

American Society for Reclamation Sciences

Annual Meeting: Broader Perspectives Session



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“Reclamation Sciences Without Borders”

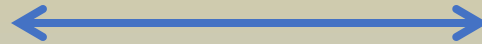
(Executive Summary)

- **Created in early 2024 to:**
 - **provide collaborative efforts with other recognized professionals and scientific and industrial organizations globally.**
 - **encourage research development, implementation, and dissemination of information world-wide.**
 - **disseminate peer-reviewed and field-tested science and technologies with relevant stakeholders around the globe.**
- **Broad focus across different disturbed lands and ecosystems including but not limited to large-scale industrial disturbance.**

ASRS, NEC



International Initiative Planning and Implementation Committee (IPC)



Roles and Responsibilities

**International Initiative Organization During Development, Planning, and Implementation
(01/01/24 to 12/31/24)**

- **Dr. Y. Paul Chugh- Co-Chair**
- **Dr. Lee Daniels**
- **Dr. Natalie Kruse Daniels**
- **Dr. Brenda Schladweiler- Co-Chair**
- **Dr. Jeff Skousen**
- **IPC members encouraged to continue beyond December 2024**

- **Communications: Internal and External**
- **Concepts Development and Planning**
- **Interface with ASRS and NEC**

Mission, Goals, Needs, and Development

MISSION

Cultivate and nurture collaborative efforts with other relevant organizations and professionals to:

- **Identify, develop and disseminate sound science and technologies related to reclamation of disturbed areas;**
- **Identify activities that have high potential for successful implementation across borders around the globe.**

GOALS

- **Work collaboratively with stakeholders, recognized professionals and scientific and industrial organizations globally to achieve the mission.**
- **Involve professional societies to develop a holistic view of considerations and practices with ecological considerations.**
- **Collaborate in easily searchable electronic information transfer mechanisms on specific topics through ASRS that will include best practices and guidelines documents, and International Workshops.**
- **Include post-disturbance reclamation activities as part of nature-based solutions to address climate change.**
- **Actively engage the next generation/s professionals in the mission.**

Needs

Need for the Initiative - Global Sustainability

“Minerals and metals are essential to our current lives and even more so to the energy transition, but they cannot come at the expense of Nature. So, people are rightly looking at our industry just saying “you have an impact on nature directly. You affect the land, you affect the air, you affect water , both fresh and ocean. And so please show us how you are going to mine these minerals we are going to need while taking care of our precious planet.”

2024 Sustainability Leaders: Energy transition transformation and the mining sector

“A world powered by renewables is a world hungry for critical minerals. For developing countries, critical minerals are a critical opportunity – to create jobs, diversify economies, and dramatically boost revenues. But only if they are managed properly.”

UN Secretary-General António Guterres 2024

Needs for the Initiative- Scholastic

- **Lack of understanding of changes in diverse ecological environments due to industrial activities and the science behind the changes.**
- **How do changes in surface topography, soils and disturbance, soil moisture and temperature and disruptions in biotic communities affect the different components of ecological environments of the affected area?**
- **Can disruptions be remediated through reclamation activities soon after project completion or does it take extended time? If so, how much time before overall ecological functions can be fully restored?**
- **Have researchers collected enough ecological data in pre- and post-disturbance conditions to understand and to predict progressive changes?**
- **Need for uniformity in characterization studies, experimental designs, data development and analysis and its availability globally.**
- **In a digital world, meaningful data is “Gold”.**
- **Compilation and analysis of case histories data critical for developing best management guidelines.**

Needs for the Initiative - Strategic

- **Organizations doing business in multiple countries.**
- **Expected large number of mine closures over the next decades.**
- **Critical minerals production will require new ventures in unexplored ecological environments.**
- **Current disparity in reclamation and ecological restoration technologies, practices, and successes in different countries.**
- **Current and expanding emphasis on ESG compliance.**
- **Lack of readily available knowledge-base and guidance on the subject for small mining companies.**

Development

- Based on identified needs from stakeholders, the National Executive Committee of the ASRS approved planning for an ASRS International Initiative in February 2024.
- Goal would be to encourage development, implementation, and dissemination of reclamation and ecological restoration based on sound scientific principles with global applications “Reclamation Sciences Without Borders”.
- Achieve goals through collaborative efforts with stakeholders, other professionals and scientific and industrial organizations globally to identify and disseminate peer-reviewed, and field-tested science and technologies.
- A 5-member Ad-Hoc Planning Committee (IPC) developed the concepts, goals and implementation plans for the initiative with their approval by NEC in April.
- An International Oversight Committee (IOC) will advise the initiative beyond December 2024.

