



The Future of  
**ECORD**

2013-2023

This document was prepared by Robert Gatliff, Catherine Mével, David McInroy, Alan Stevenson, Mireille Perrin and Gilbert Camoin

Published by Patricia Maruéjol  
February 2012  
ECORD Managing Agency - [ema@cerege.fr](mailto:ema@cerege.fr)  
<http://www.ecord.org>

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# **The Future of ECORD**

**2013-2023**



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*Opposite page, from left to right:*

*About 150 km of DSDP, ODP and IODP deep-sea cores are kept in the refrigerated store of the IODP Bremen Core Repository (A. Gerdes © ECORD/IODP);*

*The DP Hunter, drillship of the Tahiti Sea-Level Expedition operated by ECORD in 2005, berthed at Papeete, French Polynesia (D. McInroy © ECORD/IODP);*

*The ECORD Bremen Summer School on the Deep Sub-Seafloor Biosphere was held at Bremen University in 2008 and gathered 28 PhD students and young post-docs from Europe and the USA (Marum/GLOMAR);*

*The Greatship Maya, drillship of the Great Barrier Reef Environmental Changes Expedition operated by ECORD in 2010 (D. Smith © ECORD/IODP).*

## Executive summary

This document outlines proposals for ECORD's new phase as part of the Integrated Ocean Drilling Program, which from 2013 will be called the:

International Ocean Discovery Program (IODP)  
*"Exploring the Earth beneath the Sea"*

The Science Plan *"Illuminating Earth's past, present and future"*, which has been developed by the international scientific community, will be the guiding document for IODP. ECORD plans to focus on issues of particular societal relevance such as climate change, resources, geohazards and the exploration of the Arctic.

The new programme architecture will maintain an overarching international umbrella and an international scientific evaluation system, but will allocate more independence to the platform providers. This provides an excellent opportunity for ECORD to raise its profile at the European level as the mission-specific platform (MSP) operator.

ECORD is committed to operating MSPs within IODP and providing access to the international scientific community. ECORD scientists will continue having access to the *JOIDES Resolution* and to the *Chikyu*.

The new programme will have a simplified funding model that will provide better value-for-money than the current IODP programme. If the same level of funding is kept at the ECORD level (USD 21.4M), USD 14.2M will be allocated annually to the mission-specific platform (MSP) operations,

which would allow ECORD to implement an average of one expedition per year. This would allow for an average of one expedition per year. ECORD's rights will increase substantially compared to the current phase: a total of 600 berths distributed between all three drilling platforms will be allocated to ECORD scientists.

ECORD will expand the MSP concept to include other tools such as seabed drills and long piston coring. Whilst sub-seafloor coring will remain a key aspect, the new programme will allow ECORD's work to broaden to include the development of sub-seafloor observatories and new technologies.

To develop the programme, ECORD will seek co-funding on a project-by-project basis from research funds (e.g. the European Commission), non-ECORD countries and industry, plus additional funds from ECORD countries for specific projects.

ECORD's future endeavours will also utilise the European research fleet as MSPs for seabed coring missions and will develop links with other coring programmes such as ICDP and IMAGES.

ECORD will work towards the establishment of a "Distributed European Drilling Infrastructure" to strengthen co-operation between universities, institutes and SMEs that are developing/operating tools to investigate the sub-seafloor, and to help facilitate engineering development and provide a better service to the science community.







## 1 - Background

Since 2003, the European Consortium for Ocean Research Drilling (ECORD) has co-ordinated the European contribution to the international Integrated Ocean Drilling Program (IODP) with the initiation of the mission-specific platform concept. ECORD now has 18 member countries, with Poland as the most recent member. This document summarises how ECORD proposes to develop its contribution in the new phase of the programme, which is due to start in October 2013.

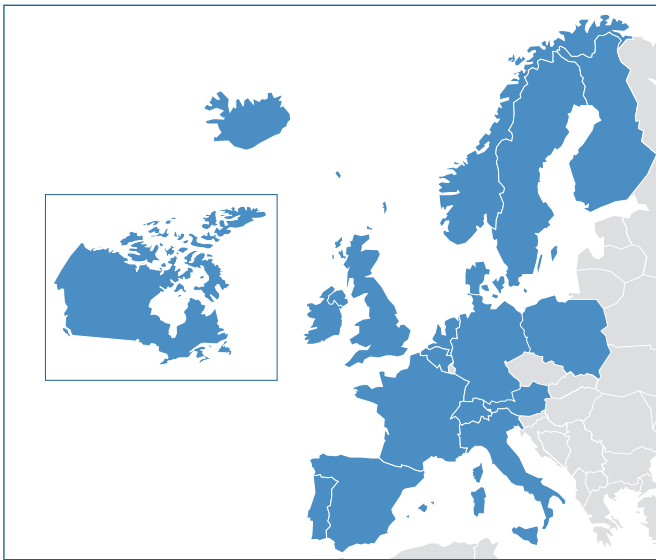


Figure 1: ECORD member countries

The set up of ECORD was facilitated by an EC-funded ERA-Net project (ECORD-Net, 2004-2008). The ECORD annual budget of ~21.4 M€ is currently supported exclusively by its 18 members, 17 European countries and Canada

(Figure 1). The level of contribution varies widely from USD 5.6 M for the major contributors (France, Germany and the UK) to USD 30,000 for the smaller contributors (Iceland, Belgium and Poland). ECORD joined IODP in 2004 as a “contributing member”, as which ECORD contributes USD 16.8 M to IODP commingled funds and supports mission-specific platform (MSP) operations within IODP. IODP membership provides scientists from the ECORD countries with the opportunity to participate in the programme’s strategic decisions and gives them access to the three types of drilling platform operated within IODP: the *JOIDES Resolution*, funded and operated by the US, the *Chikyu*, funded and operated by Japan, and the Mission-Specific Platforms (photo 1).

The 18 ECORD member countries will now decide on their level of participation in the new phase of scientific ocean drilling, renamed the “International Ocean Discovery Program” (IODP), “*Exploring the Earth beneath the Sea*”, which will start on October 1<sup>st</sup> 2013. In conjunction with its international partners’ timeline the ECORD Council has set up the following schedule for the programme’s renewal:

- The *IODP Science Plan for 2013-2023*, the *ECORD Evaluation Report* and the *Future of ECORD, 2013-2023*, will be submitted to all potential ECORD partners for the next phase in February 2012;
- Countries who intend joining ECORD for the next phase of IODP are requested to send an expression of interest by mid-April 2012;
- The new ECORD Memorandum of Understanding (MoU) will be developed mid 2012. The MoU will be signed by the

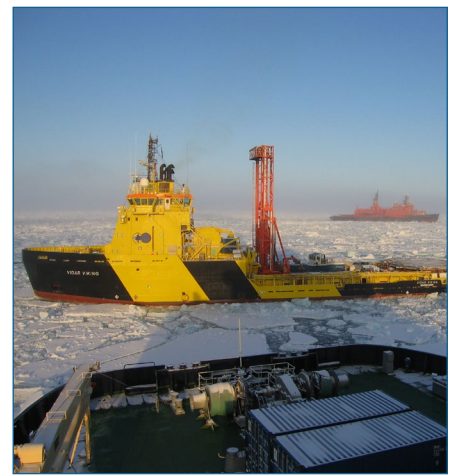


Photo 1: The three IODP drilling platforms. From left to right, the *JOIDES Resolution* (William Crawford, IODP/TAMU), *Chikyu* (©IODP/JAMSTEC) and the mission-specific platform the *Vidar Viking* used during the Arctic Coring Expedition in 2004 (D. McInroy ©ECORD/IODP).

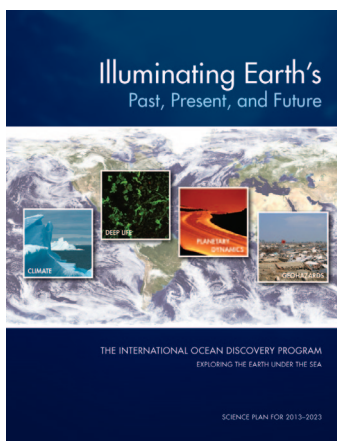
ECORD partners prior to the ECORD Managing Agency on behalf of the whole consortium. This is likely to occur at the end of 2012/beginning of 2013;

- To ensure planning prior to the start of the new phase, all potential ECORD members are requested to indicate levels of funding for the new programme during 2012.

Two documents, the 'Science Plan for 2013-2023' and the ECORD Evaluation Report, are already available. This document, "The Future of ECORD: 2013-2023" corresponds to the ECORD business plan and will be passed to the funding agencies.

