# Recent Activities on Deep Sea Mining in Japan

**Offshore & Deep Sea Mining Conference 2016**

**29 November 2016**

Radisson Edwardian Bloomsbury, London


***Hiroyuki Nakahara***

**Managing Director, Research Institute for Ocean Economics, Japan**

**Secretary, Ocean Mining Industry Promotion Round Table, Japan**

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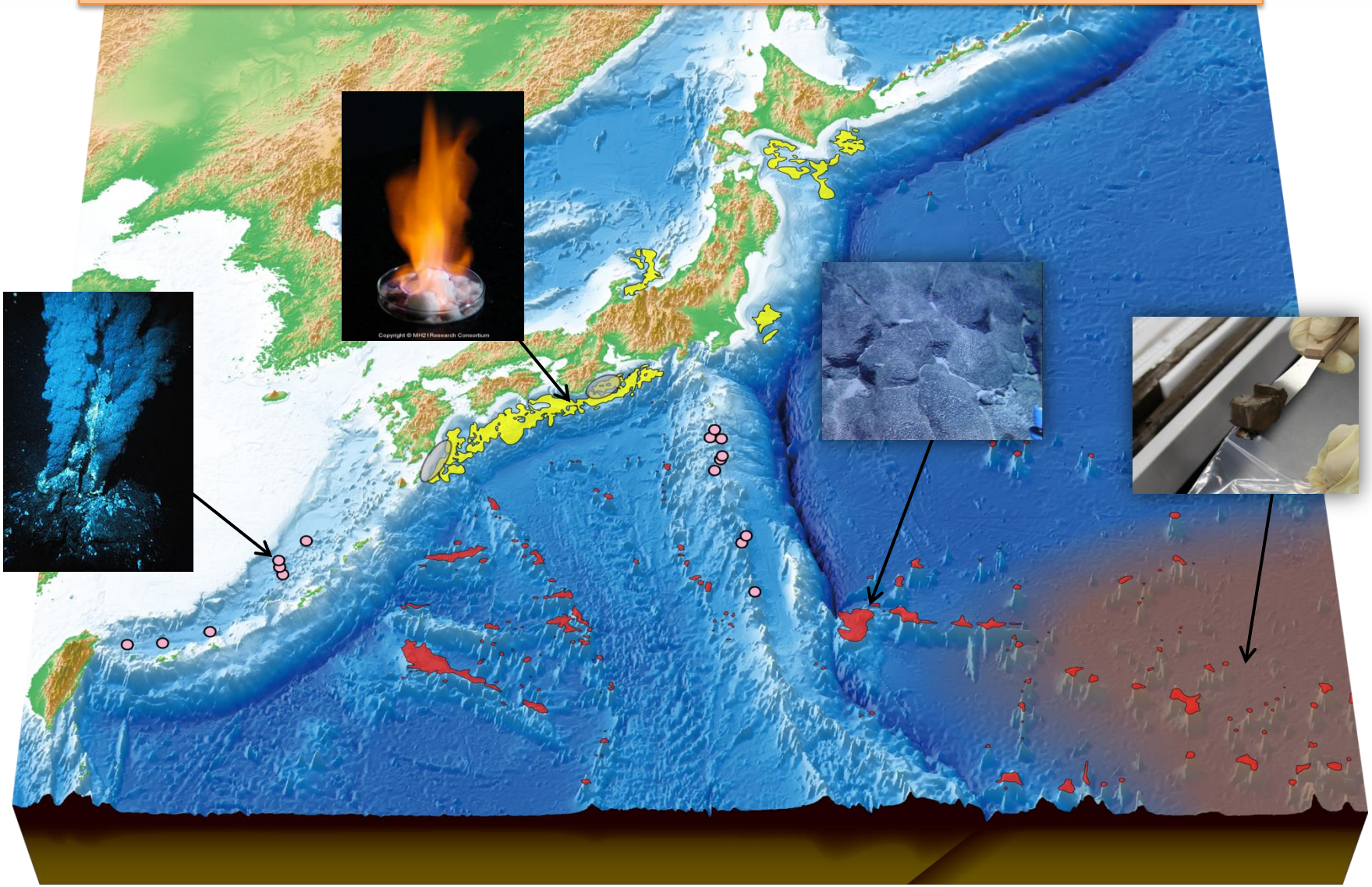
# Potential of deep sea resources around Japan




