

The Twentieth Session of the Scientific Advisory Committee  
on the Acid Deposition Monitoring Network in East Asia  
23-24 September 2020, Virtual Meeting

## **Progress of the Fourth Periodic Report on the State of Acid Deposition in East Asia (PRSAD4)**

Chairperson of Drafting Committee for PRSAD4  
Network Center

### **I. INTRODUCTION**

- The Nineteenth Session of the Scientific Advisory Committee (SAC19) approved the establishment of the Drafting Committee (DC) for the Fourth Periodic Report on the State of Acid Deposition in East Asia (DC-PRSAD4) to prepare the implementation plan and other related works. After the endorsement of the Twenty-first Session of the Intergovernmental Meeting (IG21) on the Report on the Outcomes of the SAC19 including establishment of the DC, the NC invited NFPs of the participating countries to nominate one expert from each participating country as the member of DC.
- The first meeting of DC (DC1) was held in 12 May 2020 as a virtual meeting and developed the format, contents, and lead authors and candidates of contributing authors for each chapter of PRSAD4. There were three parts: Part I: Regional Assessment, Part II: National Assessments and Part III: Executive Summary, as in the similar manner to the PRSAD3. After the DC1 meeting, the lead authors have discussed the detailed contents of PRSAD4 through email.

### **II. OUTLINE OF THE FOURTH PERIODIC REPORT**

- The document will be prepared as a scientific assessment of the state of acid deposition and air pollution in East Asia based on the data accumulated from the network. The decided title is “The Fourth Periodic Report on the State of Acid Deposition in East Asia”.
- Suggested period of monitoring data to be analyzed in the fourth periodic report is from 2000 to 2019 (twenty years). The data 2015-2019 may be also utilized for evaluating current status of the environment in EANET region. Other national/international monitoring results can be used for regional and national assessment for interpretation of EANET data.
- It is suggested that the fourth periodic report should consist of three parts. The first part is on regional assessment and the second part includes national assessments presented by participating countries on a voluntary basis, and the third part is executive summary.

- It is suggested that the fourth periodic report should be prepared to focus on special distribution, trend analysis and, possibly, impact assessment of acid deposition and air pollution in the region.
- National assessment report will be prepared by each country according to a format for national assessments which is prepared by the drafting committee. The EANET data and other domestic data of each country could be used for the national assessment.

### **III. CONTENTS OF THE FOURTH PERIODIC REPORT**

- The draft contents of the Regional Assessment of the PRSAD4 were discussed among DC and the Lead Authors as presented on ANNEX 1.
- Table of the Contents of the National Report of the PRSAD4 is as ANNEX 2.
- List of Lead Authors and Contributors is as ANNEX 3.

### **IV. IMPLEMENTATION PLAN**

- The implementation plan of the PRSAD4 is as ANNEX 4.

## ANNEX 1

## Structure and Contents of the Fourth Periodic Report on the State of Acid Deposition in East Asia (PRSAD4)

### *PART I: Regional Assessment*

Table of Contents

List of authors and contributors to the Fourth Periodic Report

Drafting Committee members in Scientific Advisory Committee

Foreword

#### **Chapter 1. Introduction**

Lead Author (LA): Dr Erdenebat Eldev-Ochir

Contributing Author (CA): Mr. Thiv Sophearith, Dr. Dodo Gunawan, Dr. Gantuya Ganbat, Mr. Jiro Sato, Dr. Zhu Meihua

##### 1.1 Background (G. Ganbat, J. Sato, M. Zhu)

- Explanation of acid deposition and related air pollution etc.
- Publication of previous PRSADs

##### 1.2 Objectives (E. Eldev-Ochir, J. Sato, M. Zhu)

- Bases and objectives of EANET establishment

##### 1.3 Institutional arrangement (T. Sophearith, J. Sato, M. Zhu)

- IG/SAC/STM/Secretariat/NC, WGFD/TF/EG, National Center of participating countries
- Progress of development in institutional framework

##### 1.4 EANET activities in 2000-2019 (D. Gunawan, J. Sato, M. Zhu)

- Medium Term Plan for EANET
- Monitoring Activities, Research activities, Fellowship program, Capacity building, Public awareness