The IODP Science Plan for 2013-2023 "Illuminating Earth's past, present and future" was developed by the international community during several workshops. The final conference, INVEST, brought together more than 600 scientists, engineers and decision makers from all around the world at the University of Bremen in September 2009. Consequently the resulting document is a community effort. The Science Plan is available at:

<http://www.iodp.org/Science-Plan-for-2013-2023/>



The Science Plan is wide ranging and includes a focus on the Arctic, the biosphere, Earth dynamics and a move towards observatories and repeated measurements. There are several options for focussing ECORD's resources, such as selections from the science plan that hold the highest science rankings, or areas

where MSPs can make the biggest impact. There are also options for Europe (ECORD) to deliver European strategic science objectives. This report highlights opportunities for European scientists, such as training of new scientists, development of new technologies, the advantages of joint programming and value for money, and the excellent opportunities for transferring research into knowledge and commercial development as part of a major European science infrastructure.

The ECORD Evaluation Report was prepared by an independent committee appointed by the ECORD Council. The report is available at:

[http://www.ecord.org/pub/ECORD\\_evaluation-report.pdf](http://www.ecord.org/pub/ECORD_evaluation-report.pdf)

It emphasises the accomplishments of ECORD within IODP both at the scientific level and the operational level (as the mission-specific platform operator).

The scientific output from the ECORD member country scientists has been prolific and of high quality, and is recognised by our global partners as an excellent contribution to the largest marine geosciences programme in the world.

From an operations and science point of view all four of the MSP operations have been tremendously successful.

Different platforms and drilling techniques have been used, and all have required high-cost commercial platforms. The challenge for the future is that we must also consider alternative cost-efficient scenarios, such as the use of research vessel with seafloor drills, and/or sequential drilling expeditions to reduce mobilisation costs.

The ECORD budget increased substantially when the Chikyu came into operation for IODP (in 2008) and has since remained static, at a level of USD ~21.4M. It is unlikely to rise substantially in the near future. The proposals presented in this document are based on the assumption that the ECORD budget will remain at the same level.

IODP is currently a superb example of a global programme, and ECORD has been one of the key players both at the science and operational levels. However, ECORD is currently perceived as essentially a European member of an international programme. Although it is important to maintain this role, it is now time to assess the potential benefits in operating a more autonomous ECORD structure. The new IODP model for post-2013 offers this opportunity. The new structure will maintain an international framework but will allocate more independence to platform providers. ECORD should therefore be in a good position to gain more visibility and to seek partnerships on an individual project basis.



## 2 - European marine science strategy and the IODP Science Plan

The *IODP Science Plan for 2013-2023* builds on the achievements of IODP and its predecessors (ODP and DSDP). Many of the IODP scientific goals are aligned to EU and ECORD member states' strategic scientific goals. Mission-specific platform operations have a clear role in Arctic research (*photo 2*), ocean bottom observatories, the biosphere, repeat measurements, resources and hazards. There are options for major MSP expeditions (*e.g.* Arctic drilling) in all of the above-mentioned areas. There are also opportunities for cheaper shallow-coring expeditions utilising shallow rock drills and mobile observatories, supported by the European research vessels or even possibly the world research fleet.



*Photo 2: The drillship Vidar Viking on station during the Arctic Coring Expedition (M. Jakobsson © ECORD/IODP).*

The EurOCEAN 2010 Conference in Ostend identified the priority of marine and maritime research challenges and opportunities in areas such as food, global environmental change, energy, marine biotechnology, maritime transport and marine spatial planning, including seabed mapping. The conference delivered an unequivocal message on the societal and economic benefits Europe derives from the seas and oceans, and of the crucial role that research and technology must play in addressing the Seas and Oceans Grand Challenge.

The conference also agreed to build on existing achievements and initiatives to address this challenge

in partnership with industry and the public sector. It also called upon the European Union and its Member and Associated States to facilitate this response by delivering several proactive and integrating actions, which are all addressed within the ECORD and IODP 2013-2023 plans: IODP bridges the boundary between the Earth Science and Marine Science research. This demonstrates a global commitment to addressing the key challenges that face Europe and the rest of the world.

Three key strategic areas are highlighted in the Ostend Declaration: scientific ocean drilling is clearly relevant to all of them. ECORD will contribute to the objectives underlined in the Ostend Declaration:

- **Joint Programming**

Develop an integrating framework that combines the assets of European programmes with those of the Member States to address the Seas and Oceans Grand Challenge, which includes the identification and delivery of critical marine research infrastructures.

*ECORD/IODP provides a unique infrastructure for access to the sub-seafloor.*

- **European Ocean Observing System**

Support the development of a truly integrated and sustainably funded "European Ocean Observing System" to (1) re-establish Europe's global leading role in marine science and technology; (2) respond to societal needs by supporting major policy initiatives such as the Integrated Maritime Policy and the Marine Strategy Framework Directive; and (3) support European contributions to the global observing systems. This could be achieved through better co-ordination of national capabilities with appropriate new investments, in coordination with relevant initiatives.

*IODP will lead on subsurface observatories, which will play a key role in Earth System Science and evaluating geohazards.*

- **Research to Knowledge**

Establish appropriate mechanisms to keep under review current marine and maritime research programmes and projects with a view to enhancing their impact by (1) exploiting the results of this research and (2) identifying existing and emerging gaps. This should be supported by a repository for the reports and findings of national and EU marine and maritime research projects, programmes and initiatives, with capacity for archiving, translating, analysing, reporting and developing integrated knowledge products to

facilitate policy development, decision making, management actions, innovation, education and public awareness.

*IODP has an excellent record of long-term, secure data archiving and free access to data to encourage strategic and wide use of the results. There are tremendous opportunities for the development of new technologies and the transfer of technology to the industry sectors within the proposed programme.*

The **IODP Science Plan for 2013-2023** addresses four major topics that are highly relevant to the society:

- Climate and ocean change: Reading the past, informing the future (climate sensitivity; ocean acidification; carbon cycle; polar ice sheets and sea-level change; climate variability and hydrology);
- The Biosphere: Co-evolution of life and the planet (records of the ocean biosphere; deep life; potential for biotechnologies);
- Deep Earth Processes: Renewing the Earth's surface; the reactive Earth's crust; recycling the crust;
- Earth in motion: Geohazards, fluid flow and active experimentation.

Within ECORD, the science community is quite diverse. Nevertheless, a focus on several specific scientific topics has been envisaged.

Undoubtedly, the Arctic will be a priority. Only mission-specific platforms can conduct scientific ocean drilling in these ice-prone high latitude areas and ECORD is committed to providing this access. With the outstanding success of the Arctic Coring Expedition (ACEX), which retrieved the first drill cores from the Arctic seabed under the ice pack (*photo 2*), ECORD opened the way to a more systematic investigation of the Arctic. It is essential to better understand the Arctic's role on the climate and global ocean circulation. In this context, a more comprehensive understanding of the history of the Arctic's sea-ice history is key. The ice is an indicator and agent of climate change, as it constantly affects the Earth's albedo, primary productivity and water-mass formation. We know that this process is linked with the tectonic evolution of the area, but it still needs to be constrained. The effect of global warming on the stability of gas hydrates trapped in sediments around the Arctic, and their potential climatic impacts, also needs to be assessed. The leadership of ECORD scientists has been clearly demonstrated. Several proposals are waiting to be implemented. ECORD has also taken the initiative to promote the collection of the necessary site-survey data.

Due to the increasing concentration of greenhouse gases in the atmosphere, global warming is affecting our planet at an unprecedented rate. Climate modelling is key to predicting the future. Ocean drilling contributes to the accuracy of models by providing real data from the past related to warm/cold periods, ocean acidification, and the melting of ice sheets and consequent sea-level rise. ECORD therefore has an obvious role to play in sea-level studies, which require shallow water drilling, through the use of MSPs (*photo 3*).



*Photo 3: Various sediment lithologies - from silty clay to coarse-grained sand - recovered at different depths during the New Jersey Shallow Shelf MSP Expedition (© ECORD/IODP).*

The discovery of the deep biosphere, which extends at least 1600 m below the seafloor, is one of the major outcomes of scientific ocean drilling, and ECORD scientists are at the forefront of this completely new field. An inventory of the organisms is still to be made. The potential that the activity of these organisms has on global geochemical cycles is still to be appreciated. Moreover, the adaptation of these unique microbial communities to extreme conditions may lead to new biotechnologies.