Hydrothermal Deposit

Methane Hydrate

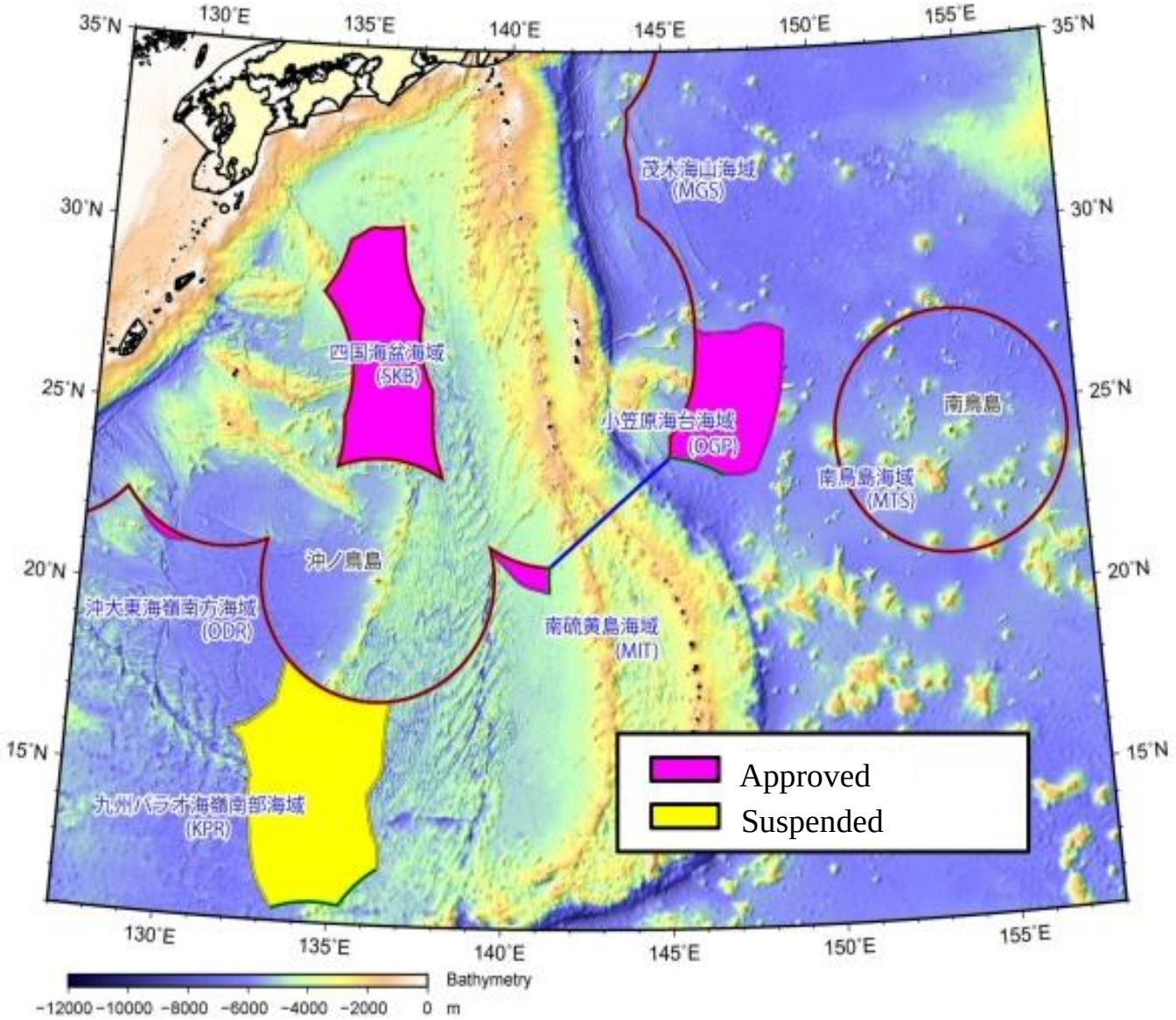
Rare Earth Sediment

Ferro-Manganese Crust

Mud Volcano

(Source; Urabe & Usui, and Methane Hydrate Resource Development Consortium, 2009

# Continental Shelf beyond EEZ of Japan




（Source ; http://www.kantei.go.jp/jp/singi/kaiyou/dai9/siryou4.pdf）

# Two Major Players; Governmental Sector

**Basic Plan on Ocean Policy (Cabinet Decision)**

## Cabinet Office

## MEXT *

**JAMSTEC** **

<Current Project;
One of the eleven SIP Projects>

***SIP***

***Next-Generation Technology for Ocean Resources Exploration***

## METI - ANRE**

**JOGMEC******

<Current Project>

***Marine Energy & Mineral Resources Development Plan***

**(METI Decision)**

- **Ministry of Education, Culture, Sports, Science and Technology**

** **Japan Agency for Marine-Earth Science and Technology**

*** **Ministry of Economy, Trade and Industry – Agency for Natural Resources & Energy**

**** **Japan Oil, Gas and Metals National Corporation**

**Cabinet Office**

**MEXT**

# JAMSTEC

# *SIP Next-Generation Technology for Ocean Resources Exploration*

# (Zipangu-in-the-Ocean Project)

**SIP** *(Cross-ministerial **S**trategic **I**nnovation Promotion **P**rogram)*

- Established in 2013 by the Cabinet based both on the “Japan Revitalization Strategy” and the “Comprehensive Strategy on Science, Technology and Innovation”.
- A cross-cutting program beyond the framework of the Cabinet Office and the ministries and of traditional disciplines.

※***SIP*** **contains eleven projects such as Automatic Car Driving System and others, including this “Next-Generation Technology for Ocean Resources Exploration”**

# SIP ; Zipangu-in-the-Ocean Project (2014 – 2018)

## Implementation Structure

**CSTI** (Council for Science, Technology and Innovation)

**Governing Board** — **all eleven SIP projects**

**Promotion Committee** — respective SIP project

**Cabinet Office**

JAMSTEC (Lead Agency)

(Research by itself/ Budgeting/ Management)