##### 1.5 References

#### **Chapter 2. Data Quality**

LA: Dr. Sergey A. Gromov

CA: Dr. Kyu Kyu Sein, Dr. Tamara V. Khodzher, Mr. Hiroshi Machida, Ms. Kumiko Nakamura, Dr. Tsuyoshi Ohizumi

##### 2.1 Introduction (S. Gromov, T. Ohizumi, H. Machida)

Importance of Data Quality on the regular phase of EANET:

- Increasing of the number of stations should be supported by appropriate data quality -> to be realized into actual growth of real data;
- Involvement of EANET data into global/inter-regular evaluations should be supported by data quality at the same level with other networks;
- Prospective using of measurement data for model validation and trend analysis should give them attribute as objective information.

## 2.2 General procedures of QA/QC (H. Machida, K. Nakamura)

Brief reference to QA/QC requirements and practice of WMO-GAW, NADP, EMEP (common issues without, for example, particular topics from national or EU standards)

Overview of EANET QA/QC procedures at the several levels based on existed documents:

- Maintaining the on-site and surrounding conditions of the site in accordance to its class;
- Tracing sampling performance and keeping from contamination/changes of properties;
- Relevance of existed QA/QC program for EANET and participating countries.

## 2.3 Evaluation of Inter-laboratory Comparison Projects (T. Khodzher, H. Machida, K. K. Sein)

Update of annual ILC projects of EANET QA/QC for last years (based on annual reports):

- Tracing of improvements in laboratory analytical performance;
- Highlighting the most difficult analyses or compounds from ILC results;
- DQO and related target parameters for EANET and other similar networks.

Brief information on involvement of EANET laboratories into QA/QC projects of WMO-GAW, in US and Europe (including possible evaluation of success, for example, with help of ring diagrams).

## 2.4 Evaluation of the regular measurements (S. Gromov, T. Ohizumi, K. Nakamura)

Evaluations based on the use of annual data presented in Data Reports for last years:

- Evaluation of progress in laboratory analytical performance for result samples (R1 & R2 for wet deposition, number of outliers);
- Discussion on correctness and validity of %PCL and %TP with concern of their importance;
- Discussion on necessity of detail meteorological and hydrological data at the site.

Brief information on application of similar QA/QC investigations in other networks.

## 2.5 Conclusion and recommendations (S. Gromov, K. K. Sein, H. Machida)

## 2.6 References

## **Chapter 3. Wet and Dry Deposition of Acidic Substances in East Asia**

LA: Dr. Le Ngoc Cau, Prof. Kazuhide Matsuda

CA: Engr. Arcely C. Viernes, Dr. Ekaterina A. Zhadanovskaya, Ms. Alisa M. Trifonova-Yakovleva, Dr. Tsuyoshi Ohizumi, Dr. Huo Mingqun, Dr. Akie Yuba

### 3.1 Introduction (L. N. Cau)

- \* Progress of monitoring activities and sites, Review of previous PRSADs

### 3.2 Datasets and data quality (A. Yuba, M. Huo, T. Ohizumi)

- \* Outcomes of QA/QC activities including ILC project, NMP, training, Manuals, etc., Quality of EANET data

### 3.3 Precipitation chemistry in East Asia (A. C. Viernes, M. Huo, A. Yuba, T. Ohizumi)

- \* Evaluate ion composition and relationship among acidity, acidic, and basic ion concentrations, spatially or temporally, etc. Summarize twenty-year observation.

### 3.4 Spatial and temporal variation of wet deposition in East Asia (E. A. Zhadanovskaya, M. Huo, A. Yuba, T. Ohizumi)

- \* Evaluate wet deposition of acidic and basic substances, spatially and temporally, etc. Summarize twenty-year observation.

### 3.5 Dry deposition assessment methodology (K. Matsuda)

- \* Explain the methodology of dry deposition estimation based on the technical manual

### 3.6 Spatial and temporal variation of total (dry and wet) deposition in East Asia (K. Matsuda, L. N. Cau, A. M. Trifonova-Yakovleva, M. Huo, A. Yuba)

- \* Evaluate the total (dry+wet) deposition at the sites where the data of filter pack and meteorological elements can be used. Consideration of new methodologies of dry deposition estimation.

