GUIDELINES FOR SUBMARINE GEOLOGICAL RISK REDUCTION FOR SUSTAINABLE OFFSHORE WIND POWER DEVELOPMENT IN ACTIVE MARGINS

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Working Group on Study of Offshore Wind Power Development for Sustainable Development Goals, Science Council of Japan, Japan

Thematic Session at the 61stCCOP Annual Session
Submarine Geohazards Risk and Reduction and 2025 Myanmar Earthquake

November 5 (Wed), 2025

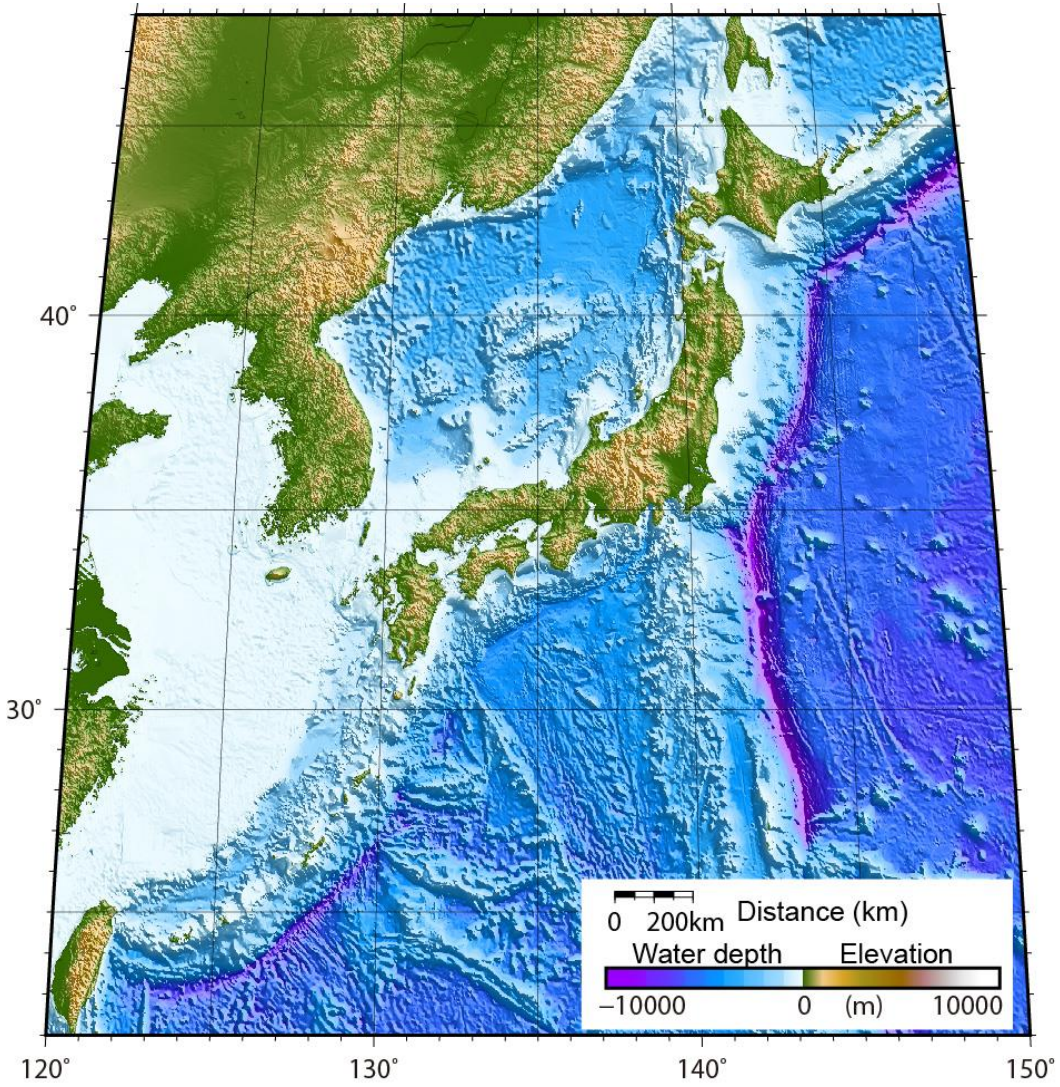
2021-Present
Working Group on Study of Offshore Wind Power Development for SDG
Objectives: To discuss Geohazards Risks on Offshore Wind Power at Active Margins

