

MAIRS-FE PROGRESS REPORT

(2018-2019)



Monsoon Asia Integrated Research for Sustainability- Future Earth

About MAIRS-FE

Monsoon Asia Integrated Research for Sustainability Study-Future Earth (MAIRS-FE) is a regional consortium for the integrated study of earth system processes in the Asia Monsoon Region. The vision of MAIRS-FE is to significantly advance understanding of the interactions between the human-natural components of the overall environment in the monsoon Asia region and their implications for the global earth system, in order to support strategies for sustainable development. MAIRS-FE addresses cross-cutting global change issues related to the unique Asian monsoon climate, topography and cultures. The MAIRS consortium is guided by a Scientific Steering Committee (SSC) and supported by an International Program Office (IPO) to reach its objectives effectively and efficiently. The conceptual framework for the MAIRS program is as following:

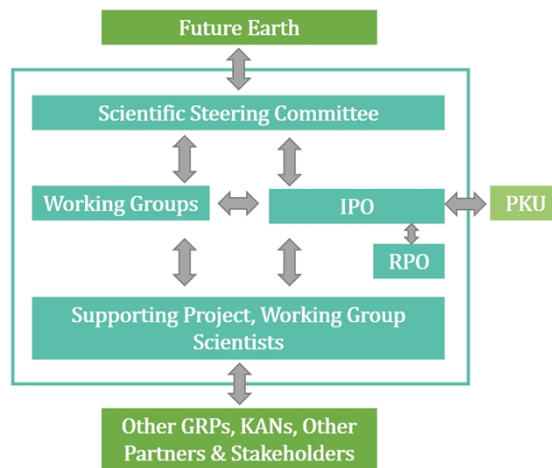


Figure: Structure of MAIRS-FE

Science Steering Committee

Tong Zhu (SSC Chair) , Peking University , China
 SK Satheesh (SSC co-vice-chair) , Indian Institute of Science , India
 Jiaguo Qi (SSC co-vice-chair) , Michigan State University , US
 Candice Lung , Academia Sinica , Chinese Taipei
 Aditi Mukeji , ICIMOD , Nepal
 Charlie Navanugraha , Nakhon Phanom University , Thailand
 Rodel Lasco , World Agroforestry Centre , Philippines
 Balt Suvdantsetseg , National University of Mongolia , Mongolia
 Fredolin Tangang , Universiti Kebangsaan Malaysia , Malaysia
 Bertand Timbal, National Environment Agency , Singapore
 Tong Jiang, Nanjing University of Information Science & Technology, China
 Lili Lei, Nanjing University, China

International Project Office @ Peking University

Tong Zhu , Peking University , China
 Shiqiu Zhang , Peking University , China
 Yong Liu , Peking University , China
 Hancheng Dai , Peking University , China
 Wei Wan (Executive Director) , Peking University , China
 Yingmu Chang (Project Officer) Peking University , China

Regional Project Office @ Indian Institute of Science

J. Srinivasan , Indian Institute of Science , India
 Smriti Basnett, Indian Institute of Science , India

Programmatic Goals

The region has a very complex topography, extending from the highest mountains to extensive coastlines and small islands, with frequent climate related disasters ranging from floods to droughts to earthquakes. In recent decades, the region has experienced the most rapid economic growth along with increasing urbanization and social mobility, imposing great challenges of land degradation, human health and social conflicts related to air and water pollution, inadequate food and energy security and social inequality. The research priorities of MAIRS focus on water-energy-food (WEF) nexus, air and climate related human health, climate-related natural disasters, and climate-related modeling and observations. For each sub-topic of MAIRS, the goals are:

1. Through water-energy-food nexus study, the program aims to address the complex and interrelated issues of sustainable natural resource management related with water, food and energy by identifying and balancing the trade-offs among different stakeholders (sectors, communities and individuals), facilitating synergy and allowing for more integrated and cost-effective planning, decision-making, implementation, monitoring and evaluation.
2. Through research on air quality and climate related human health, the program aims to identify the determinants of health risk of air pollution and climate change, analyze the cost and benefits of air quality management and/or climate mitigation/adaptation policies in Monsoon Asia, especially for those countries with greatest health burden.
3. Through research on climate-related natural disasters, the program aims to enhance the resilience of local communities to natural disasters in Monsoon Asia, associated with greater cooperation across the region in order to improve communication and understanding.
4. Through climate related observation and modeling in Monsoon Asia, the program aims to provide information, data and analysis tools for cross-cutting and regional studies for sustainability and to promote application of modeling and research outputs.