### 3.7 Summary and recommendations (K. Matsuda, L. N. Cau, T. Ohizumi)

### 3.8 References

## **Chapter 4. Gas and Aerosol Pollution in East Asia**

LA: Dr. Park Jin-soo, Prof. Fan Meng

CA: Dr. Patcharawadee Suwanathada, Prof. Hu Min, Prof. Bae Min-seok, Dr. Ekaterina A. Zhadanovskaya, Ms. Alisa M. Trifonova-Yakovleva, Dr. Hiroaki Minoura, Dr. Keiichi Sato

### 4.1 Introduction (J. Park, F. Meng)

- \* Explain the historical background that made it necessary to study gas and aerosol air pollution from deposition of acidic substances in 20 years.

### 4.2 Spatial variation of air concentration (K. Sato, M. Bae)

- \* Explain the spatial spread of gas and aerosols air pollution due to differences in climate and industrial structure.

### 4.3 Temporal variation of air concentration (M. Hu, H. Minoura)

- \* Explain long-term changes in air pollution concentration due to changes in industrial structure for 20 years, seasonal changes and short-term changes that contribute to atmospheric policy.

### 4.4 Assessment of air pollution in East Asia (P. Suwanathada, E. A. Zhadanovskaya, A. M. Trifonova-Yakovleva)

- \* The key points of atmospheric policy will be explained based on the actual conditions of air

pollution that differ according to the climate and industrial structure described in two chapters above.

4.5 Conclusion (J. Park, F. Meng)

4.6 References

## **Chapter 5** Impacts on Ecosystems in East Asia

LA: Prof. Atsushi Kume

CA: Prof. Yunting Fang, Prof. Zhaozhong Feng, Prof. Wilfredo M. Carandang, Dr. Roland Kueh Jui Heng, Dr. Hiroyuki Sase, Dr. Reiko Urakawa, Ms. Ekaterina S. Zhigacheva, Mr. Masayuki Morohashi, Mr. Hiroki Yotsuyanagi

5.1 Introduction (A. Kume, W. M. Carandang, H. Sase)

5.2 Soil and Vegetation Monitoring (Chief: A. Kume)

5.2.1 Soil (R. Urakawa)

- Soil chemical properties in the period
- Trend analysis for each region

5.2.2 Vegetation (A. Kume, Z. Feng, R. Kueh. Jui. Heng)

- Characteristics of monitoring stands
- Trend analysis for each region

5.2.3 Summary (A. Kume)

- Possible recovery from acidification of soil (or progress of acidification)
- Changes in tree dynamics and atmospheric environment

5.3 Inland Aquatic Environment Monitoring (Y. Fang, H. Sase, H. Yotsuyanagi)

5.3.1 Water chemistry (H. Yotsuyanagi, H. Sase)

- Characterization of the waters (using piper diagrams, etc.)

5.3.2 Long-term trend of water chemistry (Y. Fang, H. Yotsuyanagi)

- Trend analysis from 2000 to 2019 (including identification of the turning point, etc.)
- Comparison with the deposition data from the nearest sites

5.3.3 Summary (Y. Fang, H. Sase)

- Possible recovery from acidification (or progress of acidification)
- Future needs

5.4 Catchment Analysis (Chief: H. Sase)

5.4.1 Ijira and Kajikawa (H. Sase, M. Morohashi)

- Trend analysis (including deposition and stream water chemistry)
- Input-output budget
- Biogeochemical processes, including related studies on analyses of isotopic ratios and heavy metals

5.4.2 Komarovka River (E. S. Zhigacheva, H. Sase)

- Trend analysis (including deposition and stream water chemistry)
- Input-output budget

#### 5.4.3 La Mesa Watershed (W. M. Carandang, H. Sase)

- Characteristics of the catchment
- Expected outcomes in the near future

#### 5.4.4 Summary (H. Sase)

- Possible recovery from acidification (or progress of acidification, depending on sites)
- Future needs

#### 5.5 Summary of the chapter (A. Kume, W. M. Carandang, H. Sase)

- Possible recovery from acidification (or progress of acidification)
- Future needs