Furthermore, significant resources (hydrocarbons, metals, gas hydrates) remain buried beneath the seafloor. Reaction between seawater and the mantle leads to the production of hydrogen, a potential avenue for alternative energy. The sub-seafloor potentially provides an environment for CO<sub>2</sub> storage, but experimentation is still required to assess the possible environmental consequences.

Situated at the point of collision between the African and European plates, the Mediterranean Sea is the most tectonically active area of Europe. Europe's history holds

records of numerous devastating geohazards, including earthquakes, tsunamis and volcanic eruptions. The deployment of borehole instruments is fundamental to the understanding of these events. The sea completely dried out ~6 M years ago, leading to the deposition of a ~1km thick layer of salt. This extreme environment potentially hosts unique organisms, and is also enriched in important chemical elements such as lithium. The terrains beneath the salt are still unknown but have great potential for resources.

ECORD's main focus in IODP 2013-2023 will be to both maximise the scientific excellence of the programme and ensure the high impact of science and engineering innovations, collaboration and technology transfer. ECORD will ensure that within the science programme, high priority is given to the ECORD member countries' relevant strategic science with socio-economic impacts. At the European level, drilling is an important component of the EC-funded Deep Sea and Sub-Seafloor Frontier (DS<sup>3</sup>F) project. DS<sup>3</sup>F is currently developing a white paper that will integrate scientific drilling with other approaches in the deep sea's investigation. It is expected that both at the scientific and technological level, the ECORD and DS<sup>3</sup>F priorities will be in line with the new HORIZON 2020 EC framework that starts in 2014.

### 3 - ECORD within the IODP

#### 3.1 - The new IODP architecture and management system

The new programme architecture and management system (See Annex 1) was developed by IWG+ (International Working Group +), a committee composed of representatives from all IODP funding agencies. It was recognised that the current system is not satisfactory in terms of money flow and the science advisory structure (SAS). Discussions led to proposals for a system that will be more flexible and allocate more independence to the platform providers.

The new framework is summarised in Figure 2. The major points are:

- The IODP Forum will be the overarching international umbrella of the programme. All funding agencies contributing to the programme will be represented. The IODP Forum will develop a long-term strategic view. The Chair of the Forum will be a well-recognised senior scientist, who will be the face of the programme, interact

with other international science initiatives, and promote the programme internationally.

- The international Science Advisory Structure (SAS) will evaluate all proposals for all platforms. It will be assisted by a "Support Office" that will help to deal with the proposals. The future SAS will have a simpler structure than that of the current programme.

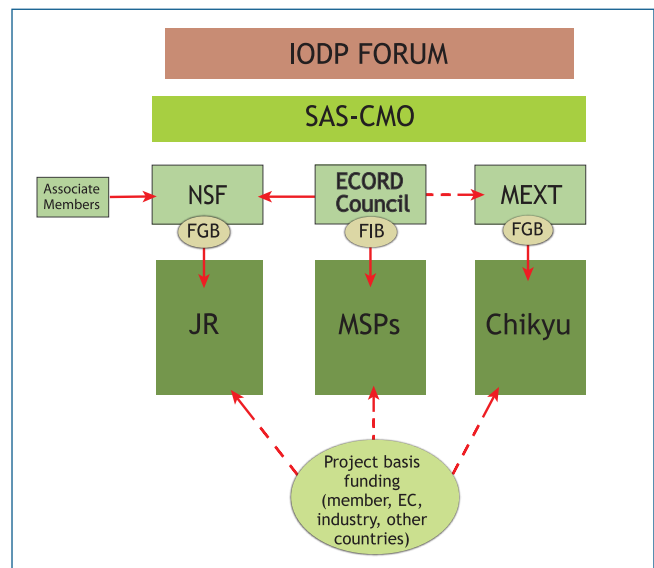


Figure 2: The new framework for scientific ocean drilling. SAS: Science Advisory Structure, CMO: Central Management Organization, NSF: National Science Foundation (US), MEXT: Ministry of Education, Culture, Sport, Science and Technology, JR: JOIDES Resolution, MSPs: Mission-Specific Platforms, FGB: Facility Governing Board, FIB: Facility Implementation Board.

- Platform providers will be completely responsible for funding the operations, and will in turn have more independence. Each of them will rely on its own board, the Facility Governing Board (FGB) in the case of NSF and MEXT, and the Facility Implementation Board (FIB) in the case of ECORD, to schedule their platforms based on the positively evaluated proposals forwarded by the SAS. The ECORD "FIB" will include leading scientists, representatives of the funding agencies, the ECORD Managing Agency (EMA) and the ECORD Science Operator (ESO).

- The programme will have the flexibility in its funding sources to allow it to seek additional funding from industry, the EC or other countries. Funding from IODP members on a project basis will be also encouraged and facilitated.

To secure a viable business model and allow the JOIDES Resolution to operate up to 12 months per year (as opposed to the current 8 months), the NSF will seek international

contributions through a membership fee. The ECORD Council has already agreed to contribute to the JR funding (see 3.2, page 12). Several of the current associate members of IODP have also indicated that they will seek membership of the new programme through NSF.

Access to the *Chikyu* will be possible through a berth-exchange mechanism (with the *JOIDES Resolution* and MSPs respectively). MEXT is also planning to develop a membership model for other countries, with a minimum fee of USD 250,000. However MEXT will also seek financial contribution on an individual project basis. For example, if the *Chikyu* implements a project of particular interest to ECORD, specific additional funding will be requested by MEXT.

Access to the MSPs will be offered to non-US *JOIDES Resolution* Members and Associate Members. Exact participation levels are to be defined in the Annex of the MoU signed between ECORD and the NSF. Additional places may be offered through an exchange mechanism. Monitoring of the exchanged berths will be the responsibility of the PMOs in coordination with the IOs.

NSF has indicated that it will fund the “Support Office” from its members’ contributions to the JR. Most of the functionalities (and associated costs) currently covered by IODP-MI will be transferred to the Implementing Organisations, and will therefore have to be covered by the platform providers.

### 3.2 - New financial model for ECORD

The current annual funding for ECORD is ~USD 21.4M (Table 1). However, as specified in the Memorandum signed between ECORD, NSF and MEXT, in the current system most of the ECORD budget is used to contribute to the commingled funds (USD 16.8M).

In the new organisation, ECORD will be a more independent platform provider and will be able to keep a larger portion of its budget, which would allow more MSP activities.

ECORD’s annual expenditure is calculated based on the following points:

- (1) The ECORD Council has negotiated with the NSF to

Austria	100,000	Italy	100,000
Belgium	30,000	The Netherlands	400,000
Canada	500,000	Norway	1,100,000
Denmark	170,000	Poland	30,000
Finland	66,380	Portugal	90,000
France	5,600,000	Spain	762,000
Germany	5,600,000	Sweden	528,000
Iceland	30,000	Switzerland	560,000
Ireland	140,000	United Kingdom	5,600,000
Total (US\$)	21,406,380		

Table 1. ECORD Budget 2012 in USD.

contribute USD 6 M per year to the *JOIDES Resolution* funding, provided that the vessel implements at least 4 expeditions per year (currently 8 months). At this level of contribution, ECORD will be allocated 8 berths on every *JOIDES Resolution* expedition. If, due to a drop in the total ECORD budget, this amount represents more than 33%, it will have to be revisited. ECORD will not contribute independently to the “Support Office”. This will be covered from the funds pooled at NSF.

(2) In the new framework, some of the current activities supported from the IODP-MI budget will have to be covered from the ECORD budget. This corresponds essentially to the full support of the IODP Bremen Core Repository (BCR) and to the publications resulting from MSP expeditions. Additional minor costs (such as the support of the Facility Implementation Board for MSPs, increased outreach responsibilities, the support of the Magellan+ Programme) will slightly increase the EMA budget.

(3) The ECORD Council has agreed to allocate a small budget to facilitate the relationships with MEXT and in particular to help develop drilling proposals for the *Chikyu*.

(4) ECORD will not contribute systematically to *Chikyu* operations, but may decide to do so for a specific project of particular interest, at a maximum level of USD 10M.

Table 2 shows that if the ECORD total annual budget remains at USD 21.4M, an amount of USD 14.2M will be available annually for the ECORD Science Operator (ESO), responsible for implementing MSP operations. However, due to the very difficult economic situation in most European countries, the total budget may decrease. At a total funding of USD 20M, there will still be USD 12.8M available for ESO. In both cases, the amount is about three times more than the current budget (~USD 4.2M).