<CONTENTS>

**①Research on genesis of submarine resources**

JAMSTEC, AIST, University

**②Development of exploration technologies**

JAMSTEC, NMRI, PARI, NICT, Industry, University

**③Ecosystem survey and development of long-term monitoring technologies**

JAMSTEC, NIES

MEXT — Cabinet Office

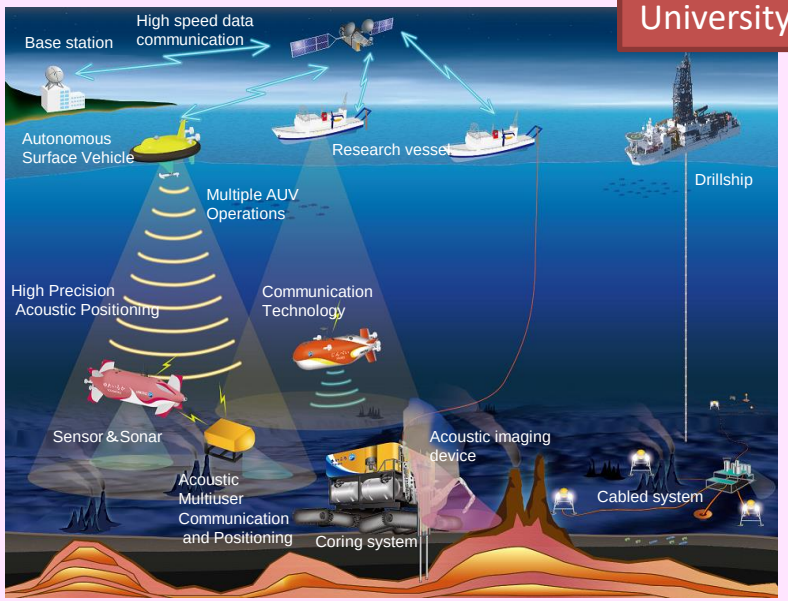
¥6 billion (FY2015) ¥4.56billion (FY2016)

JAMSTEC

contract research

¥2 billion(FY2015)

AIST | NMRI | PARI | NICT | NIES | Industry | University




Development of ocean exploration industry for ocean minerals and resources And its overseas deployment

(Source: JAMSTEC, 2015)

# Management Structure (Restructured in 2016)

Management Meeting (Monthly) With theme leaders

Program Director (**T. Urabe**)

Acting PD (**S. Ishii**; Japan Petroleum Exploration Co.)

Sub-PD (**T. Tsujimoto**; JOGMEC)

Deputy & Sub-PD (**T. Ura**; Kyushu Inst. Tech )

Sub-PD (**T. Hotta**; JAMSTEC)

Advisory Comm. for Industrial-ization ( Chair: M. Takashima)

Secretariat:
Cabinet Office
JAMSTEC

Promotion Committee

Among PD, Deputy PD, Sub-PD, Cabinet Office , MEXT, METI, MLIT, MIAC, Ministry of Environment, Headquarters for Ocean Policy, Research Institutes, advisors from various fields, etc.

- Task Force for Strategic Planning
- Task Force for EIA Standardization
- W.G. for R & D Optimization
- Committee for Intellectual Rights

## Theme 1

Theme Leader E. Kikawa

- AIST
- JAMSTEC
- Kyushu Univ.
- Kochi Univ.
- Tokyo Univ.

## Theme 2

Theme Leader T. Ura

- 2.1 J-MARES, JAMSA, Kochi Univ.
- 2.2 NMRI, JAMSTEC
- 2.3 PARI, JAMSTEC
- 2.4 NICT

## Theme 3

Theme Leader K. Yamamoto

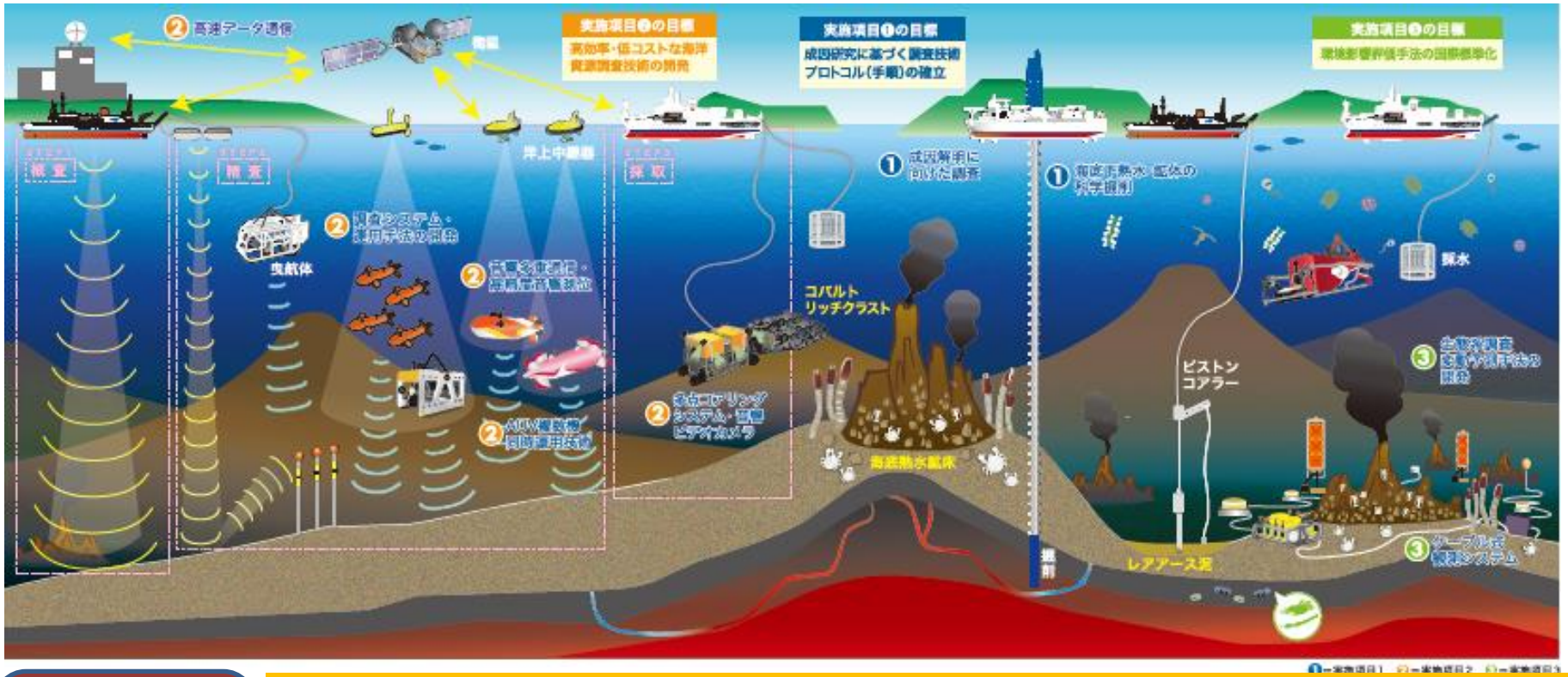
- NIES
- JAMSTEC
- Tokyo Marine Univ.
- Yokohama Nation. Univ.