### **Chapter 6.** Cross-cutting Studies on Atmospheric Environment in EANET Region

LA: Dr. Toshimasa Ohara

CA: Prof. Atsushi Kume, Prof. Kayo Ueda, Dr. Hiroyuki Sase, Dr. Ken Yamashita, Dr. Junichi Kurokawa, Dr. Zhu Meihua, Dr. Yuusuke Kiriyama, Prof. Xerxes T. Seposo, Dr. Kenichi Sato, Dr. Syuichi Itahashi

#### 6.1 Introduction (T. Ohara)

#### 6.2 Observational studies for EANET region (K. Sato, S. Itahashi, H. Sase)

- 6.2.1 Field campaigns for regional air quality
- 6.2.2 Satellite observations
- 6.2.3 Acidification and nitrogen leaching in catchments

#### 6.3 Emission Inventories (J. Kurokawa, T. Ohara)

- 6.3.1 Global inventories
- 6.3.2 Regional inventories in Asia
- 6.3.3 National inventories in EANET member countries

#### 6.4 Chemical transport modeling studies (J. Kurokawa, Y. Kiriyama, S. Itahashi)

- 6.4.1 MICS-Asia
- 6.4.2 Sulfur, nitrogen and acids in East Asia
- 6.4.3 Ozone in East Asia

#### 6.5 Ecosystem impact assessment studies (A. Kume, H. Sase)

- 6.5.1 Biochemical models
- 6.5.2 Risk of acidification and eutrophication
- 6.5.3 Environmental risk assessment of ozone and PM

#### 6.6 Impact assessment studies on human health (K. Ueda, K. Yamashita, X. T. Seposo)

- 6.6.1 Overview of impact assessment studies on human health by air pollutants
- 6.6.2 Impacts of PM on human health

- 6.6.3 Impacts of ozone on human health
- 6.7 Other international initiatives on air pollution (M. Zhu, S. Itahashi)
  - 6.7.1 WMO/GAW
  - 6.7.2 TF HTAP
  - 6.7.3 LTP
  - 6.7.4 APCAP
  - 6.7.5 Others
- 6.8 Conclusions (all)
- 6.9 References

## **Chapter 7. Summary and Recommendations for Future Activities**

LA: Dr. Shiro. Hatakeyama

CA: Ms. Nongnout Phanphongsa, Mr. Mohan Kumar Sammathuria, Dr. Yang Xiaoyang, Dr. Ken Yamashita, Dr. Hiroyuki Sase, Dr. Hiroaki Minoura, Dr. Tsuyoshi Ohizumi

- 7.1 Introduction (X. Yang, S. Hatakeyama)
- 7.2 Conclusion
  - 7.2.1 Data Quality (Chapter 2) (N. Phanphongsa)
  - 7.2.2 Wet and Dry Deposition of Acidic Substances in East Asia (Chapter 3) (M. K. Sammathuria)
  - 7.2.3 Gas and Aerosol Pollution in East Asia (Chapter 4) (H. Minoura)
  - 7.2.4 Impacts on Ecosystems in East Asia (Chapter 5) (H. Sase)
  - 7.2.5 Other Related Studies in EANET Region (Chapter 6) (K. Yamashita)
- 7.3 Summary and Recommendations for Future Activities\* (X. Yang, T. Ohizumi, S. Hatakeyama)
- 7.4 References

\* In addition to recommendations corresponding to 7.2.1-7.2.5 Emission inventories, Modeling activities, and Risk of ozone and PM as well as other related activities to be performed under the umbrella of EANET in the future will be described in the section 7.3.

List of the Secretariat of the Drafting Committee for the Fourth Periodic Report



## ANNEX 2

**Table of the contents of the National Report of the Fourth Periodic Report on the State of Acid Deposition in East Asia (PRSDA4)****PART II: National Assessment**

Participating countries:

|                   |                           |
|-------------------|---------------------------|
| <i>Cambodia,</i>  | <i>Myanmar,</i>           |
| <i>China,</i>     | <i>Philippines,</i>       |
| <i>Indonesia,</i> | <i>Republic of Korea,</i> |
| <i>Japan,</i>     | <i>Russia,</i>            |
| <i>Lao PDR,</i>   | <i>Thailand,</i>          |
| <i>Malaysia,</i>  | <i>Viet Nam.</i>          |
| <i>Mongolia,</i>  |                           |

(Modification of structure can be made by each country)