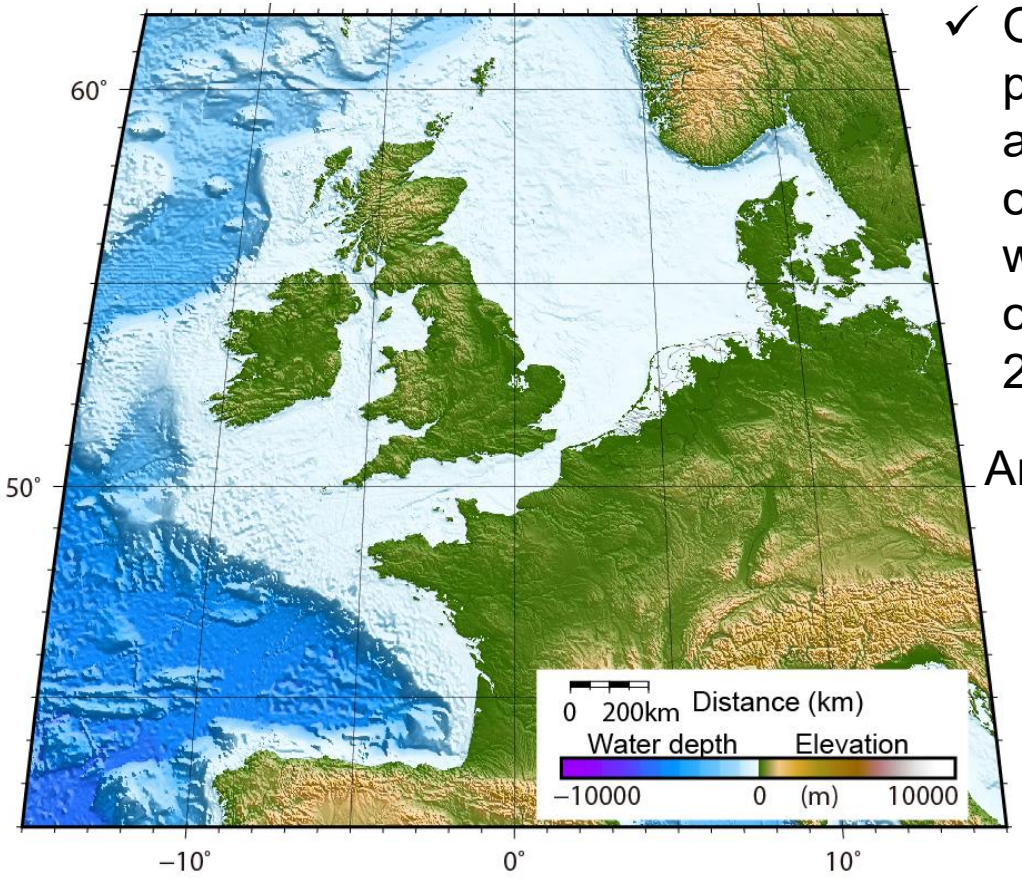
3rd June 2022
Open Symposium: Offshore Wind Power Generation at Active Margins

14th Nov 2024
Open Symposium: Submarine Geohazards and Offshore Wind Development

22nd Sept 2023
Advisory Opinion: Toward Sustainable Development of Offshore Wind Power at Active Margins -Importance of Submarine Geohazard Risk Assessment-

