

## Concept Note

# In-depth capacity building training programme on GEMS data applications

### Background

Air pollution is now considered the world's largest environmental health risk. Globally, 7 million deaths were attributable to the joint effects of household and ambient air pollution in 2016, and Asia-Pacific countries share more than 60% of the total death<sup>1</sup>. The degradation of air quality associated with high levels of particulate matter, tropospheric ozone and other pollutants has impacts on agricultural productivity and natural ecosystems as well as human health and welfare. Tropospheric aerosols and ozone are also the primary short-lived climate forcers yet estimates of their radiative impacts remain subject to large uncertainty. Understanding air pollution, such as accurate knowledge of emissions, chemical transformation and transport, is essential for pollution control.

In-situ measurements provide a basis on national air quality management. Governments operate ground-based air quality monitoring networks within their territories. Such monitoring reveals the current pollution status and its long-term history and provides information on emission sources and types. In-situ monitoring has limitations since monitoring stations are mostly concentrated in densely populated cities with rigid installation requirements and a very narrow spatial coverage. Satellite observations can complement the ground-based networks by providing data over wider areas of the globe, which is particularly useful for regions where no surface monitors are installed, and are now essential tools for evaluating air quality models and improving emissions inventories.

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<sup>1</sup> World health statistics 2019: monitoring health for the SDGs, <https://digitallibrary.un.org/record/3868814?ln=en>



Therefore, monitoring air quality from satellites has played a key role in understanding the status of air pollution loadings and trends on the regional-to-global scale, by providing information on pollutant amounts, emissions and transport in a quantitative manner<sup>2</sup>.

## Rationale

In February 2020, the Geostationary Environment Monitoring Spectrometer (GEMS) was launched by the Republic of Korea. It is the first of the three-satellite constellation which enables the hourly monitoring of air pollution levels for almost 20 countries in Asia. This marks a significant leap forward in the ability of scientists to monitor air pollution from space.

In collaboration with the National Institute of Environmental Research (NIER), Korea International Cooperation Agency (KOICA), and Pusan National University (PNU), the ESCAP secretariat held a capacity-building training programme for 13 young government officials from 5 Asian countries in June 2022, in Incheon of the Republic of Korea. The training was for three weeks and was introductory but comprehensive in which 23 lecturers from academic, research, private, and public institutions were invited to give lectures.

After the training in June 2022, a survey which asked for the current needs of target countries resulted in priority implementation order for GEMS data applications. This activity is a continuation of the previous training and focuses on the aerosol GEMS data product and organized as a side event for the Fourth session of the Committee on Information and Communications Technology, Science, Technology and Innovation (CICTSTI4), to be held on 30 August to 1 September 2022 in Bangkok, Thailand which aims to leverage the STI and ICT to support achieving sustainable development in the region. The content of the lectures will focus on practical and hands on experience with using the aerosol data products from both GEMS and Pandora instruments.

This activity is in line with the mandates from multiple plans of actions. Within the Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018-2030), this activity is aligned with the theme Social Development and subtheme Contamination and Pollution and Action Area 2: Capacity-building and technical support. Alternatively, within the ASEAN Plan of Action, this activity is aligned with the theme of Socio-cultural Cooperation and the subtheme Environment and Climate Change. Therefore, the building

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<sup>2</sup> Levelt et al. 2018



of capacity from this training programme will contribute to the progression of SDG goal 3.

## Goals

To build capacity of countries in the Asia-Pacific region in utilizing satellite data for monitoring and management and transboundary issues on air pollution.

## Objectives

1. To enhance the capacity of governmental officials in selected target countries to strengthen national level air pollution monitoring and management.
2. To provide hands on experience in data applications of GEMS data for air pollution monitoring and management.

## Expected Outcomes

1. Enhanced capacity of national space agencies, environment ministries and relevant ministries in target countries responsible for space applications and air pollution management, to utilize GEMS derived data for air pollution monitoring.

## Venue and Date/Time

Venue: United Nations Conference Centre (TBD) and Zoom (Hybrid), Bangkok, Thailand

Training

Date/Time: 09:30-17:00 (UTC+7), 29-30 Aug 2022

Technical Assistance

Date/Time: 09:30-17:00 (UTC+7), 1 – 2 Sept 2022

## Organisers

- United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)
- Republic of Korea's National Institute of Environmental Research (NIER)
- Korea International Cooperation Agency (KOICA)
- Geo-Informatics and Space Technology Development Agency (GISTDA)



## Participating Countries

Young scientists and technical staff from space and environmental agencies will be invited from Asian countries (in particular under the field of view of GEMS):

- Cambodia
- Indonesia
- Laos, PDR
- Mongolia
- Philippines
- Thailand
- Vietnam

Senior experts from NIER and other countries will also join the training.