**Chapter 1.** Basic Information on National Monitoring Activities

- 1.1. Outline of the activities on acid deposition and air pollution in National Monitoring Plan
- 1.2. Monitoring program
- 1.3. Monitoring Stations
- 1.4. Sampling and Measurements

**Chapter 2.** Acid Deposition and Air Pollution in Each Participating Country and Their Environmental Impacts

- 2.1 State of acid deposition and air pollution
- 2.2 State of inland aquatic environment
- 2.3 State of soil and vegetation
- 2.4 State of catchment monitoring
- 2.5 Overall analysis

**Chapter 3.** Review of National Air Quality Management including Acid Deposition**Chapter 4.** Conclusion or Summary**PART III: Executive Summary**

## ANNEX 3

**List of Lead Authors and Contributors in each Chapter  
of the Fourth Periodic Report on the State of Acid Deposition  
in East Asia (PRSAD4)**

As of August 27, 2020

| Chapter   | Lead author                                   | Contributor  |
|---|---|--|
| 1. Introduction   | Dr. Erdenebat<br>Eldev-Ochir                  | Mr. Thiv Sophearith, Dr. Dodo Gunawan, Dr. Gantuya Ganbat, Mr. Jiro Sato, Dr. Zhu Meihua   |
| 2. Data Quality   | Dr. Sergey A.<br>Gromov                       | Dr. Kyu Kyu Sein, Dr. Tamara V. Khodzher, Mr. Hiroshi Machida, Ms. Kumiko Nakamura, Dr. Tsuyoshi Ohizumi   |
| 3. Wet and Dry Deposition of Acidic Substances in East Asia               | Dr. Le Ngoc Cau,<br>Prof. Kazuhide<br>Matsuda | Engr. Arcely C. Viernes, Dr. Ekaterina A. Zhadanovskaya, Ms. Alisa M. Trifonova-Yakovleva, Dr. Tsuyoshi Ohizumi, Dr. Huo Mingqun, Dr. Akie Yuba  |
| 4. Gas and Aerosol Pollution in East Asia                                 | Dr. Park Jin-soo,<br>Prof. Fan Meng           | Dr. Patcharawadee Suwanathada, Prof. Hu Min, Prof. Bae Min-seok, Dr. Ekaterina A. Zhadanovskaya, Ms. Alisa M. Trifonova-Yakovleva, Dr. Hiroaki Minoura, Dr. Keiichi Sato   |
| 5. Impacts on Ecosystems in East Asia                                     | Prof. Atsushi Kume                            | Prof. Yunting Fang, Prof. Zhaozhong Feng, Prof. Wilfredo M. Carandang, Dr. Roland Kueh Jui Heng, Dr. Hiroyuki Sase, Dr. Reiko Urakawa, Ms. Ekaterina S. Zhigacheva, Mr. Masayuki Morohashi, Mr. Hiroki Yotsuyanagi |
| 6. Other Cross-cutting Studies on Atmospheric Environment in EANET Region | Dr. Toshimasa Ohara                           | Prof. Atsushi Kume, Prof. Kayo Ueda, Dr. Hiroyuki Sase, Dr. Ken Yamashita, Dr. Junichi Kurokawa, Dr. Zhu Meihua, Dr. Yuusuke Kiriya, Prof. Xerxes T. Seposo, Dr. Kenichi Sato, Dr. Syuichi Itahashi                |
| 7. Summary and Recommendations for Future Activities                      | Dr. Shiro.<br>Hatakeyama                      | Ms. Nongnout Phanphongsa, Mr. Mohan Kumar Sammathuria, Dr. Yang Xiaoyang, Dr. Ken Yamashita, Dr. Hiroyuki Sase, Dr. Hiroaki Minoura, Dr. Tsuyoshi Ohizumi  |