Total ECORD budget (USD M)	21.4	20.0
<b>Fixed costs</b>		
Contribution to NSF (JR operations)	6.00	6.00
Support of the BCR	0.35	0.35
MSP-related publications*	0.15	0.15
EMA**	0.35	0.35
ESSAC	0.25	0.25
ECORD/Japan interactions	0.10	0.10
<b>Total fixed costs</b>	<b>7.2</b>	<b>7.2</b>
<b>Annual budget for ESO***</b>	<b>14.2</b>	<b>12.8</b>

Table 2. ECORD annual expenditure (USD M).

\* MSP-related publications are currently handled by the USIO and funded by IODP-MI. The USIO has agreed to continue providing this service at an annual cost of USD 0.15 M.

\*\* The current budget of EMA has been increased to include additional outreach activities (currently covered by the IODP's commingled funds) as well as the support of the Magellan+ programme at an annual level of € 50,000.

\*\*\* ESO estimates annual non-platform costs to be ~USD 2.4 M.

Estimates prepared by ESO for 2014 vary depending on the logistical constraints:

- An Arctic expedition (with support ice breakers) is estimated to cost in the order of USD 16M
- For a standard expedition in other areas, costs are estimated to be about USD 11M.
- The cost of operating a seabed drill expedition using a research vessel is estimated at USD 3M plus in-kind platform contributions.

Note that the ESO estimates include costs for preparing projects, supporting IODP meetings and contribution to the IODP Bremen Core Repository (BCR) costs.

Estimating how this cost will evolve over the 2013-2023 period is a real challenge. This will obviously depend on general inflation, but mainly on oil price and availability of platforms on the market. Average annual costs over the 10-year period can be roughly estimated to USD 19M for an Arctic MSP, USD 13M for MSP expeditions in other areas, and USD 3.5M for a Research Vessel/seabed drill MSP operation.

Table 3 shows that within the current budget, it will be possible to implement at least one MSP projects per year, provided that it is a mix of expensive (e.g. Arctic) and cheap (seabed drills) expeditions.

The table also shows that, if the same level of budget is maintained, ECORD will be in the position to implement at least one MSP expedition per year. However, given the difficult economic situation in Europe, the total ECORD budget may decrease at least temporarily. This would have serious implications on the number of MSP expeditions that can be implemented. In addition, the opportunities for technological development necessary to keep ESO at the forefront may also be affected.

Moreover, if the Chikyu implements a project of specific interest to ECORD (for example in the Mediterranean Sea or the North Atlantic), MEXT will request a financial contribution up to a maximum of USD 10M. This would result in one less MSP expedition.

ECORD income (USD M) over 10 years (annual budget = 21.4M)		214	
Budget available for ESO (USD M) over 10 years (annual budget = 14.2M)		142	
MSP Options	Average cost	No. of expeditions	Total cost
Arctic	19.0	4	76
Non-Arctic	13.0	4	52
RV with seabed drill	3.5	4	14
<b>Total over 10 years</b>		<b>12</b>	<b>142</b>

Table 3. Evaluation of the costs of combining various MSP expeditions over 10 years.

However, the new structure allows ECORD to seek additional funding on an individual project basis, an avenue that needs to be further explored and publicised (see 3.4, page 14).

In January 2012, the NSF indicated that it is currently predicted to have a shortfall in budgets within the JOIDES Resolution funding mechanism. Using the figures provided by NSF, the cost of running the JOIDES Resolution for 8 months is approximate USD 65M. The shortfall in the NSF budget is USD 15M. The NSF has indicated that the current additional member contributions, including USD 6M from ECORD may be about USD 2.5-USD 3M short. An additional USD 9M would be required to run the JR for 10 to 12 months. Whilst ECORD will plan for at least one MSP per year, it is recognised that if some MSP operations are less expensive, such as in the case of the use of research vessels and seafloor

drills, surplus funds may be made available to support the *JOIDES Resolution*.

### 3.3 - Benefits to the ECORD science community

The current IODP phase is almost finished and we now have a good estimate of the rights allocated to ECORD over the next 10 years. The *Chikyu* started operating for IODP only in 2008, for an average of 5 months per year. The complete renovation of the *JOIDES Resolution* resulted in a long gap in drilling. The current funding allows for the implementation of only 4 expeditions per year. The MSP operations turned out to be more expensive than initially thought and therefore at the end of the 2003-2013 period only 5 expeditions will be completed. At the beginning of IODP, ECORD was able to negotiate the very good deal of 8 berths on every expedition. At the end of the programme, it is estimated that ECORD will have been allocated a total of 384 berths (to be confirmed): 240 on the *JOIDES Resolution*, 40 on MSPs and 104 on the *Chikyu*. Co-chief Scientists are currently counted in the country quota, therefore within the contingent of 8 berths.

The new scheme will provide more benefits to the ECORD science community. Each MSP expedition will have about 28 berths (this includes the whole science party, those involved in the offshore part plus those only included in the onshore part at the IODP Bremen Core Repository)

- (1) ECORD will exchange 8 berths on the *JOIDES Resolution* with 8 berths on MSPs for US scientists
- (2) A portion of the remaining 20 MSP berths will be made available to members of the JR/NSF consortium. Exact participation of these members will be defined in the MoU annex. Another set of berths will be bartered with *Chikyu* berths (with scientists from Japan)
- (3) The remaining berths will be for ECORD's scientists, except for the co-funded projects where some additional berths may be provided to the relevant funding agency.

This mechanism will continue to guarantee that ECORD scientists gain access to all three platforms. But compared to the current system, it has the advantage of keeping in hand at the ECORD level a large number of berths and therefore provides room for some flexibility in the staffing. This is particularly important in the case of co-funded projects.

*Table 4* shows the total number of berths available for ECORD's scientists during the 2013-2023 period. It is calculated with the assumption that the *JOIDES Resolution* will implement 5 expeditions per year (although note that NSF's objective is to have 6 expeditions per year, which would further increase the benefit to ECORD).

	<i>JOIDES Resolution</i>	MSPs*
Per expedition	8	20
Per year	40	20
Over 10 years	400	200
<b>Total</b>	600	

*Table 4. ECORD rights for berths during the 2013-2023 period.*

\* A portion of the MSP berths will be bartered against *JOIDES Resolution* berths and *Chikyu* berths.

Moreover, in the new scheme, it has been agreed at the international level that the Co-chief Scientists will not be counted in the country quotas, as an acknowledgement of their intellectual contribution to the programme. ECORD can therefore expect about 40 additional berths for Co-chief Scientists distributed between all three platforms. In addition, ECORD will be represented in the SAS panels and committees. Clearly, this new organisation is beneficial to ECORD scientists.

### 3.4 - Potential sources of additional funds for ECORD

To increase its drilling activity and become more visible within Europe, it is envisaged that ECORD could play an active role in seeking additional funds. The possible avenues for new funding sources include:

- ECORD funding for each MSP operation could take the form of a grant, which may or may not cover the full cost of the expedition. In cases where the proposal is considered to have value to e.g. industry, the proponents could be encouraged and helped to seek co-funding from commercial sources. A similar model could draw on EU funding if the scientific objectives fitted with calls for support by the European Commission. Along with the support of the ECORD Industrial Liaison Panel, ECORD has begun a new dialogue with the oil industry, specifically to investigate possible co-funding for future Arctic expeditions. However,



there are implications for these new co-funding models that need to be considered. If proponents are requested to seek additional funds, then they may be allocated more rights on participation. In the International Continental Scientific Drilling Program (ICDP), the Principal Investigator has the decision on the science party, and a hybrid system could be implemented for co-funded projects. Countries that provide additional funding for a specific project may also require additional places on the relevant expedition. This will be made possible by the flexibility that ECORD will have for the allocation of berths on MSPs (see 3.3, page 14).

The **ECORD Industrial Liaison Panel (ECORD ILP)** was created in 2009 by expanding the long standing UK ILP to all of ECORD. It acts as a link between academia and industry, forging and fostering mutually beneficial relationships. The panel mainly consists of representatives from interested industries (the UK, Europe and wider international). As a first step, the ECORD ILP has decided to focus on the Arctic, acknowledging that it is one of the last frontiers, and of common interest to academia and industry.  
<http://www.ecord.org/ecord-ilp.html>

- ECORD has made efforts to attract new national partners from e.g. Baltic countries and Russia. This resulted in Poland joining ECORD in 2012. Positive contacts were also made with Israel in 2011. However, in the current economic situation the prospects of attracting new partners seems unlikely. A model in which co-funding could be sought where there could be national interest on an individual expedition basis could be considered, e.g. an MSP expedition in the eastern Mediterranean could be supported by non-ECORD countries in that region. In Africa, there are few funds available to allocate to basic research. ECORD's long-term efforts to encourage Russia to join the consortium have so far been unsuccessful, but this effort will be renewed with a focus on Arctic research. Project-specific contributions are considered to be the approach with the most likely chance of success.