(Source: same as next.)

AIST (Nat. Inst. of Advanced Industrial Science and Technology
PARI (Port and Airport Research Institute)
NICT (Nat. Inst. of Information and Communications Technology)
NIES (National Institute for Environmental Studies)
NMRI (National Maritime Research Institute)
JAMSA (Japan Marine Survey Association)

# Next-Generation Technology for Ocean Resources Exploration = *Zipangu-in-the-Ocean* Project

*Budget= 45 Million US$ (2016FY), Duration= 2014-2018 (5 years)*

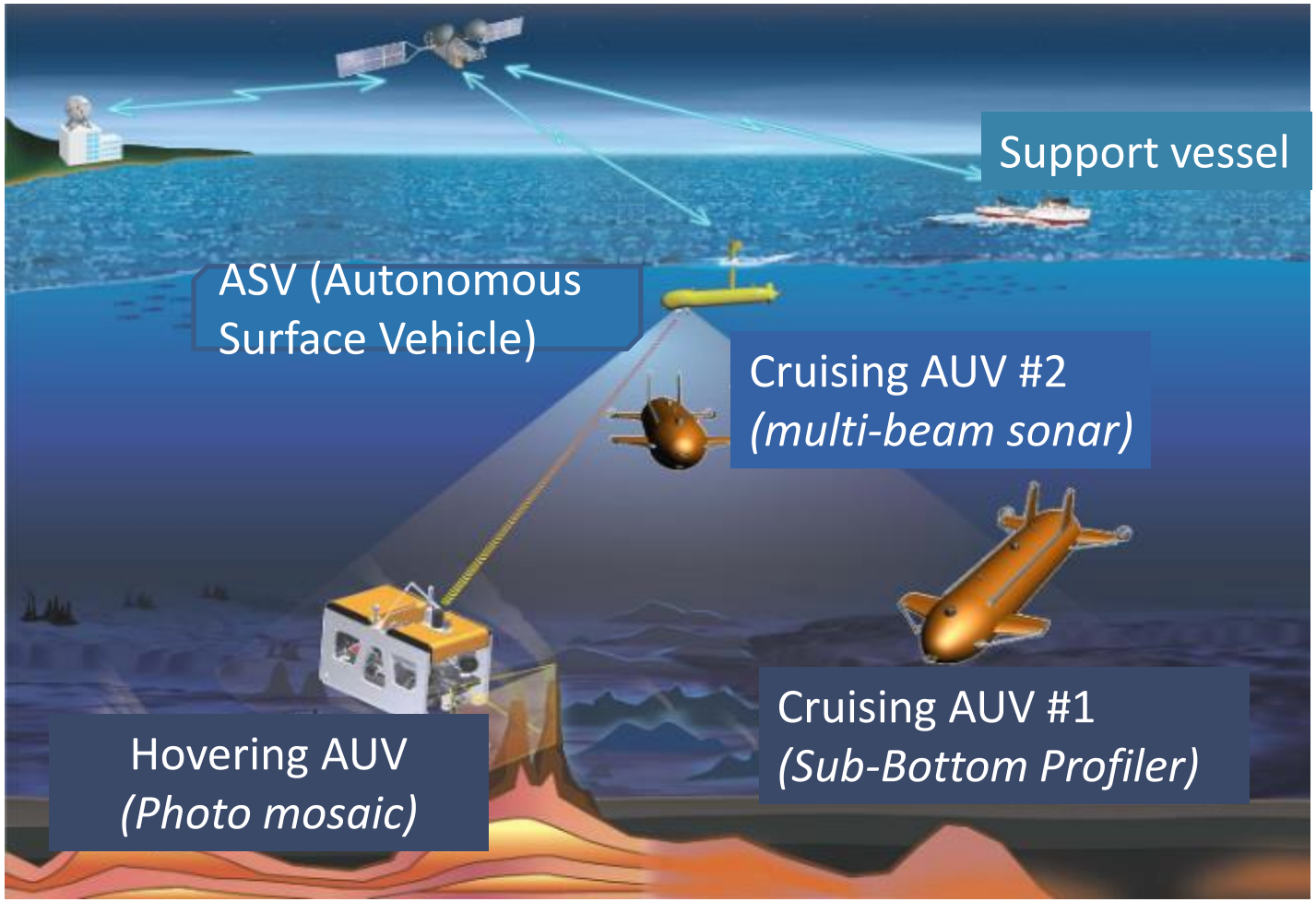



## Action Themes

1: Scientific research on the origin of sea-floor resources
2: Develop sea-floor resource survey technologies
3: Develop ecosystem survey and long-term monitoring technologies