## ANNEX 4

**Implementation Plan of the Fourth Periodic Report  
on the State of Acid Deposition in East Asia (PRSAD4)**

| <b>Year</b> | <b>Month</b>                 | <b>Activities/Events</b>  | <b>Deliverables</b>  |
|-------------|------------------------------|---|--|
| 2019        | October                      | <b>SAC19</b>  | Proposal on establishment of the DC of PRSAD4 to SAC19 by the NC   |
|             | November                     | <b>IG21</b>   | Report of the SAC19  |
|             | December<br>-January<br>2020 | Nomination of DC member from NFPs to NC   | List of the DC member  |
| 2020        | February                     | Circulation of the list of the DC members to all NFPs.<br>NC arranges the 1 <sup>st</sup> DC meeting. | List of the DC member  |
|             | May                          | <b><u>1<sup>st</sup> DC Meeting</u></b>   | Draft Table of Contents of PRSAD4<br>Names and contacts of the DC members<br>Names of the LA of Regional Assessment Report<br>Names of Contributors to the National Assessment Report<br>Work Schedule |
|             | May                          | Report of 1 <sup>st</sup> DC meeting send to the DC member  | Report of 1 <sup>st</sup> DC meeting   |
|             | May                          | Provision of EANET dataset until 2018 to the DC member  | Monitoring dataset (2015-2018)   |
|             | September                    | <b>SAC20</b><br>The Chairperson of the DC reports the progress of PRSAD4                              | DC Chairperson's Report to SAC20   |
|             | October                      | <b>IG22</b><br>The Chairperson of SAC reports progress of PRSAD4 to IG22                              | SAC Chairperson's Report to IG22   |
|             | October                      | <b><u>1<sup>st</sup> LA Meeting</u></b>   | Comments from the LA meeting   |
|             | October                      | Reports of 1 <sup>st</sup> LA meeting send to the LA members  | Report of 1 <sup>st</sup> LA meeting   |
|             | November                     | Provision of monitoring dataset (2019) to the DC member   | Monitoring dataset (2019)  |
| 2021        | December<br>-February        | Compilation, editing and communications with the LA and Contributors                                  | Preliminary draft of some sections of PRSAD4   |
|             | February                     | <b><u>2<sup>nd</sup> DC Meeting</u></b><br><b><u>2<sup>nd</sup> LA Meeting</u></b>                    | Comments from the DC and the LA meetings   |
|             | February                     | Reports of 2 <sup>nd</sup> meetings sent to the DC members  | Reports of 2 <sup>nd</sup> meetings  |
|             | February<br>-April           | Preparation of First Draft of PRSAD4  | First Draft of PRSAD4  |
|             | April                        | Circulation of First Draft among the DC and the LA members, Contributors for comments                 | Comments from the DC and the LA members, Contributors  |

|           |  |  |
|-----------|--|--|
| May-June  | Revision of First Draft to include comments from the DC and the LA members, Contributors   | Second Draft of PRSAD4   |
| June      | Circulation and revision of Second Draft to include comments from the DC and the LA members, Contributors<br>Drafting of Executive Summary                           | Third Draft of PRSAD4 and Draft Executive Summary                            |
| July      | <b><u>3<sup>rd</sup> DC Meeting</u></b><br><b><u>3<sup>rd</sup> LA Meeting</u></b>   | Comments from the DC and the LA meetings                                     |
| July      | Reports of 3 <sup>rd</sup> meetings sent to the DC members   | Reports of 3 <sup>rd</sup> meetings  |
| August    | Revision of the Third Draft of PRSAD4 and Executive Summary to include comments from the DC and the LA meetings  | Final Draft of PRSAD4  |
| September | Circulation of the Final Draft of PRSAD4 and Executive Summary to the DC members and SAC members for approval  | Final Draft of PRSAD4 and Executive Summary (approved by DC and SAC members) |
| September | Circulation of the Final Draft of PRSAD4 and Executive Summary to NFPs for endorsement   | Final Draft of PRSAD4 and Executive Summary (endorsed by NFPs)               |
| October   | <b>SAC21</b><br>Preparation of the report of the Chairperson of the DC to SAC21<br>Presentation of Final Draft of PRSAD4 and Executive Summary to SAC21 for adoption | Final Draft of PRSAD4 and Executive Summary (to be adopted by SAC21)         |
| November  | <b>IG23</b><br>The Chairperson of SAC reports the outcomes of SAC21 including preparation of PRSAD4 to IG23 for endorsement  | Final Draft of PRSAD4 and Executive Summary (to be endorsed by IG23)         |
| December  | Language Check   | Final Draft of PRSAD4 checked by language expert                             |
| December  | Printing and distribution of PRSAD4  |  |