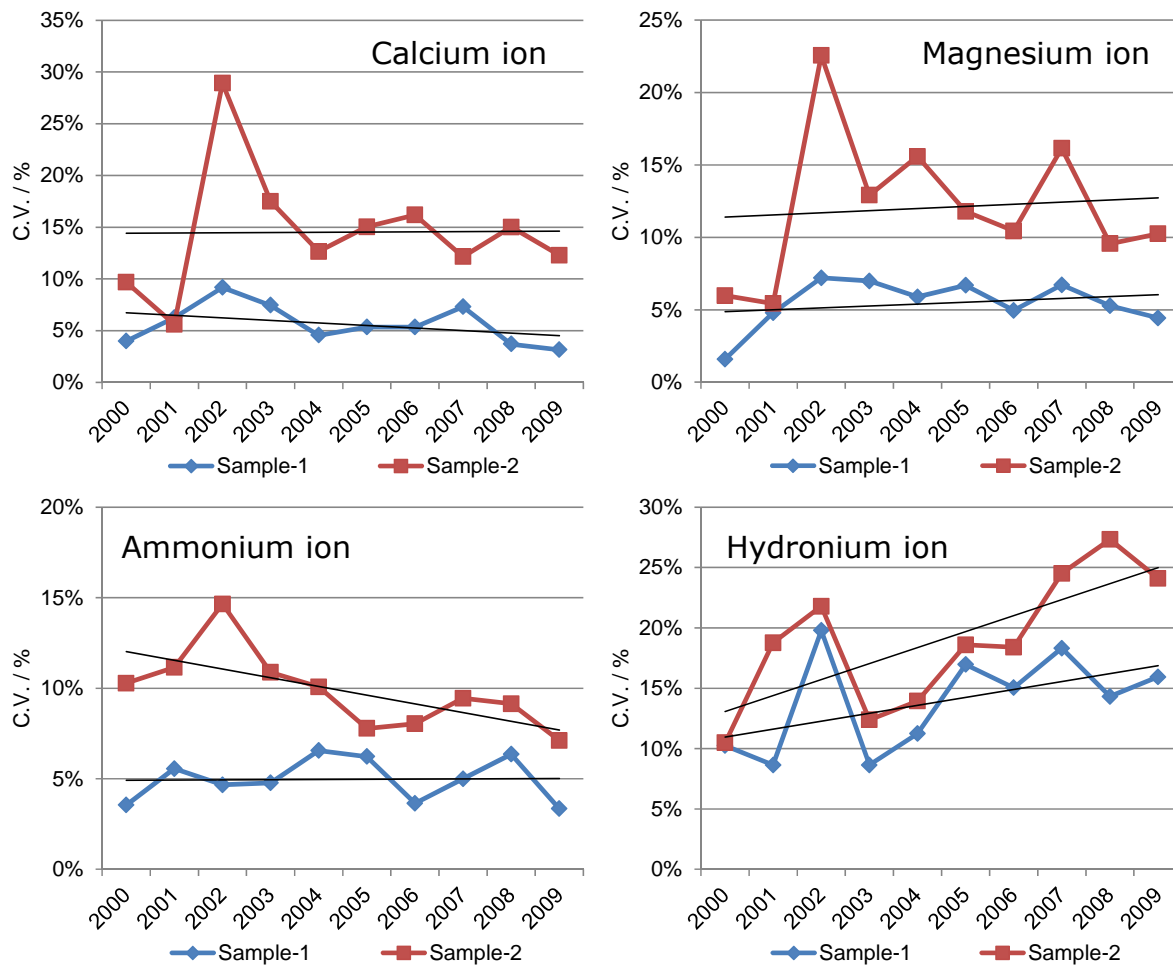


Figure 2 Trend of coefficient of variation of analytical results (2)