(Source: T. Urabe, Keynote Lecture at Techno-Ocean Conference, Kobe, Japan, October 6th, 2016)

# Multi-AUV Operation in 2016; a key technology




**Enhance efficiency of exploration methods**

- High cost of vessel charter reduces the competitiveness of seabed exploration.
- Multi-AUV operation as platform for several different sensors is the key to solve the issue

(Source: T. Urabe, Keynote Lecture at Techno-Ocean Conference, Kobe, Japan, October 6th, 2016)

# Multi-AUV Operation supported by an ASV

(Sept. 26, 2016 in Uchinoura Bay, Izu (depth=90 meters)

- Semi-submersible ASV which was manufactured in middle 2016 has tested here for the first time
- The ASV was acoustically linked to these two AUVs, and chased / positioned both AUVs successfully



Barge & tugboats at Mitohama Pier

ASV (front) and two AUVs (back) of NMRI

(Source: T.Urabe, Keynote Lecture at Techno-Ocean Conference, Kobe, Japan, October 6th, 2016)

**Basic Law on Ocean Policy (2007)**

**Basic Plan on Ocean Policy 2008 &2013**

**(Cabinet Decision)**

**METI - ANRE**

**JOGMEC**

**Marine Energy* & Mineral Resources Development Plan**

**(Current Plan ; 2013 METI Decision)**

***Marine Energy, in this case ; Oil & Gas, Methane Hydrate and others.**

# Basic Plan on Ocean Policy (2013-2018)

## Extraction

### Principal Actions Under the Basic Plan on Ocean Policy

**Methane Hydrate**

- Build technologies toward achieving commercialization targeting at around FY2018
- Implement technological development in efforts to start a project led by a private company for commercialization in 2023-2027, taking the international circumstances into account.
- Conduct a broad-based distribution exploration concerning shallow methane hydrate that was discovered mainly in areas in the Sea of Japan side. (Underline by Nakahara)

(Source ; http://www.kantei.go.jp/jp/singi/kaiyou/kihonkeikaku/130426gaiyou_e.pdf)

## Polymetallic Sulphides

- Promote assessment of the amount of reserves of known mineral deposits, promote discovery of new mineral deposits and comprehension of the approximate amount of reserves, development of equipment technologies and environmental impact assessment methods related to mining and lifting, including actual offshore tests, expecting projects to be initiated aiming at commercialization with the participation of private companies in or after FY2023-2027. Push ahead with these actions in collaboration between the governmental and private sectors for making their results beneficial to private companies.

(Underline by Nakahara)

(Source ; http://www.kantei.go.jp/jp/singi/kaiyou/kihonkeikaku/130426gaiyou_e.pdf

# Cobalt-rich Crusts, Polymetallic Nodules and Rare Earth

- For Cobalt-rich crusts and polymetallic nodules, implement surveys on their amounts and research on production-related technologies in accordance with the regulations on exploration issued by the International Seabed Authority (ISA) . Especially for cobalt-rich crusts, draw up a specific development plan in consideration of the results of efforts concerning polymetallic sulphides.
- For rare earth, implement basic scientific surveys and studies for examining future potential as resources. Among other efforts, in about three years starting in FY 2013 conduct a survey on an estimated amount and abundance of rare earth reported to exist under the seabed.

(Underline by Nakahara)

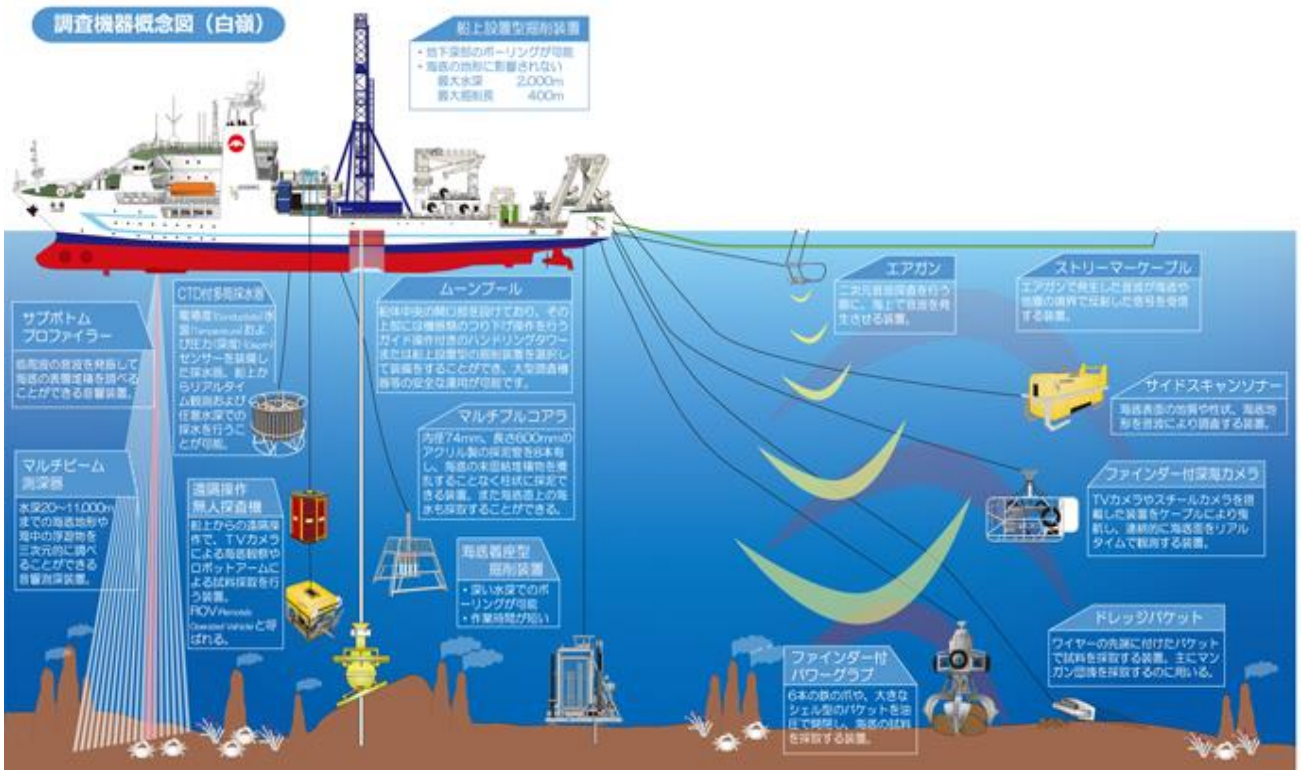
(Source ; http://www.kantei.go.jp/jp/singi/kaiyou/kihonkeikaku/130426gaiyou_e.pdf)