- ECORD member countries might also be interested in providing additional funds for a project in which they have a particular interest. For example, Canada has indicated that they could contribute more funds to Arctic drilling expeditions.

- In-kind contributions could be sought from ECORD (or non-ECORD) members, such as the provision of research vessels.
- Funding for technology development from national, European and commercial sources could be encouraged.

Being successful in attracting funding from new sources would increase the ECORD budget and allow more activities. To ensure scientific excellence, all projects implemented by ECORD will need to be positively evaluated by the international SAS. Implementing these projects will require some discussions on a case-by-case basis, regarding the rights and obligations of the third party. Some expeditions might be implemented under the "Complementary Project Proposal" scheme, that was introduced during the current phase of IODP. If the third party contributes a substantial portion of the platform costs this scheme would allow for the fast tracking of proposals. In any case, it will be important to maintain the current IODP data policy of core storage and free data access (after the moratorium period), but otherwise proposals to seek co-funding could provide additional key support.

## 4 - Developing ECORD for the new programme

### 4.1 - Revised ECORD structure

ECORD was created in 2003 to join the international IODP programme as a single member, however this did not allow the consortium to have a particularly high level of visibility at European level. The new framework of the International Ocean Discovery Program Program gives more independence to the platform providers and so an excellent opportunity to raise ECORD's profile and better serve the community in Europe and Canada.

More independence at the consortium level, and in particular in the implementation of MSP expeditions, will require broadening the successful parts of ECORD (the Council, EMA, ESO, ESSAC), and adding a "Facility Implementation Board" to have an overview of the scheduling of MSP expeditions. Options that provide new skills and integration across a wider scientific community could provide additional scientific challenges and open new sources of funding. It is

proposed here that a similar structure for ECORD, consisting of the Council, EMA, ESO and ESSAC (Figure 3) should be maintained for the new phase of IODP, but with modified

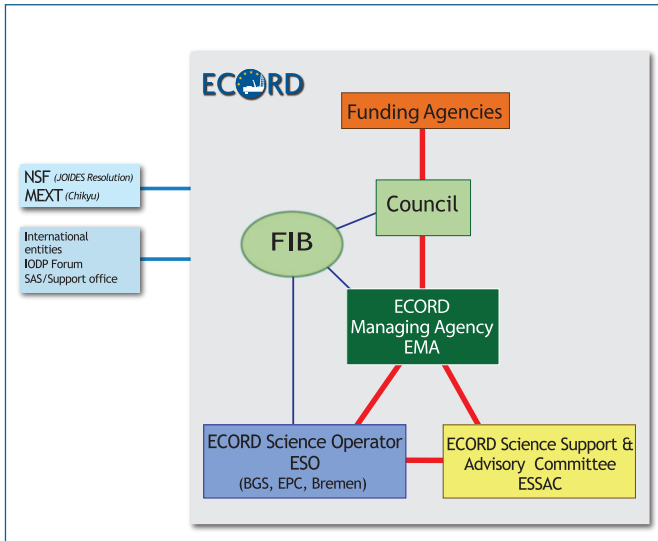


Figure 3 : Proposed ECORD structure. FIB: Facility Implementation Board.

NSF: National Science Foundation (US), MEXT: Ministry of Education, Culture, Sport, Science and Technology, SAS: Science Advisory Structure, BGS: British Geological Survey, EPC: European Petrophysics Consortium, FIB: Facility Implementation Board.

membership and roles to account for the new international framework. The ECORD Council has already agreed to extend the current mandate for EMA (managed by CNRS in France) and ESO (managed by the BGS in the UK) until 2016, to ensure a smooth change-over during the IODP renewal process. After that three-year transition period, these responsibilities will be opened to competition if necessary. The Facility Implementation Board (FIB) for MSPs will also need to be set up. Details on proposed changes for all ECORD entities are given below (see chapter 5, pages 18-20).

#### 4.2 - Expanding the concept of MSPs

The vision in 2003 for IODP included drilling barges, jack-up rigs and seafloor drilling systems. So far, the four MSPs expeditions have required one drillship, with support vessels (ice breakers), two independent drillships and one liftboat (jack-up) (photo 4). Initially, the Lead Agencies of IODP (US and Japan) wanted to restrict the technology used to conventional drilling, from a vessel or a jack-up rig. The intent was to clearly separate the international

programme’s goals from what can be achieved at a national level. However, this position has evolved with time. ESO is currently scoping a highly ranked proposal that specifically requests the use of a seafloor drill for technical reasons (preservation of the upper 50cm). In the future phase of IODP, the wider use of seafloor drills can therefore be envisaged, although there are still technological issues regarding fulfilling the science objectives when using seafloor drills. Most of the ranked projects are focussed on deeper targets beyond the reach of seafloor drills, which currently have a range of about 50-100m sub-seabed.



Photo 4: The liftboat Kayd, drilling vessel of the New Jersey Shallow Shelf Expedition (E. Gillespie © ECORD/IODP).

Wireline logging systems are still under development for these drills, and new design concepts can make use of other sensors (e.g. temperature, chemistry, fluid sampling in pre-drilled holes etc.). The availability of suitable winches for operating seabed systems from research vessels is also limited. Investment in ECORD infrastructure and technology development is likely to be cost effective and allow for the successful completion of more technically challenging scientific objectives.

Seafloor drills provide an excellent option for cost-effective drilling for several aspects of the newly emerging science plan (e.g. resources, biosphere, fluid flow). This technology also provides the opportunity to core multiple holes giving more extensive lateral sample density, compared with the results of previous IODP missions, at a relatively low cost. There is therefore a strong case to support development of these technologies by ECORD.

Long piston coring is another commonly used technique to sample the sub-seafloor. It is the tool used by the IMAGES (International Marine Past Global Change Study) community to investigate the past climate change that has taken place mainly during the last glacial cycles. Discussions are currently ongoing with the IMAGES programme to investigate the possibility of operating long piston coring as MSP facility within the framework of IODP. Involving this community within the programme would be greatly beneficial as there is clearly some overlap between the scientific goals of IMAGES and IODP.

MSPs provide the only means for major drilling programmes in the Arctic Ocean and shallow-water environments. The use of a wider range of mission-specific technologies further complements the science that can be achieved by the *JOIDES Resolution* and *Chikyu*. There are discussions at the European level to build a new scientific icebreaker, the *AURORA BOREALIS* equipped with permanent drilling capabilities, or a similar ice-breaking scientific vessel. Even though the *AURORA BOREALIS* project has been postponed for the moment, an icebreaking research vessel would be a great asset for an MSP drilling mission to the Arctic.

### 4.3 - Towards a "Distributed European Drilling Infrastructure"

Investigating the sub-seafloor clearly goes beyond drilling and coring, and requires a concerted approach with other initiatives. ECORD proposes a dynamic approach to developing and utilising new technologies in the new programme. The aim is to develop a network between all the existing centres that operate and/or develop tools that investigate the sub-seafloor. A workshop, funded through the EU "Deep Sea and Sub Seafloor Frontier" (DS<sup>3</sup>F) project, was held in February 2011. It supported this concept as well as the goal of focussing on the efficient use of resources across Europe to support collaboration, innovation and development of new technologies. At this workshop, the strong expertise disseminated in various European Institutes, Universities and SMEs was recognised. The development of this network would help to operate tools with a concerted approach to maximize access to the scientists, but would also facilitate the improvement

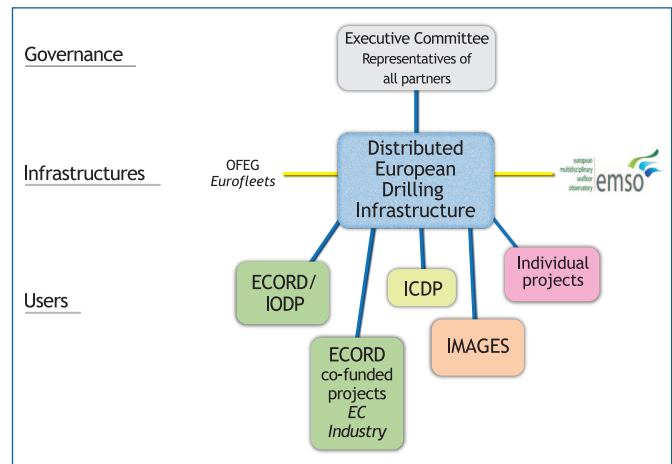


Figure 4 : An outline model for the Distributed European Drilling Infrastructure.