Approach

Co-design, Co-production of Knowledge — To address systemic challenges in Monsoon Asia, MAIRS-FE is rooted in the local level, in collaboration with local scientists and community, adopted a bottom-up approach to conduct tailored research and capacity building activities based on needs. The knowledge generated from MAIRS-FE can be applied in local community and scaled up as regional solution.

Identify and prioritize research themes based on the sustainability challenges and social needs in Monsoon Asia, take human health and nature disaster themes for example: human health in monsoon Asia—ambient air pollution was estimated to cause 4.2 million premature deaths worldwide per year in 2016, with the highest numbers in South and East Asia in 2015 (WHO, 2018). In 2013, cost of exposure to ambient and indoor air pollution in South and East Asia is equivalent to 7.4 and 7.5 per cent of their GDP respectively. To understand and reduce health impact of air pollution at both regional and local level is very important for Monsoon Asia countries. Resilience to climate-related natural disasters—Asian countries are among the most at risk to climate-related

disasters. From 1970 to 2014, about 6 billion people in the region were affected by disasters with floods and drought affecting the highest number of people. Economic losses increased by almost 15 times since 1970 while the region's GDP only grew 5 times. Research on mechanisms of natural disasters, on the impacts of disasters on natural and societal systems, and on responses to mitigate and adapt to disasters is relevant across monsoon Asia.

Promote science-based policy making by collaboration with local authorities, for example, health working group has been advising the Chinese government on controlling air pollution and protecting human health, such as Beijing Environmental Protection Bureau and Guangdong Environmental Protection Bureau. CARE Beijing project led by Prof. Tong Zhu revealed the mechanism of air pollution formation in Beijing and North China, providing scientific basis for air pollution control policies. By collaborating with Guangdong Department of Environment Protection, Peking University team has set up the enhanced air quality observing network in Pearl River Delta, which is a pioneer of regional ambient air monitoring in PR China and has been playing key role in air quality management in PRD.

Facilitate synergy of development goals through cross-cutting study, for example, WEF Nexus team has developed an effective way to address the complex and interrelated issues of sustainable natural resource management. It provides a conceptual approach to better understand and systematically analyze the interactions between the natural environment and human activities in order to achieve optimal management strategies to meet the UN sustainable development goals. By identifying and balancing the trade-offs among different stakeholders (sectors, communities and individuals) synergy can be achieved, allowing for more integrated and cost-effective planning, decision-making, implementation, monitoring and evaluation.

Demonstration in local community based on case studies, for example, the nature disaster team helped improve resilience and adaptive capacity to climate change in the Hindu Kush-Himalayan region (China, Bangladesh, India and Nepal) through engagement with local officials and community groups and development of a roadmap for the expansion of the toolkit methodology to other countries.

The value proposition of MAIRS-FE for transition to the next stage :

A. From Facilitation to Engagement

- Participating in concept note/proposal development and implementation. For example, to organize WriteShop to develop working plan, proposals, reports and working papers on specific themes.
- Developing its own knowledge products, including scientific thematic newsletters, reports, papers, event postings developed with input from both working groups, offices and other stakeholders.
- Engaging in the establishment of regional research and capacity building hubs in hosting and participating organizations. For example, WEF Asia Hub, Clean Air Training Hub.

B. From Comprehensive Perspective to In-depth Impact

Take lead and invest in key activities with in-depth impact in specific area, for example, regional assessment report focused on health impact related to pollution, and development of an international journal on WEF Nexus related issues.

C. Serving Participants, Engaging Core Faculties and Fostering Research Community

- Serving as platform for participants to co-develop research proposals, collaborate in research activities and publications, exchange information and data, and fill the gap between science and action/intervention.
- Engaging core faculties and key players in MAIRS research areas to foster a dynamic, active and productive research community.