# JOGMEC

## *RV. HAKUREI*

Length : 118.3 m
Beam :19.0 m
Gross : 6,200 t

海底着座型掘削装置
（海底面下50mの 掘削が可能）




(Source : http://www.jogmec.go.jp/metal/metal_10_000005.html)

# Survey of sea-floor polymetallic sulphides

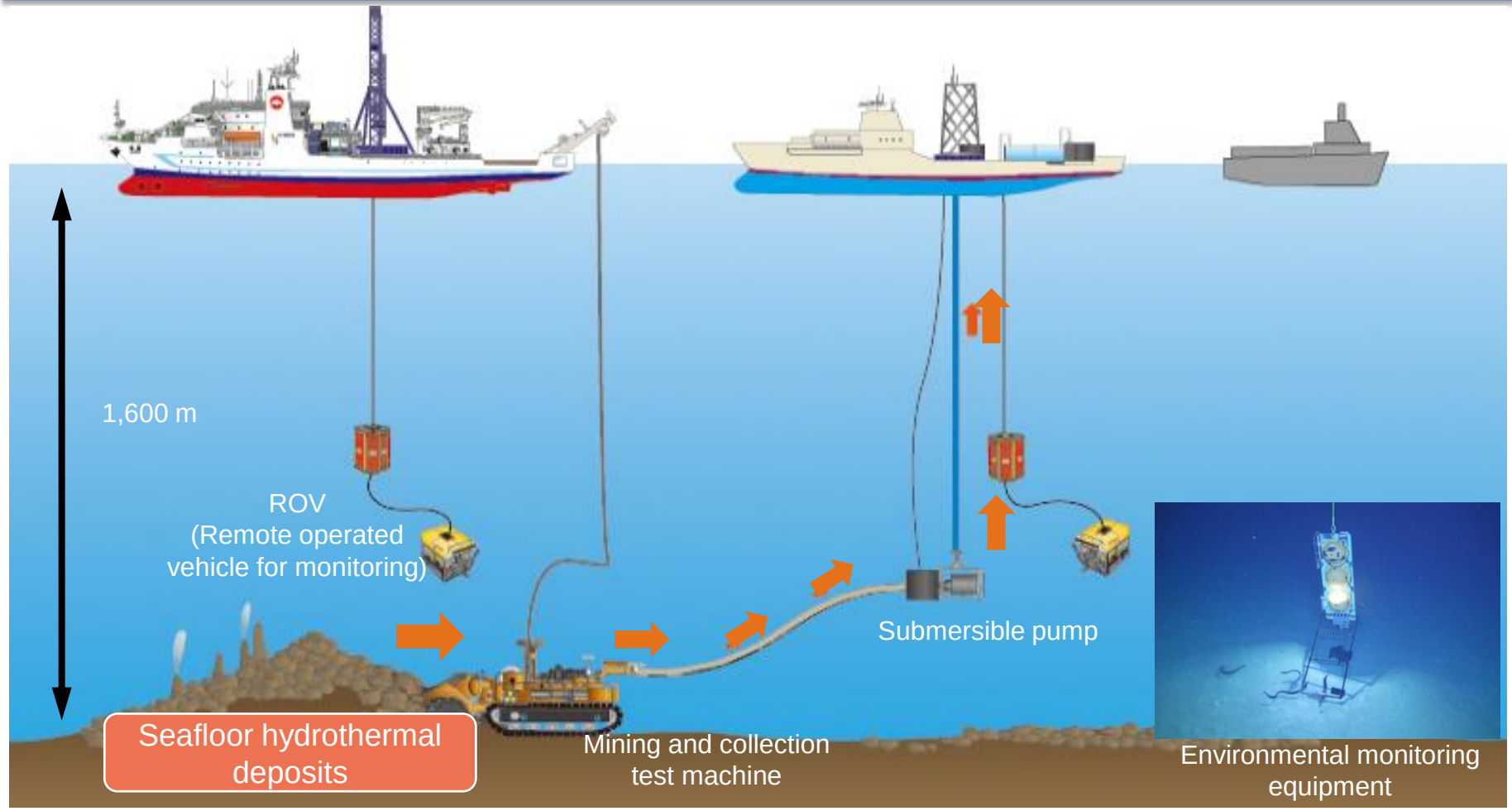
From 1985 to 2003, JOGMEC carried out surveys for polymetallic sulphides in the East Pacific Rise, the Okinawa Trough and the Izu-Bonin back-arc basin. JOGMEC has been performing resource assessment surveys since 2008. In 2012, JOGMEC conducted a deep drilling survey of sea-floor polymetallic sulphides in the Okinawa Trough using the marine resource research vessel **"Hakurei,"** and discovered a new, deeper ore body which could turn out to be a large-scale deposit.