Guideline





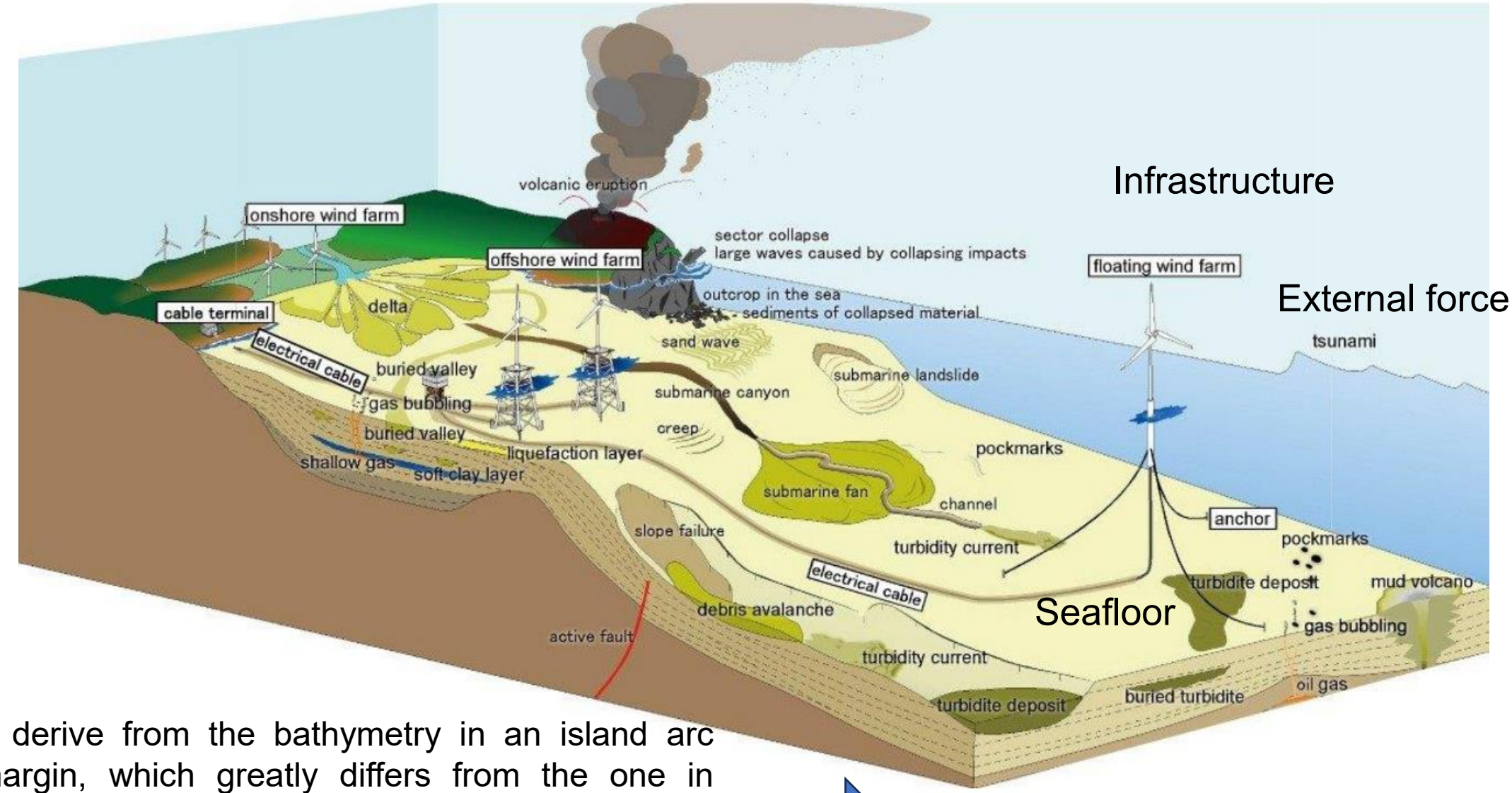
✓ Offshore wind powers in Europe are mainly in areas of the North Sea with a water depth of shallower than 200 meters,

Area: 570,000 km2

✓ In Japan, development of offshore wind power generation is also progressing.

✓ However, in active marginal areas such as Japan, the seafloor topography is steep and the continental shelf is narrow, limiting the development area.

Guideline



- ✓ The risk derive from the bathymetry in an island arc active margin, which greatly differs from the one in continental inactive margin such as Europe.

→ High risk of geohazards

- ✓ The whole interaction between external forces, seafloor and infrastructure has not been fully studied.