Considerations

General Considerations

- **Inter-disciplinary learning from others through active cooperation with professionals in reclamation technologies, ecological restoration, water management, geochemistry, biochemistry, etc. and operations leaders.**
- **Can we use abandoned disturbed sites in the USA, Canada, Africa, Australia for nature-based solutions for environmental protection at a reasonable cost for regional improved socio-economic conditions?**
- **How do we plan for and effectively close the industrial sites that have highly disturbed pre-existing ecological environments?**
- **How do we integrate economics into mine, reclamation, and closure planning to minimize negative cost impacts?**

Initiative Sustainability Considerations

- 1) Have broader focus of lands disturbed by industrial activities such as mining, energy production, and other extensive impactful activities.**
- 2) The impacts of such activities are similar, but the areal and time scales of disturbance can be different.**
- 3) Actively promote international activities related to reclamation of lands disturbed by industrial activities associated with critical minerals and nature-based solutions to deal with environmental impacts.**
- 4) Work with the U.S. Department of the Interior who is developing guidelines for “Nature-Based Solutions” for remediation of disturbed lands, e.g., wetlands where wetlands did not exist before. Regional reclamation based on current and future needs.**

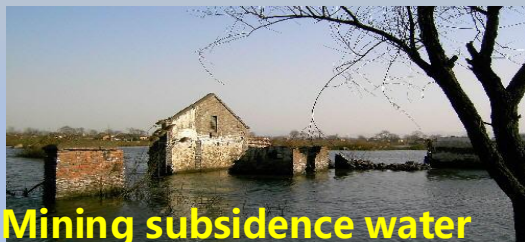
Example of an Ongoing International Collaborative Research Project



China-US Cooperative Research: Impacts of coal mining on ecosystems in Eastern China and identification of restoration approaches

Project background

- In Eastern China, groundwater is relatively shallow, leads to surface water accumulation after mining subsidence.
- This transforms the original terrestrial ecosystem into a water-land composite ecosystem, significantly impacting the ecological processes, structure, and functions, as well as related ecosystem services.



Mining subsidence water



Building damage



Cropland waterlogging



Landscape changes

□ Chinese side: Rapid development

- ◆ Earliest location: Eastern China
- ◆ Research duration: 50 years
- ◆ Restoration type: Plain-farmland
- ◆ Challenges faced: Lack of a comprehensive mining area ecosystem service diagnosis system and practical evaluation methods

□ American side: Early start in ecological restoration of mining areas

- ◆ Earliest location: Eastern United States
- ◆ Research duration: Over 70 years
- ◆ Restoration type: Mountainous-forest
- ◆ Main advantage: Preliminary establishment of indicators and methods for assessing forest ecosystem services



China-US Cooperative Research: Impacts of coal mining on ecosystems in Eastern China and identification of restoration approaches

Project Partner

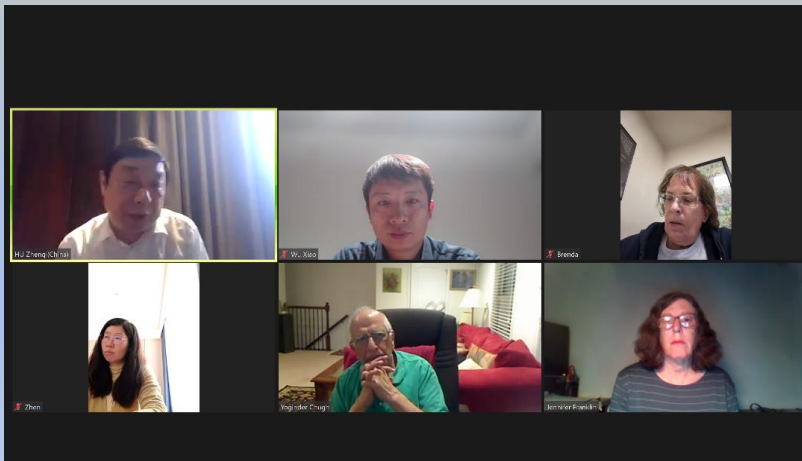
- CHINA UNIVERSITY OF MINING AND TECHNOLOGY
- ZHEJIANG UNIVERSITY
- THE UNIVERSITY OF TENNESSEE