In addition, JOGMEC successfully carried out the world's first crawl and mining test using a small test mining machine and has started to develop actual machines

(Source : http://www.jogmec.go.jp/english/stockpiling/metal_10_000002.html)

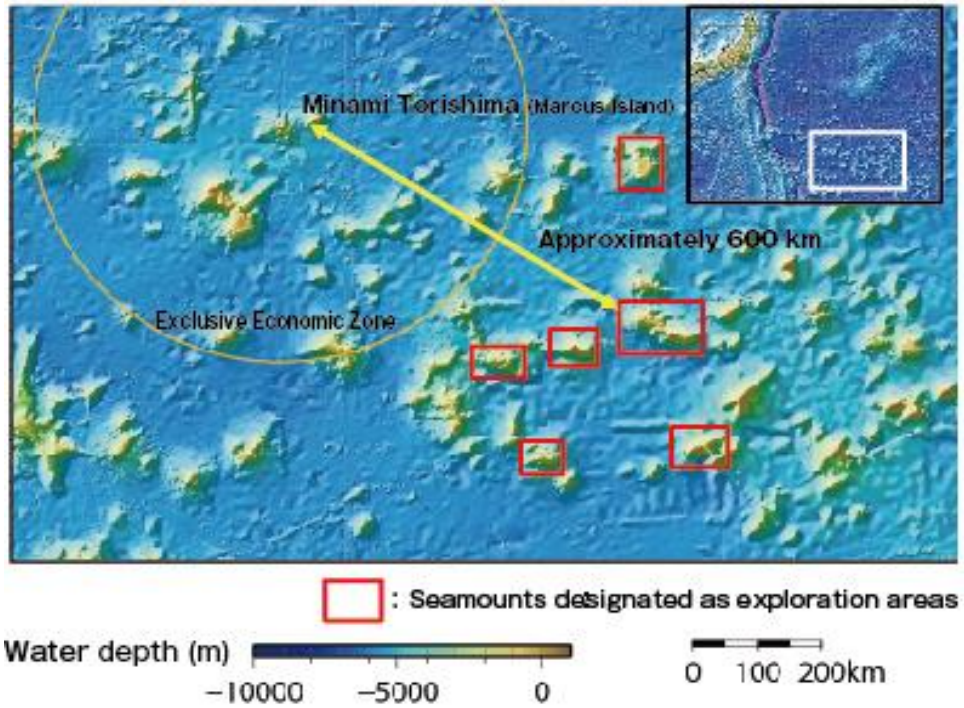
# Development of seafloor hydrothermal deposits

- In next year 2017, Japan will launch the world's first pilot experiment of mining and lifting from seabed hydrothermal deposits.
- It will be the first step toward commercialization of marine mineral resources development.



# Cobalt-rich ferromanganese crusts

Cobalt-rich ferromanganese crusts are similar to manganese nodules and consist of iron and manganese oxides. They cover the bed rock on the slopes and tops of seamounts, with thicknesses ranging from several millimeters to several tens of centimeters. The cobalt content of cobalt-rich crusts is roughly three times that of manganese nodules, and cobalt-rich ferromanganese crusts also contain small amounts of platinum.




Location map of exploration areas for cobalt-rich crusts

（Source：http://www.jogmec.go.jp/english/stockpiling/metal_10_000002.html9）

# Contract for Exploration between JOGMEC and ISA on Cobalt-rich Ferromanganese Crusts (Jan.27, 2014)

News Releases

**Signing a Contract for Exploration for Cobalt-Rich Ferromanganese Crusts with International Seabed Authority**
**－Conduct for 15 years exploration activity of rare metals mineral deposit contained cobalt, nickel, platinum and the like－**

PDF (337 KB)

Japanese Ver.

January 27, 2014

Japan Oil, Gas and Metals National Corporation (JOGMEC, President: Hirobumi Kawano) is pleased to announce that it has signed a Contract for Exploration for Cobalt-Rich Ferromanganese Crusts(※), in the high seas located approximately 600 kilo-meters offshore of south-east of Minami-Tori-Shima Island, with International Seabed Authority (ISA) who controls activities in mineral resources of the Area in the high seas in accordance with United Nations Convention on The Law of the Sea today.

According to this Contract, a 15-year exclusive right of the exploration right of Cobalt-Rich Ferromanganese Crusts is ensured and the contract enables JOGMEC to conduct exploration activity in the view of mining development of rare metals, such as cobalt, nickel, platinum of which Japan depends supply from overseas.

JOGMEC has been conducting studies of cobalt-rich ferromanganese crusts in the high seas of the Northwest Pacific since 1987, under consignment contract with Ministry of Economy, Trade and Industry (METI), aimed at understanding its resource potential.