OFEG: Offshore Facility Exchange Group, ICDP: International Continental Scientific Drilling Program, IMAGES: International Marine Past Global Changes Studies , EMSO: European Multidisciplinary Seafloor Observatory.

of existing technologies through the sharing of knowledge and experience.

Based on the outcomes of the DS<sup>3</sup>F workshop, ECORD proposes to work towards the establishment of a "Distributed European Drilling Infrastructure" focussed on sub-surface sampling and observing systems. ECORD would work closely with ICDP, the European seafloor coring community and the piston coring community. The aim is to develop an integrated approach to technology development and usage – by IODP, and other affiliated research programmes and projects such as ICDP, IMAGES, the European Commission and nationally-funded research programmes of member countries. Such an infrastructure could attract additional funding from the EU and would provide a vehicle for additional cost-effective use of technology and people across Europe. Figure 4 summarises an outline model for such a "Distributed European Drilling Infrastructure".

The "Distributed European Drilling Infrastructure" would provide access to all of the facilities distributed across Europe in various Universities or Institutes. The governance would rely on an Executive Committee in which all the partners would be represented. The infrastructure would obviously have links with other related initiatives at the European

level, such as EMSO for the observatory component and OFEG (Ocean Facility Exchange Group), as well as the EC-funded project Eurofleets, which would facilitate access to ships. Other possibly relevant EC-supported initiatives are the EMBRC (European Marine Biological Resource Centre) that has already shown interest for the deep biosphere, as well as SeaDataNet for access to data.

The users are expected to be fully organised communities via existing programmes such as ECORD/IODP, IMAGES or ICDP. However, individual scientists could also require the use of specific tools to develop their research.

Establishing the “Distributed European Drilling Infrastructure” would provide several key benefits:

- to share experience and capability;
- to avoid duplication;
- to help seek joint funding for new technological development;
- to attract SMEs and larger companies;
- to optimise the use of research vessels and sampling capabilities;
- to develop links between key institutions in several European countries;
- to provide capabilities for sustainable use of samples and data;
- to provide training for younger generations;
- to help develop international links.

Contacts have already been made with several possible nodes in Europe and the feedback is very positive. Besides the current ECORD Science Operator partners (BGS, MARUM at the University of Bremen, University of Leicester, University of Montpellier and RWTH Aachen University), IPEV (Institut Paul Emile Victor) and GFZ Potsdam have expressed interest. Discussions are ongoing with other potential partners. When advanced, this project will seek recognition from the European Strategy Forum on Research Infrastructures (ESFRI) committee to gain visibility and support.

Obviously, a higher level of funding would favour the activities of the infrastructure. In particular, it would allow technological development to keep Europe at the forefront in areas of excellence, such as seabed drills, long piston coring, high temperature tools, and pressure sampling, among others.

## 5 - Additional proposed changes to ECORD

### 5.1 - The ECORD Council

A recent change to the ECORD Council has provided more continuity to the executive group, by extending the Chair’s term to one year, with further continuity provided by an incoming designated Chair and the outgoing Chair. The workings of the ECORD Council members representing the funding agencies provide the overview of how the European contribution is used. Members of EMA, ESO, and ESSAC attend meetings with an interval of six months to one year. EMA provides support for Council and takes forward its decisions.

The membership of ECORD has increased from the 12 initial signatories in 2003 to 18 with the recent membership of Poland. Further efforts to expand ECORD will be maintained as a potential source of crucial additional funding, through workshops, invitations to attend IODP meetings, stands at international conferences and personal visits by ECORD representatives.

It is suggested that the ECORD Council:

- Assesses the best suitable structure for ECORD management;
- Implements a renewed campaign to increase the number of countries participating in ECORD with a particular focus on Russia;
- Approaches other countries in line with funding on a project basis where there is strategic/geographical interest;
- Implements a funding model in which proponents of expeditions may be encouraged to seek co-funding from other funding sources, including industry and other funding bodies, such as the EU;
- Considers input to the SAS consideration of the societal relevance/impact of proposals;
- Negotiates time on European research vessels to provide in-kind additional support for ECORD to undertake seafloor drill and observatory expeditions;
- Supports a more pro-active role for technology development for seafloor drills, innovative coring, logging and sub-seabed observatory technology.

### 5.2 - The ECORD Managing Agency (EMA)

The management of ECORD is undertaken by EMA, which provides the central services for funds, the link between ECORD and the other members of IODP, and the oversight of ESO and ESSAC. EMA will also implement policies driven by the ECORD Council such as the promotion of future increases in membership.

One of the most important functions for EMA is to act as controller of finances and contributions from the member countries and, when accumulated funds allow, to enable funds to be managed to pay for MSP expeditions. More flexible control of finances (e.g. bank accounts in different currencies) may restrict losses due to exchange rate fluctuations and allow for easier banking and carry over of funds to pay for expensive expeditions every 2 or 3 years.

It is suggested that EMA, acting on behalf of ECORD Council:

- Assesses the best suitable structure to manage ECORD funds ;
- Builds closer relationships with the EU ;
- Focuses on funding and in-kind support from Russia ;
- Develops the ECORD Industrial Liaison Panel ;
- Maintains close links with other parts of IODP.

### 5.3 - The ECORD Science Operator (ESO)

The ESO consortium (British Geological Survey, European Petrophysics Consortium and the University of Bremen) has worked well and has consistently delivered MSPs (*photo 5*) and the associated activities. The experience gained by the consortium is invaluable and all members of ESO are willing to continue through the next phase of ECORD/IODP. However, there are options to improve the capability and widen the expertise available, to provide new strengths, as well as to develop the capability and technical excellence of the consortium. Two such areas are the enhanced performance of seafloor drills and the development of wire line logging and methodologies. The latter is conducted for repeat entry and long-term monitoring as part of the proposed observatory programme.

It is suggested that ESO initiatives include:

- An invitation to closer links with the International Continental Scientific Drilling Program (ICDP) to make use



Photo 5: The drill floor of the Greatship Maya during the Great Barrier Reef Environmental Changes Expedition operated by ESO (C. Cotterill © ECORD/IODP).

of their experience in undertaking drilling expeditions;

- An invitation to closer links with the Marine Technology Group at MARUM, University of Bremen and co-ordinate European developments of rock drilling capability and associated observatory activities;
- The development of closer links with the piston coring community;
- The development of closer links with subsea observatory groups;
- The direct participation in future research funding bids.

The development of ESO, as part of the proposed “Distributed European Drilling Infrastructure”, is fundamental to the future of ECORD.

### 5.4 - The ECORD Science Support and Advisory Committee (ESSAC)

The current model for ESSAC differs from ESO and EMA as the management office has rotated every two years in member countries (University of Amsterdam 2003-05, University of Cardiff 2005-07, CEREGE, Aix en Provence 2007-09, Alfred- Wegener-Institute, Bremerhaven, 2009-11, University of Granada, 2011-13). This has worked well in maintaining a fresh approach and generating widespread interest in the programme. New experienced scientists are involved in the IODP SAS structure and expeditions on the *JOIDES Resolution*, the *Chikyu* and MSPs.

ESSAC's role in education and outreach to the science community includes liaison with national IODP groups. Within this role, there is potential to encourage scientists to actively look for additional sources of funding through the European or national programmes. The role of ESSAC in promoting scientific drilling to the European Union could be expanded, and it is suggested that ESSAC:

- Participates in EU initiatives such as the Deep Sea and Sub-Seafloor Frontier project;
- Encourages proposals which are integrated with the EU framework projects;
- Encourages proposals which are integrated with the national funding agencies;
- Encourages a new approach to site surveys, e.g. coordinated European research vessel activities in the Arctic area;
- Participates in the ECORD Facility Implementation Board.



Photo 6: ECORD Bremen Summer School on Geodynamics of Mid-Ocean Ridges, 2010 (© ECORD/IODP).

ESSAC organises support activities such as the ECORD Summer Schools, the ECORD Distinguished Lecturer Programme and the ECORD grants that are crucial to train the next generation of scientists within ECORD member countries. This function must continue in the future. For example the "Virtual Ship Experience", organised during the summer schools held at the IODP Bremen Core Repository (*photo 6*), has been very efficient and effective.