Program 1/3
Open Symposium:
Offshore Wind Power Generation at Active Margins
3rd June 2022

Symposium of Offshore Wind Power Generation at Active Margins

3 June (Fri.) 2022, 10:00–18:00

Admission fee: FREE
Presentation: Online presentation and question and answer by Chat
Language: English or Japanese
How to participate: Application form is available at the official site of the Science Council of Japan

The government has declared that it aims to realize a carbon-neutral, carbon-free society in 2050. The annual amount of wind power generation is currently about several million kW, and it is said that it will be more than ten million kW for offshore wind power alone in 2030. In order to achieve this goal, we need to enforce the law associated with renewable energy, which stipulates various conditions such as weather, sea conditions, conservation of harbors, fishery conservation, and conservation of the marine environments.
However, there is a risk of marine geological disasters such as liquefaction and submarine landslides in shallow waters at active margins such as Japan. Therefore, marine geological risk assessment for site selection and design is required. It is also necessary to evaluate the effects of tsunamis and ocean currents. Power transmission from the ocean is a risk as well.
In this symposium, we discuss these issues in terms of offshore wind power development in activity margins and discuss the solutions.

Organizers: Science Council of Japan
Co-Organizers: IUGS, Japan Geoscience Union
Supporters: The Japan Landslide Society, International Tsunami Disaster Prevention Society, The Society of Exploration Geophysicists of Japan, The Society for Study of Submarine Geological Risks (SSSGR), International Consortium on Landslides、National Taiwan University

Program 2/3
Open Symposium:
Offshore Wind Power Generation at Active Margins
3rd June 2022

Coordinator: **Chikako Iwaki** (Science Council of Japan)

Session 1 Current status of offshore wind power generation (Convener: **Jun Matsushima**)

10:00 Aiming to offshore wind powers for main power supply
Dr Manabu Tsuchiya (Director, Japan Wind Power Association)

10:20 Activities of NEDO
Shunsuke Saegusa (Project Coordinator, Offshore Wind & Ocean Energy, New Energy Technology Department, New Energy and Industrial Technology Development Organization)

10:40 Cost and balance ratio of energy on Offshore wind powers)
Prof Jun Matsushima (Department of Environment Systems, Graduate School of Frontier Sciences, The University of Tokyo)

10 min. break

Session 2 Introduction of marine geological hazards (Convener, Hajime Naruse)

11:10 Japanese paleotsunamis and future risks
Prof Kazuhisa Goto (School of Science, The University of Tokyo)

11:30 Risk assessment of deep seafloor geohazards: an example of earthquake-tsunami induced turbidity currents
Dr Hajime Naruse (Graduate School of Faculty of Science, Kyoto University)

10 min. break

Session 3 Methodology for risk evaluation of geological disasters (Convener: Hideo Nomura)

12:00 Seismic survey for risk evaluation of seabed and near surface.
Takeshi Kozawa (Manager, JGI, Inc.)

12:20 Evaluation and prediction of geohazard risks at littoral and offshore regions
Dr Shinji Sassa (Research Director, International Research Center for Coastal Disasters, Ocean Infrastructure Research Center, Port and Airport Research Institute, National Institute of Maritime, Port and Aviation Technology)

12:40 Assessment of geohazards for the development of offshore wind export cables (Movie)
Dr Paul Dimmock (Norwegian Geotechnical Institute)

Program 3/3
Open Symposium:
Offshore Wind Power Generation at Active Margins
3rd June 2022

Session 4 Archive data for risk evaluation (Convener: Tomoyuki Sato)

13:50 Introduction of JAMSTEC database
Dr Yukari Kido (JAMSTEC)

14:10 Database of Japan Coast Guard
Dr Naoto Ujihara (Hydrographic and oceanographic department, Japan Coast Guard)

14:30 Marine geological maps and its original data
Dr Tomoyuki Sato (Geological Survey of Japan, AIST)

14:50 Seabed 2030: Compiling archived and recent datasets (Movie)
Jaya Roperez (National Institute of Water and Atmospheric Research; NIWA)