## Draft Programme

Day 1: Monday 29 August 2022	
Time (UTC+7)	Topics
09:00 – 09:30	Registration
09:30 – 09:40	<b>Opening session</b>  Welcome Remarks by ESCAP secretariat and NIER <ol style="list-style-type: none"><li>1. Mr. Keran WANG, Chief, ESCAP IDD SAS</li><li>2. Mr. Dongwon Lee, Director, NIER</li><li>3. Mr. Jiyong Kim, Associate, KOICA</li></ol>
09:40 – 10:10	<b>Session 1. Introduction to the GEMS project</b> Lecturer: Mr. Dongwon LEE, NIER Online lecture
10:10 – 11:10	<b>Session 2. Atmospheric radiation and basic physical parameters for understanding aerosol remote sensing</b> Lecturer: Mr. Ukkyo JEONG, Pukyong National University (PKNU) In-person lecture Discussion and exercise
11:10 – 11:20	Coffee break
11:20 – 12:20	<b>Session 3. Aerosol remote sensing using ground-based instruments (e.g., Pandora, AERONET)</b> Lecturer: Mr. Ukkyo JEONG In-person lecture Discussion and exercise
12:20 – 13:50	Lunch break



13:50 – 15:00	<b>Session 4. Aerosol remote sensing using satellite-based instruments (e.g., GEMS)</b> Lecturer: Ms. Seoyoung LEE, Yonsei University In-person lecture Discussion and exercise
15:00 – 15:10	Coffee break
15:10 – 16:10	<b>Session 5. Introduction to GEMS aerosol data and access to satellite data using Python</b> Lecturer: Ms. Seoyoung LEE In-person lecture Discussion and exercise
16:10 – 16:40	Wrap up
<b>Day 2: Tuesday 30 August 2022</b>	
Time (UTC+7)	Topics
09:30 – 10:00	<b>Session 6. Introduction to the Pandora data</b> Lecturer: Mr. Ukkyo JEONG In-person lecture Discussion and exercise
10:00 – 11:00	<b>Session 7, Observing the 4th session of the Committee on Information and Communications Technology, Science, Technology and Innovation</b>  Conference Room 1
11:00 – 11:10	Coffee break
11:10 – 12:10	<b>Session 8. Pandora data handling training (1)</b> Lecturer: Mr. Ukkyo JEONG In-person lecture Discussion and exercise
12:10 – 13:10	Lunch Break
13:10 – 14:10	<b>Session 9. Pandora data handling training (2)</b> Lecturer: Mr. Ukkyo JEONG In-person lecture Discussion and exercise
14:10 – 15:10	<b>Session 10. GEMS aerosol data handling training (1)</b> Lecturer: Ms. Seoyoung LEE In-person lecture Discussion and exercise
15:10 – 15:20	Coffee break
15:20 – 16:20	<b>Session 11. GEMS aerosol data handling training (2)</b> Lecturer: Ms. Seoyoung LEE In-person lecture Discussion and exercise
16:20 – 16:50	Wrap up



<b>Day 3: Thursday 1 September 2022</b>	
Time (UTC+7)	Topics
09:30 – 12:00	Technical visit to the Pollution Control Department (PCD) <ol style="list-style-type: none"> <li>1. Visit the Pandora site</li> <li>2. Group discussion</li> </ol> <i>By NIER, KOICA, GISTDA, PKNU Cambodia's Ministry of Environment experts only</i>
<b>Day 4: Friday 2 September 2022</b>	
Time (UTC+7)	Topics
09:30 – 12:00	Technical visit to the Chiang Mai Municipality Office  <i>By NIER, KOICA, GISTDA, PKNU experts only</i>
13:30 – 16:00	Technical visit to the Pandora site in Chiang Mai Rajabhat University (CMRU) <ol style="list-style-type: none"> <li>1. Visit the Pandora site</li> <li>2. Group discussion</li> </ol> <i>By NIER, KOICA, GISTDA, PKNU experts only</i>