D. Creating Benefits for Host Organization

- Being independent while creating benefits for hosting organization through:
- Co-design and co-implement activities in consistent with priorities of host organization;
- Develop international hub of interest, thus increasing the impact of host organization;
- Opportunity of connecting its researchers to an international/regional network, especially for early career researchers;
- Channels of boosting research across disciplines;
- Possibility of establishing a science-policy interface.

Highlights in 2018~2019

Scientific Steering Committee and Advisory Group

MAIRS-FE has renewed and expanded the scientific steering committee and advisory group. The members are listed as below:

SSC

Name	Working Area	Affiliation	Country	Gender
Tong Zhu (SSC Chair)	Human Health	Peking University	China	Male
SK Satheesh (SSC co-vice-chair)	Human Health	Indian Institute of Science	India	Male
Candice Lung	Human Health	Academia Sinica	Chinese Taipei	Female
Jianguo Qi (SSC co-vice-chair)	WEF NEXUS	Michigan State University	United States	Male
Aditi Mukeji	WEF NEXUS	ICIMOD	Nepal	Female

Charlie Navanugraha	WEF NEXUS	Nakhon Phanom University	Thailand	Male
Rodel Lasco	Nature Disaster	World Agroforestry Centre	Philippines	Male
Balt Suvdantsetseg	Modeling and observation	National University of Mongolia	Mongolia	Female
Fredolin Tangang	Modeling and observation	Universiti Kebangsaan Malaysia	Malaysia	Male
Bertand Timbal	Modeling and observation	National Environment Agency	Singapore	Male
Tong Jiang	Nature Disaster	Nanjing University of Information Science & Technology	China	Male
Lili Lei	Modeling and observation	Nanjing University	China	Female

Advisors

Congbin Fu	Chinese Academy of Sciences	China
Michael Manton	Monash University	Australia
Tetsuzo Yasunari	Research Institute for Humanity and Nature	Japan
Dahe Qin	Chinese Academy of Sciences	China
Guoxiong Wu	Chinese Academy of Sciences	China
Bojie Fu	Chinese Academy of Sciences	China
Peng Cui	Chinese Academy of Sciences	China

IPO Development

IPO has been officially recognized as a core international research project of Peking University and secured the support of new leadership of PKU. The executive office is supported by university level in term of administration and finance while hosted by College of Environmental Sciences and Engineering (CESE), PKU. The MAIRS-FE website was refined and transferred to <http://www.mairs-fe.net/>.

Publications

Papers

Participating researchers of MAIRS-FE have published papers related with MAIRS-FE research areas, more details can be found at the MAIRS-FE website:

<http://www.mairs-fe.net/index.php?m=content&c=index&a=show&catid=19&id=28>

Articles

MAIRS-FE IPO has initiated a joint social media column themed on environmental health for public education. The articles were co-developed with Clean Air Asia, and the first published article reached about 2000 audiences and ranked in We-Chat Weekly Top articles themed on environment.

Wei Wan and Tong Zhu contributed in Air Quality in an Oxford Encyclopedia article *Selected Megacities: Challenges and Opportunities* as co-authors.

MAIRS-FE IPO also contributed in below publications with high impact:

- **NSR Special Issue - Air pollution in China: scientific challenges and policy implications**, Guest Editorial, Tong Zhu

Air pollution and its control in China are important scientific and public policy challenges. China's high coal consumption and rapid economic and social developments lend different angles to air pollution formation mechanisms to those that have been previously established. To address these challenges, the National Natural Science Foundation of China is funding a major research program 'Fundamental researches on the formation and response mechanism of air pollution complex in China' to study: (1) the key chemical processes and the atmospheric oxidative capacity in the formation of air pollution complex; (2) the interaction between the multi-scales physical processes in the atmosphere and the air pollution complex; (3) the key technological principles and response mechanism for controlling air pollution complex. To reflect recent progress in this field, NSR dedicated special topic to air pollution research in China, covering the following three topics: (1) anthropogenic emission inventories and PM_{2.5} sources; (2) modeling secondary organic aerosols and potential applications of dual-carbon isotopes in revealing the sources and formation of carbonaceous aerosols; and (3) aerosol and boundary-layer interactions and impact on air quality (Tong Zhu, 2018).