Session 5 international cooperation (Convener: Yasukuni Okubo)

15:10 Activities of IUGS
Prof. Hiroshi Kitazato (Science Council of Japan, Tokyo University of Marine Science and Technology)

15:30 International cooperation associated with renewable energy development at active margins
Dr Yasukuni Okubo (Science Council of Japan)

15:50 Environmental impacts of deep water offshore wind (Movie)
Dr Robert M Dorrell (University of Hull)

16:00 Examples in Taiwan (Movie)
Dr Jih-Hsin Chang (Institute of Oceanography, Nation Taiwan University; Ocean Center, Nation Taiwan University)

10 min. break

Session 6 Relation to capacity development and our society (Convener: Kiichiro Kawamura)

16:20 Capacity development at Universities
Prof Kiichiro Kawamura (Graduate School of Science and Technology for Innovation, Yamaguchi University)

16:40 Innovative training for new industries (Movie)
Prof James M Gilbert (University of Hull)

16:50 Offshore wind power development leading towards regional revitalization
Dr Ayano Takeuchi (Department of Environmental Science, Faculty of Science, Toho University)

10 min. break

17:20 Panel discussion: the recommendations to our society

Panelists: **Jun Matsushima, Hajime Naruse, Hideo Nomura, Tomoyuki Sato, Yasukuni Okubo, Kiichiro Kawamura**

Program 1/4
Open Symposium: Submarine Geohazards and Offshore Wind Development
14th Nov 2024

Open Symposium of the Science Council of Japan

Submarine Geohazards and Offshore Wind Development

1. **Organizers:**
   Subcommittee on Energy and Science and Technology, Committee on Engineering, Science Council of Japan, IUGS Subcommittee, Committee on Earth and Planetary Sciences, Science Council of Japan

2. **Co-organizers:**
   IUGS, Japan Geoscience Union

3. **Supporters:**
   Japanese Geotechnical Society, International Association for Tsunami Disaster Prevention, Japan Society of Exploration Geophysicists, The Society of Study for Submarine Geological Risk, International Consortium on Landslides, National Taiwan University, Japan Society of Civil Engineers, Japan Wind Energy Society, Center for Environmental Information Science, The Engineering Academy of Japan

4. **Date and time:**
   Thursday, November 14, 2024, 10:00-18:00

5. **Venue:**
   Auditorium of the Science Council of Japan and online distribution

6. Purpose of the event:

In Europe, the US and other countries, the development of offshore wind power generation is progressing and it is now playing a major role in renewable energy. Development of offshore wind power generation is also progressing in Japan. However, in active marginal areas such as Taiwan, Japan, Philippines and so on, the seafloor topography is steep and the continental shelf is narrow, limiting the development area. In addition, there are submarine geohazard risks in coastal areas such as submarine liquefaction and mud volcanoes. For the sustainable operation of offshore wind power generation, developers need to recognize the existence of seafloor geohazard risks and carry out development based on appropriate plans. In this symposium, experts and developers will gather to discuss seafloor multi-geohazards and offshore wind power development.

Program 2/4
Open Symposium: Submarine Geohazards and Offshore Wind Development
14th Nov 2024

7. Agenda

Chairperson: Chikako Iwaki (Associate Member of the Science Council of Japan)

10:00 Objective of the event: Yasukuni Okubo (Associate Member of the Science Council of Japan)

Session 1: Case Studies of Submarine Geohazard Events (Convener: Shinji Sassa)

10:10 Submarine Geohazards with the Risk to Offshore Wind
Shinji Sassa (Port and Airport Research Institute, National Institute of Maritime, Port and Aviation Technology)

10:30 Recent Advances in Understanding Turbidity Currents
Hajime Naruse (Kyoto University)

10:50 Recent Advances in Understanding Submarine Landslides and Tsunamis
David Tappin (British Geological Survey)

11:10 Recent Advances in the Mitigation of Scour in Offshore Wind
Andreas Roulund, (Ørsted)

Break (20 min)

Session 2: Submarine Geological and Geophysical Data Archives (Convener: Yukari Kido)