中方



美方



Webinar in April 12th, 2024

- National Key Laboratory of Coal Resources and Safe Mining
- Research Institute of Land Reclamation and Ecological Reconstruction
- Sophisticated theoretical system of mine ecological monitoring and ecological restoration technology.
- Matured mine-side rehabilitation technology

- Close cooperative relationship with the Oak Ridge National Laboratory.
- Practical methods for evaluating forest functions.
- Advanced experience in forest restoration in coal mine reclamation areas.
- Evaluation of a complete system of ecosystem services in reclaimed mining areas.



China-US Cooperative Research: Impacts of coal mining on ecosystems in Eastern China and identification of restoration approaches

Research objective

This project aims to address the environmental challenges associated with mining activities in both China and the United States with emphasis on eastern China. Through collaborative efforts, the project seeks to:

- *Develop and implement effective science-based strategies for land reclamation and ecological restoration of mining areas.*
- *Advance scientific knowledge on restoration ecology.*
- *Foster a platform for knowledge exchange and capacity building.*
- *Promote international collaboration in addressing global environmental issues.*

*Joint Student
Training*

*Joint Research and
Publications*

*Data Sharing and
Analysis*

*Academic Exchange
and Dissemination*



China-US Cooperative Research: Impacts of coal mining on ecosystems in Eastern China and identification of restoration approaches

Expected outcomes

This project should yield significant benefits for both countries and the globe:

Research & Development Benefits:

- Develop cost-effective and ecologically sound mine land reclamation strategies.
- Improve scientific understanding of restoration ecology in post-mining areas.
- Enhance research capacity in both countries for mining-related environmental issues.

International Relations Benefit:

- Strengthen global efforts towards sustainable mining practices and ecological restoration.
- Strengthen the China-US relationship through scientific collaboration.

Implementation

Overall Implementation Plan ASRS-International Initiative (Reclamation Sciences Without Borders)

**Facilitate Global Capacity Building in
Reclamation Sciences and Ecological
Restoration**

Information

**Technical
Support**

**Nurture Future
Professionals**

Information

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graph TD; Information[Information] --- Synthesis[Synthesis & Development]; Information --- Transfer[Transfer]; Synthesis --- S1[Manuals]; Synthesis --- S2[Guidelines]; Synthesis --- S3[State-of-the Art Chapters]; Synthesis --- S4[Futuristic Ideas]; S4 --- S4a[Disruptive]; S4 --- S4b[Non-disruptive]; Transfer --- T1[Journal Papers]; Transfer --- T2[Special Issues]; Transfer --- T3[Topical Workshops]; Transfer --- T4[Webinars]; Transfer --- T5[Field Visits];
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Synthesis & Development

- **Manuals**
- **Guidelines**
- **State-of-the Art Chapters**
- **Futuristic Ideas**
 - **Disruptive**
 - **Non-disruptive**

***All based on collaborative efforts**

Transfer

- **Journal Papers**
- **Special Issues**
- **Topical Workshops**
- **Webinars**
- **Field Visits**

Technical Support

- **Characterization needs and procedures**
- **Data analysis, needs, and corrective procedures**
- **Field experimental design**
- **Field studies implementation, data collection, and analysis**
- **Collaborative experimental and analytical studies**
- **Data synthesis and identification of research needs and pollution**
- **Monitoring for assessment (remote sensing)**

Nurture Future Professionals

- **Student scholarships**
- **International student exchange programs**
- **International student design competition**
- **Outstanding student awards**
- **Outstanding young professional awards**
- **Field internships**