- **UN Environment Report - Air Pollution in Asia and the Pacific: Science-based Solutions** , Contributed author and translator, Wei Wan; Reviewer, Shiqiu Zhang

The report aims to support efforts to address air pollution in Asia and the Pacific by providing options for tackling air pollution in the context of the SDGs. To this end, it brings together evidence of historical trends with future development perspectives and provides detailed analyses of past and future economic trends and their implications for ambient and indoor

air pollution. From there, the report identifies a detailed portfolio of 25 cost-effective measures for technological and policy interventions that would contribute to the achievement of the SDGs while delivering the greatest benefits for human health, crop yields, climate and the environment, as well as socio-economic development. The report provides a clear picture of the benefits to be gained by adopting the measures and offers some implementation guidance through real-life case studies. It is also hoped that the report will act as a platform to share experiences with practical actions to prevent and control atmospheric pollution across the Asia and Pacific region (UN Environment, 2018). The Chinese report was presented at United Nations Environment Assembly (UNEA4) in Nairobi, Kenya in 2019.

- Clean Air Asia Report - China's Progress on Air Pollution Prevention and Control 2018 & **Special Report – Breaking Through: China's Path to Clean Air 2013-2017** developed by Clean Air Asia, Co-author and reviewer, Wei Wan

The “China Air – Air Pollution Prevention and Control Progress in Chinese Cities” report series to objectively monitor the development and implementation of national, regional and municipal policies that are enacted since the release of China’s Action Plan for Air Pollution Prevention and Control in 2013. The annual reports also track ambient air quality status in over 300 Chinese cities and analyze city best practices. The reports facilitate civil society to support and supervise policy implementation and promote cross learning among cities. Additionally, the English version help other countries better understand China’s pathways towards clean air. As special report of the series, this report is an attempt, from the standpoint of a third-party, to summarize and analyze major air pollution prevention and control measures and methods under-taken by China between 2013 and 2017 (Clean Air Asia, 2018). The special report was well received by the policy makers of China and selected as one key reference of the official Ministry of Environment and Ecology publication for 6-5 World Environment Day in 2019.

Activities

Annual SSC Meeting: On April 19-20, 2018, the annual meeting of the Future Earth- Monsoon Asia Integrated Research for Sustainability (MAIRS-FE, Monsoon Asia Integrated Research for Sustainability - Future Earth) Scientific Committee was successfully held at the School of Environmental Science and Engineering of Peking University. The meeting presented the latest research results of MAIRS in the water-energy-food nexus, environmental health, natural disasters, models and observations, and released the MAIRS-FE 2017 Annual Work Summary Report, discussed the future work plan of MAIRS-FE and the candidate list of the next Scientific Steering Committee. The 2019 SSC Meeting will be organized on 21-22 May, Nanjing in conjunction with the Forum on Food, Land, Energy and Water System in Asia, 23-25 May, Nanjing.

Workshop: MAIRS-FE was involved in 6 international workshops as co-organizer and contributing organization, including:

- ✧ Workshop on Urban Floods held in Bangalore, Indian on 27-29 June 2018;
- ✧ International Workshop on Land Cover/Land Use Changes and WEF Nexus, held in Vientiane, Laos on 11-17 August, 2018
- ✧ Workshop on Data and Tools for Climate Resilience Planning in South Asia, held in Bangalore , Indian on 13-14 August 2018
- ✧ Science and Training Workshop on Climate Change over the High Mountains of Asia, held in Pune, Indian on 8-12 October 2018
- ✧ Workshop on climate change for young scientists held in Bangalore, Indian on 5-7 December 2018
- ✧ UN Special Session: Air Pollution in Asia and the Pacific Science-Based Solutions at Better Air Quality Conference organized in Kuching, Malaysia on 14 November, 2018

MAIRS-FE at Divecha Centre for Climate Change (DCCC) hosted a two-day workshop on 'Data and Tools for Climate Resilience Planning in South Asia' over 13th to 14th August 2018. The workshop provided a platform for dialogue on climate adaptation and resilience, among research communities, policy makers, funding agencies, Government officials, NGOs, Sustainability enterprises, and other stakeholders, in South Asia. The workshop was attended by scientists, economists, NGO representatives and Govt. officials from Nepal, Bhutan, Myanmar, Sri Lanka and India. The participants expressed their desire to collaborate with the Future Earth Regional office on a host of climate adaptation related issues.