11:50 Necessity of local risk assessment with wide-area geological trends in mind using existing data such as topography, underground cross sections, and grain size distribution
Tomoyuki Sato (Geological Survey of Japan, AIST)

12:10 Use for hazard evaluation and data archive of bathymetric datasets
Hiroki Minami (Japan Coast Guard)

12:30 Submarine Geological and Geophysical Data Archives
Vicki Ferrini (Lamont-Doherty Earth Observatory, Columbia University)

12:50 Seabed2030 and Hunga Tonga-Hunga Ha'apai　eruption bathymetry expedition
Kevin Mackay（National Institute of Water and Atmospheric Research）

Program 3/4
Open Symposium: Submarine Geohazards and Offshore Wind Development
14th Nov 2024

Session 3: Requirements of offshore geological and geophysical surveys to properly characterize submarine geohazard risks (Convener: Jun Matsushima)

14:10 Risk and Uncertainty: Geophysical exploration for geological assessment
Jun Matsushima (University of Tokyo)

14:30 Required marine geological, geophysical and geotechnical surveys for offshore wind farm development in Taiwan
Char-Shine Liu (National Taiwan University)

Session 4: Global review of submarine geohazard risks to offshore renewable energy (Convener: Kiichiro Kawamura; Yamaguchi University)

14:50 Potential submarine geohazard on the Kumano-nada continental slope, West Japan: Consideration of factors that cause submarine landslides
Toshiya Kanamatsu (Japan Agency for Marine-Earth Science and Technology)

15:10 Geological framework and possible geohazards in central Taiwan Strait
Jih-Hsin Chang (National Taiwan University)

15:30 The experience of the Italian Marine Geology Research community in standardized geohazard feature mapping on the Italian Seas」
Francesco Latino Chiocci (Geologia Marina Dipartimento Scienze della Terra Università La Sapienza)

Program 4/4
Open Symposium: Submarine Geohazards and Offshore Wind Development
14th Nov 2024

16:00「Opening remarks」 Maria Rose Petrizzo（IUGS vice-President）

Session 5: International Capacity Building (Convener: Ayano Takeuchi; Toho University)
16:10 The Aura Centre for Doctoral Training in Offshore Wind Energy
Robert Dorrell (University of Hull)

16:30 The Geology of Wind Power: from the second largest wind economy in the mid-continent US to the offshore challenge
Nicholas Hayman (University of Oklahoma)

16:50 The Research Institute for Volcanology and Risk Assessment (IVAR) and its potential as a training platform
José Manuel Pacheco (IVAR - Instituto de Investigação em Vulcanologia e Avaliação de Riscos, Universidade dos Açores)

Panel discussion: Towards a guideline
17:10 Panelists: Shinji Sassa, Yukari Kido, Jun Matsushima, Kiichiro Kawamura, Ayano Takeuchi

17:50 Closing remarks
Harue Masuda (Associate Member of the Science Council of Japan)

Field Trip

Date: 15 (Fri) and 16 (Sat) November
Place: Miura Peninsula
Guide: Yujiro Ogawa (Professor Emeritus, University of Tsukuba)
Contact: kiichiro@yamaguchi-u.ac.jp
Deadline for registration: 30 October, 2024

Field observation:
1) Miocene to Pliocene of accretionary prism along the Sagami trough plate subduction boundary. Sedimentary rocks derived mainly from Izu volcanic arc.
2) Uplifted benches and coastal terraces due to subduction earthquake during recent 100 kyears.
3) Evidence of various types of sedimentation and deformation due to accretionary prism formation, particularly by earthquakes, submarine landslides by discussion either liquefaction, fluidization, or diapirism. Many interesting structures are seen.
4) People's life styles by fisheries and sightseeing, and preparedness