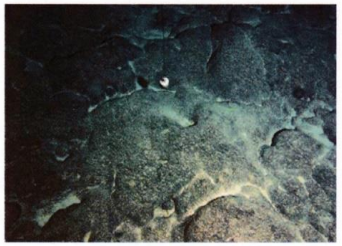
In July 2012, JOGMEC applied for a plan of work for cobalt-rich ferromanganese crusts at the same time of enactment of Regulations on Prospection and Exploration for Cobalt-rich Ferromanganese Crusts in the Area by ISA, and reached for signing the contract through making an adjustment with ISA after application approval in July 2013 by ISA.

The signing of the Contract for plan of work for Exploration for Cobalt-Rich Ferromanganese Crusts is the first case for ISA after enactment of the regulations in July 2012.

From now on, JOGMEC conducts actual exploration activity in order to understand resource potential and its possibility of development, in consideration of production technology and environment preservation.

(※) The Ferromanganese oxide mineral which contains cobalt, nickel, platinum and the like, and forms crust like shape on summit and slope of seamount. Its average thickness varies from a few cm to tens of cm in the depth from 1,000m to 2,000m.


**Signing Ceremony**
Signed by Nii Allotey Odunton, Secretary General, ISA and HirobumiKawano, President, JOGMEC
Midori Matsushima, State Minister of Economy, Trade and Industry ofJapan
(Ms. Matsushima joins as the witness)



Occurrence of Cobalt-rich crust
on summit of seamount

Image of Cobalt-rich crust
Cross-sectional

（Source: www.jogmec.go.jp/english/news/release/news_10_000014.html）

# Related Associations; Private Sector

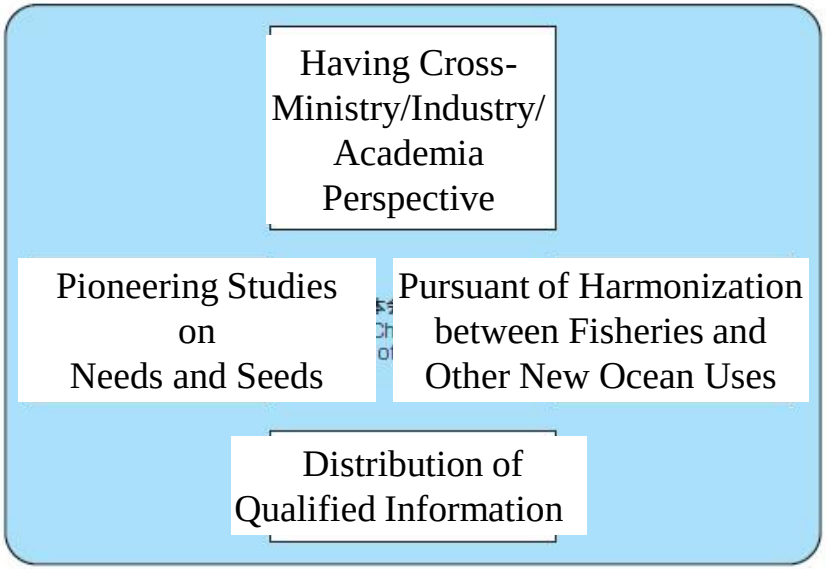
Major Organizations ; Ocean Resources Committee, KEIDANREN,
Shipbuilders' Association of Japan,
Japan Mining Industry Association, etc.,

## *Research Institute for Ocean Economics*

- Inaugurated in 1970 …….More than 45 years history
- Authorized as a public cooperation by MEXT, MAFF-Fisheries Agency, METI-ANRE, MLIT
- About 80 member companies, covering Steel, Shipbuilding, Dredging, Construction, Fisheries, Environment Survey and others,
- Playing a role of Secretariat of ***Ocean Mining Industry Promotion Round Table***

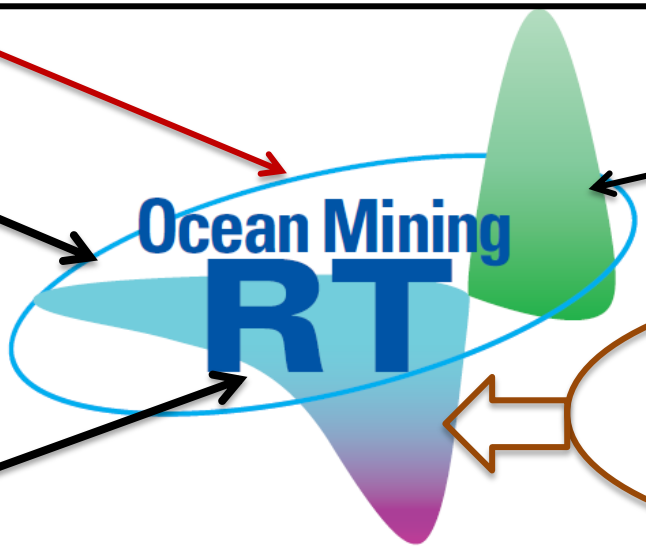
RIOE

Characteristics of RIOE



**RoundTable**

Organized in 2009.
55 members; 45 private companies, 6 associations and 4 Research institutions.




Other Related Industries

Mining Industry

Ocean Industry

Potential of Deep Sea Resources

海洋資源・産業ラウンドテーブル
Ocean Mining Industry Promotion Roundtable

## *Ocean Mining RT*

Purpose is to exchange information, to learn each other and to have better mutual understandings and, so as to promote deep sea mineral resource exploration and exploitation in sound manner

# Thank you for our attention.

***Hiroyuki Nakahara***

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