The International Meeting on Land Cover/Land Use Changes and Water Energy Food (WEF) Nexus in Southeast Asia was held to seek solutions, in Vientiane, Laos on August 11-17th, 2018. The meeting attracted over 100 participants from 13 countries, representing research institutions, government agencies, regional committee and international programs. The objectives of this meeting were to seek solutions to the WEF nexus issues in the Lower Mekong River Basin – synergy for win-win scenarios, present the latest scientific advances WEF nexus approaches land use and land cover change dynamic, bioenergy and climate change and promote regional collaborations and capacity building in the region.

An international workshop on Urban floods was organized during 27th to 29th June 2018 by the regional office of the Future Earth in Bengaluru. This workshop was a part of activities to promote work on Monsoon Area Integrated Research on Sustainability (MAIRS-FE). The program was formulated by Divecha Centre for Climate Change (DCCC) and Inter- disciplinary Centre for Water Research. The main purpose of the workshop was to share the experience in dealing with urban floods in different parts of world. This experience will increase our resilience to deal with extreme rainfall events that are expected in the future. The workshop attracted participants from different organizations in India and scientists from Paris, Canada, Malaysia, Sri Lanka and Nepal

MAIRS-FE at DCCC, along with the Centre for Climate Change Research in Pune and the Earth System Science Organization of the Ministry of Earth Sciences, Government of India, organized a 5 day

'Science and Training Workshop on Climate Change over the High Mountains of Asia during 8th to 12th Oct 2018, at Indian Institute of Tropical Meteorology, Pune. The workshop discussed the use of regional climate downscaling techniques relevant to the high mountains of Asia. This workshop enabled the participants to derive science-based climate information that can be integrated with local knowledge. There were 48 participants (8 foreign and 40 Indian) and 28 speakers (5 International and 23 National). The foreign participants were from Nepal, Srilanka, Cambodia, Laos, Thailand and Spain. The foreign speakers were from Nepal, Japan, South Africa, UK and USA.

MAIRS-FE at DCCC and the World Academy of Sciences (Central and South Asia regional partner) organized a workshop on climate change for young scientists from 5th to 7th December 2018 at Indian Institute of Science in Bengaluru. The workshop attracted young scientists from Africa, Central Asia, South and South east Asia. The talk by eminent experts on impact of climate change on developing countries was followed by presentations on local climate change by the participants from Benin, Ghana, Sri Lanka, Ethiopia, Uganda, Cameroon and Kenya.

MAIRS-FE will co-organize the 8th Congress of the East Asian Association of Environmental and Resource Economics, 2-4 Aug 2019, Beijing and the Beijing Forum - Sub-forum themed on Environment and Health, 1-3 Nov 2019, Beijing.

Regional Training Hub: MAIRS-FE initiated a regional air quality management training program in collaboration with regional partners, serving as capacity building platform for Asian policy makers. The training hub aims to build the bridge between science and policy and support science-based policies in countries with emerging health challenges caused by air pollution and climate change. MAIRS-FE has established partnership with target beneficial countries including Indian, Pakistan and Qatar and scheduled 3 training programs during 2019 -2020. Under the training program, key activities including tailored training courses developed by scientists, on-site guidance by technical experts and study tours at Chinese leading cities with best practices will be provided to beneficial countries and cities per needs.

Partnership

MAIRS-FE has kept liaison with Future Earth communities — Global Hubs, Regional Hub, Chinese National Committee, Nexus KAN and Health KAN, other GPRs such as IGAC, IRG and SOLAS etc. MAIRS-FE IPO has strengthened liaison with international cooperation and scientific research divisions and Institute of Area Studies in PKU. It also established partnership with international organizations and NGOs such as UN Regional Office of Asian Pacific , International Institute for Applied Systems Analysis (IIASA) and Clean Air Asia.