The ECORD science community has benefited from the ESF-run Magellan Workshop Programme. This scheme

was initiated by ECORD and has demonstrated successful results in administering funds for workshop support and developing IODP-submitted drilling proposals. This programme ended in August 2011, and there was no opportunity at the ESF for a renewal. During their meeting in Montréal in June 2011, the ECORD Council considered the programme essential in maintaining the above-mentioned outcomes. For this reason the Council decided to directly allocate a maximum level of € 50,000 from the ECORD budget to support the Magellan+ Programme. Co-funded by the ICDP, this new scheme will also contribute to the improvement of the relationships between the oceanic and continental drilling communities.

### 5.5 - The Facility Implementation Board for MSPs

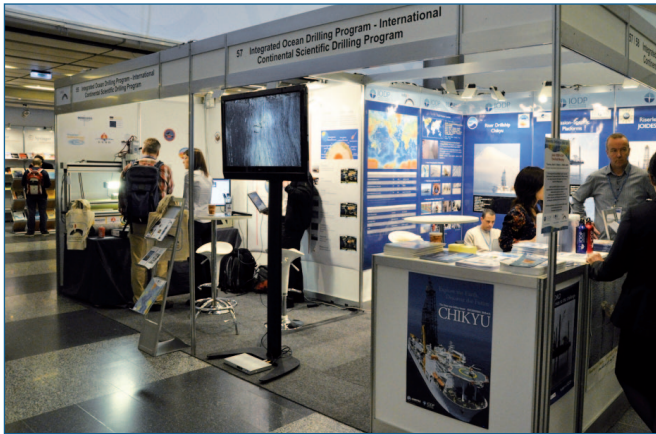
The Facility Implementation Board will replace the Operations Task Force and some of the responsibilities of the existing panels within IODP. It will be the key planning forum for MSP operations where the work programme for expeditions will be approved. The final membership of the Board is to be determined by the ECORD Council, but it is expected that it will include scientists and representatives of the funding agencies, ESO and EMA. A consensus approach will be adopted. EMA will organise the Board, which will be chaired by an ECORD scientist.

## 6 - Communication, Outreach and Education

IODP has an effective communication, outreach and education programme distributed between the central management organisation, the US, Japan, ECORD and national offices. The prime communication for day-to-day activities occurs through a series of websites linked through IODP-MI. ECORD has linked websites, including the ESO and ESSAC specific sites.

ECORD contributes to a broader pan-IODP approach to communications, outreach and education. In general, the lead on media and public outreach within ECORD is through the outreach team in ESO and EMA. The lead in scientific outreach is fostered through ESSAC. The links between the different communication and outreach branches are

established through combined activities at several major conferences, meetings and exhibitions (*photo 7*).



*Photo 7: The joint ECORD/IODP-ICDP exhibition booth organised at the European Geosciences Union Conference in 2011 (photo T. Wiersberg, ICDP).*

In the new programme, more outreach responsibilities will be given to the platform providers. It is essential, however, to maintain a united face towards other international science initiatives and to continue communicating as one single united voice. Within ECORD, the outreach activities will remain with EMA and ESO. There are still three areas where the current remit may be expanded or improved:

- **Governments:** providing better feedback on the results of the programme, *i.e.* demonstrating that the results meet the objectives of the funding agencies (through addressing relevant scientific areas) and the quality of the science outcomes. IODP currently operates an information system (SEDIS) including publications resulting from the IODP expeditions. Regular analysis of this database could provide an annual review of the ECORD scientists' activities in different areas of the programme and the scientific impact of individual expeditions. Better feedback will improve measurement of both value and performance.
- **Industry:** developing closer links with industries (including oil, gas and minerals) to demonstrate the opportunities for joint expeditions and new flexibility, and to allow for the creation of jointly funded missions. Steps in this direction have already been taken with the ECORD Industrial Liaison Panel. This could be expanded to develop

closer links in particular with the sub-sea minerals industry, which is likely to become strategically more important as more pressure is placed on resource utilisation.

- **New funding opportunities:** pro-actively participate in national and European science planning exercises to ensure that the opportunities for collaboration with other funding and project opportunities are maximised. In addition, to reach out to other communities/entities,
- ECORD will prepare an annual report on the IODP programme's scientific impact and will provide a comparative evaluation of the scientific results from the ECORD scientists on a mission-by-mission basis;
- ECORD will set up a task force to support ECORD's activities by seeking co-funding opportunities from national and European funding agencies in both science and technology development.

## 7 - Progress Reviews

During the current phase of IODP, there have been two independent reviews of ECORD, one after 5 years and a second review conducted in 2011. It is envisaged that in the context of a 10-year international research programme, a similar pattern of reviews should be maintained.

In the new programme framework, the scheduling of MSP expeditions will be the responsibility of the newly created ECORD Facility Implementation Board. It is suggested that the FIB organises the Operational Reviews that are currently the responsibility of IODP-MI.

## 8 - Implementation

During the IODP renewal process, several reviews of IODP have been completed or are in progress. The process of implementing changes has begun. Before the start of the new IODP in October 2013, a similar window of opportunity exists for the initiation of changes and enhancements for the current ECORD operating practices. It is suggested that the operations plan outlined here should be implemented during the programme's renewal, in order to provide a smoother transition into the new phase.

## Annex 1: Framework of the International Ocean Discovery Program 2013-2023 (as of January 23, 2012)

The new program architecture and management system was developed by the International Working Group plus (IWG+). IWG+ consists of representatives from all the IODP funding agencies (NSF, MEXT, ECORD, Korea, China, India, Australia and New Zealand), representatives from the Implementing Organizations (USIO, JAMSTEC/CDEX, ESO), SAS, IODP-MI, the Program Member Offices, and other interested observers - <http://www.iodp.org/International-Working-Group-Plus/2/>

### IODP Program Management

1. The Science Plan "Illuminating Earth's Past, Present and Future" is the guiding scientific document for the new IODP.
2. A Support Office, funded through contributions to support the *JOIDES Resolution* operations, will have the following tasks: support of the Science Advisory Structure (SAS), support of IODP Forum, oversight of Site Survey Data Bank, preparation of Annual Program Plan, maintenance of the IODP website, and publication of the journal '*Scientific Drilling*'. The Support Office will handle the workshop proposals and drilling proposals for the *JOIDES Resolution*, *Chikyu*, and MSPs and may be utilized upon request by other platform providers.
3. Most other functions of the current Central Management Organization not included in Item #2 will be transferred to the Platform Providers and/or program partners (*i.e.*, data management, core curation, publications, engineering development, and education and outreach).
4. The IODP Forum membership is open to all countries, consortia or entities providing funds to platform operations. The IODP Forum will be the custodian of the Science Plan and is a venue to monitor scientific progress during the new program and provide advice on Platform Provider activity. The IODP Forum will have liaisons from all major entities in the program and others who are interested in the IODP (*e.g.*, other large science programs, potential new members). The chair of the IODP Forum (a well-recognized scientist) will be the face of the program and will discuss with the respective Facility Governing Boards the progress of the program toward completion of the Science Plan. IODP Forum will start from Oct 1<sup>st</sup>, 2013. Terms of Reference for the IODP Forum will be developed by SIPCOM and be approved by the IWG+.

### Platform Provider Program Management

5. Individual Platform Providers contribute to IODP by fulfilling objectives identified in the Science Plan.
6. NSF will operate the *JOIDES Resolution* as an independent Platform Provider. ECORD will operate MSPs as an independent Platform Provider. MEXT/JAMSTEC will operate *Chikyu* as an independent Platform Provider.
7. Each Platform Provider will have its own Facility Governing Board (FGB) that will be responsible for the effective delivery of the Facility's contribution to the IODP Science Plan with the available resources.
8. The U.S. Facility Governing Board will consist of (1) representatives from funding agencies contributing to *JOIDES Resolution* operations, (2) members of the scientific community, and (3) representatives from the USIO. NSF will act as the chair. The U.S. FGB will have liaisons from all major entities in the program. The US Facility Governing Board will (1) schedule proposals for drilling based upon science priorities and optimal geographic distribution, (2) advise on long-term planning, and (3) approve the Annual Facility Program Plan and (4) fund the Support office.
9. The ECORD Facility Implementation Board will include leading scientists, representatives from the ECORD Science Operator and the ECORD Managing Agency, and representatives from ECORD/IODP funding agencies. The Board will be organized by EMA, with a European scientist as Chair. The ECORD Facility Implementation Board will have liaisons from all major entities in the program. The ECORD Facility Implementation Board will primarily (1) schedule proposals for drilling based upon science priorities, optimal geographic distribution and costs, and (2) advise on long-term planning.