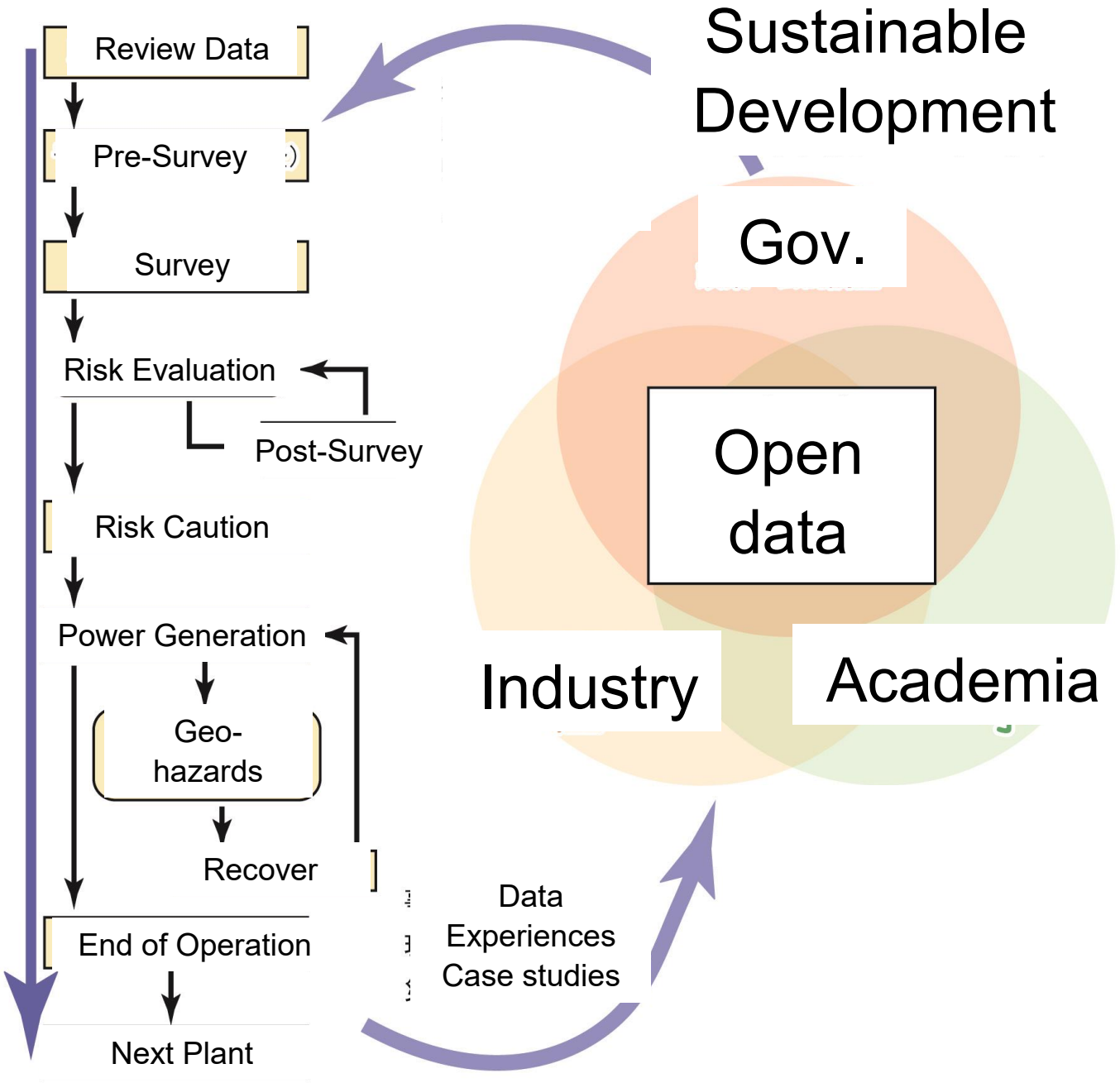
https://iugs-tgsg.comGeohazards

About | Scientific Rationale | Aim and Objectives | Management Structure and Governance | Proposal and Leaflets | Contact and Link | Activity

Future Topics

Open data-driven industry-academia-government collaboration

- ✓ We would like to establish database commonly used.
- ✓ In order to establish the database, we require the collaboration between Gov. Academy and Industry.
- ✓ We will discuss how to establish the database.



See you at CCOP AS next year

Thank you very much for your attention