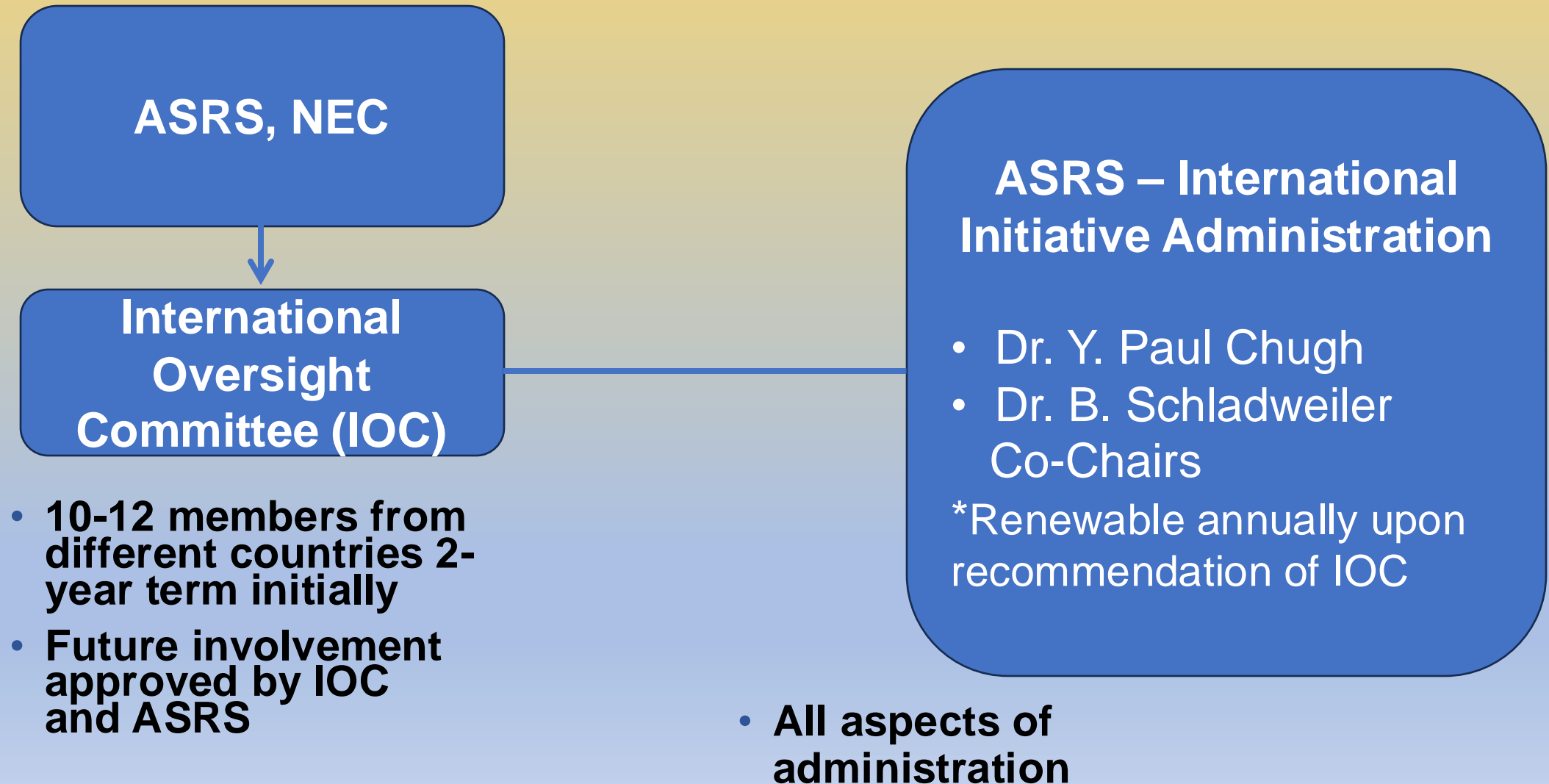


***These will vary from country to country based on organizational structure**

Initiative Implementation Beyond 2024

- During the period June-November, 2024, IPC will seek qualified professionals to serve on an International Oversight Committee (IOC) that will oversee all activities of the initiative in an advisory role.**
- It is expected that the IOC will consist of about 10 members (five from the USA) and five from selected countries around the globe.**
- The IOC will become effective January 1, 2025 with Drs Chugh and Schladweiler serving as co-chairs. They will serve one-year terms upon the recommendation of IOC and appointed by NEC.**

ASRS-International Initiative Organization- Final Implementation After January 1, 2025



Initiative Implementation

(Interactive Discussion)

Questions to consider

- What organizations and countries globally should the initiative focus on to work collaboratively?
- What critical areas of reclamation sciences should be developed to build technical capacity globally (for example, ecological services evaluation, mine closure, nature-based solutions, remote sensing, data analytics, etc.)?
- What topical areas should we consider focusing at the 2025 ASRS Annual Meeting to support this initiative?
- How can we encourage other countries in need of reclamation sciences knowledge-base to participate in the initiative?

Thank you! We need your input to make the initiative strong and successful. Send comments to:

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