**10.** Members of the Japanese Facility Governing Board, which will be called “*Chikyu* IODP Governing Board (CIGB)” will consist of (1) representatives from entities contributing to *Chikyu* operations, (2) members of the scientific community, and (3) representatives from MEXT/JAMSTEC/CDEX. Chair will be selected from the scientific community. The CIGB will have liaisons from all major entities in the program. The CIGB will (1) schedule proposals for drilling based upon science priorities, engineering feasibilities and optimal geographic distribution, (2) advise on long-term planning, and (3) approve the Annual Facility Program Plan.

**11.** The current geographical distribution of cores will continue into the next phase, with the goal to maintain a uniform sampling policy among all the IODP repositories. NSF/USIO will support all cores from the *JOIDES Resolution/Glomar Challenger* and MSPs located at the Gulf Coast Repository. In reciprocity, ECORD will support all cores from the *JR/Glomar Challenger* and MSPs located at the Bremen Core Repository. JAMSTEC will support *Chikyu* cores wherever they are stored. JAMSTEC will request funding from NSF/USIO and ECORD to support the cores from the *JOIDES Resolution/Glomar Challenger* and from MSPs located at the Kochi Core Center (KCC), respectively.

**12.** Data collection and archiving for each platform will be the responsibility of the Platform Provider.

**13.** Publications including shipboard reports, the Scientific Prospectus, Preliminary Reports, and Proceedings volumes will be the responsibility of the Platform Provider. The Program encourages the Platform Providers to maintain common publication formats.

### **Program Exchange**

**14.** Nations providing platform(s) towards IODP Science Plan goals may have berths on *JOIDES Resolution*, *Chikyu*, MSP expeditions and other platforms through an exchange program agreed upon bilaterally between individual Platform Providers.

### **Science Advisory Structure**

**15.** The Science Advisory Structure (SAS) will consist of the Proposal Evaluation Panel (PEP) and essential service

panels (e.g., Site Characterization Panel, Environmental Protection and Safety Panel, Scientific Technology Panel) necessary to assist in evaluating proposals. The current Terms of Reference will provide the basis for the Terms of Reference for panels in the post-2013 program.

**16.** Proposals from PEP will be forwarded directly to the appropriate FGB(s) for consideration for drilling.

**17.** Platform Providers should only utilize service panels (e.g., EPSP) if they require that particular advice from an international body for evaluation/approval of their operations.

**18.** PEP and service panel representatives will be staffed by the National Program Member Offices using a to-be-determined national quota system. Scientific and technical expertise considerations, when necessary, may override individual quotas.

### **JOIDES Resolution Planning and Project Architecture and Financial Contribution**

**19.** Partner contributions will be used to offset costs associated with operating the *JOIDES Resolution* and SAS Support Office activities.

**20.** *JOIDES Resolution* members will include any entity providing at least \$3.0M/annum towards operation of the *JOIDES Resolution* and SAS Support Office activities. This contribution provides representation on all SAS panels and two berths/expedition on the *JOIDES Resolution*.

**21.** Associate Members will include any entity that provides contributions of at least USD 1M USD/annum for the operation of the *JOIDES Resolution* and SAS Support Office activities. Levels of representation on SAS panels and berths on the *JOIDES Resolution* will be scaled accordingly.

**22.** Participants making a contribution of less than \$1M USD/annum may join via a consortium.

**23.** Exact participation levels for members and associate members on the *JOIDES Resolution* and SAS planning panels are to be defined in the Annex to the Memorandum of Understanding (MoU) and will be based on their total contribution to the program.

### **ECORD MSP Planning and Project Architecture and Financial Contributions**

**24.** ECORD will be responsible for funding the implementation of mission-specific platform operations. In addition to its own funding, ECORD will encourage and help proponents to seek for additional funding sources on a project basis, with the aim of offering more opportunities. Possible additional funding may come, *inter alia*, from the European Commission, partnership with industry, and specific funding at the national level.

**25.** ECORD will sign a Memorandum of Understanding (MoU) with NSF that includes access to the *JOIDES Resolution* for ECORD scientists and in reciprocity access to MSPs for US scientists. Exact participation levels are to be defined in the Annex to the MoU.

**26.** Access to MSPs will be offered to non US Joides Resolution Members and Associate Members. Exact participation levels are to be defined in the Annex of the MoU signed between ECORD and the NSF. Additional places may be offered through a swop mechanism. Monitoring of the exchanged berths will be under the responsibility of the PMOs, in coordination with the IOs.

**27.** ECORD will sign a MoU with MEXT to barter berths between MSPs and the *Chikyu* for ECORD and Japanese scientists respectively.

**28.** Co-funded projects will require a flexible approach to staffing.

### **Chikyu Planning and Project Architecture and Financial Contributions**

**29.** *Chikyu's* major part of ship time will continue to be allocated for scientific drilling. With more flexible scheduling and dynamic geographical movement, she will conduct a few large riser projects utilizing full-fledged riser technology, but also implement ancillary shorter-term riserless projects of various scientific themes.

**30.** Operation costs of *Chikyu* will be supported through two channels; namely, through the newly formed *Chikyu* partnership body (tentatively called "*Chikyu* Friends") and individual project-based contributions. Countries, research institutions, private organizations, universities, foundations or any other entities/consortia are invited to join "*Chikyu* Friends" or provide project-based contributions.

**31.** In order to join "*Chikyu* Friends", the minimum unit of participation fee of USD 250,000/annum should be paid by the entity, and this will enable one berth of *Chikyu* expedition and utilization of Kochi Core Center research facilities by paying actual costs. Other benefits such as options for choosing berths of other two platforms (*JOIDES Resolution*/MSP) and SAS/CIGB representation may be obtainable subject to availability, with multiple units of participation [Details to be defined and agreed separately].

**32.** Project partners are encouraged to participate from early project formulation stage, and their contributions should be crucial for *Chikyu* operations. Benefits of project partners will be determined through bilateral negotiations for each project, based on levels of contributions in a flexible manner [Details to be defined in the MoUs].

### **Transition**

**1.** The SAS, with its current panels and representation quotas, will be used to evaluate and prioritize proposals through 2013.

**2.** IODP Council will continue as the program authority through 2013. After 2013, IODP Council will be disbanded.

**3.** IWG+ will stay in existence until the operational framework of the new program is fully implemented.

**4.** Facility Governing Boards will be initiated prior to the start of the new program and will need to work closely with SIPCOM during the period of overlap.

## Annex 2 - List of Acronyms

**ACEX:** Arctic Coring Expedition  
**AWI:** Alfred Wegener Institute  
**BCR:** Bremen Core Repository  
**BGS:** British Geological Survey  
**CDEX:** Center for Deep Earth Exploration  
**CEREGE:** Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement  
**CIGB:** *Chikyu* IODP Governing Board  
**CMO:** Central Management Office  
**CNRS:** Centre National de la Recherche Scientifique  
**DSDP:** Deep Sea Drilling Project  
**DS<sup>3</sup>F:** Deep Sea and Sub-Seafloor Frontier  
**EC:** European Commission  
**ECORD:** European Consortium for Ocean Research Drilling  
**ECORD ILP:** ECORD Industrial Liaison Panel  
**EMBRC:** European Marine Biological Resource Centre  
**EMA:** ECORD Managing Agency  
**EMSO:** European Multidisciplinary Seafloor Observatory  
**EPC:** European Petrophysics Consortium  
**ERA-Net:** European Research Area Network  
**ESFRI:** European Strategy Forum on Research Infrastructures  
**ESO:** ECORD Science Operator  
**ESSAC:** ECORD Science Support and Advisory Committee  
**EU:** European Union  
**FGB:** Facility Governing Board  
**FIB:** Facility Implementation Board  
**GCR:** Gulf Coast Repository  
**GFZ:** Deutsches GeoForschungsZentrum  
**ICDP:** International Continental Scientific Drilling Program  
**IMAGES:** International Marine Past Global Changes Studies  
**INVEST:** IODP New Ventures in Exploring Scientific Targets  
**IO:** Implementing Organization  
**IODP:** Integrated Ocean Drilling Program  
**IODP:** International Ocean Discovery Program  
**IODP-MI:** Integrated Ocean Drilling Program Management International Inc.  
**IPEV:** Institut Paul Emile Victor  
**IWG+:** International Working Group Plus  
**JAMSTEC:** Japan Agency for Marine Earth Science and Technology  
**JOIDES:** Joint Oceanographic Institutions for Deep Earth Sampling  
**JR:** *JOIDES Resolution*  
**KCC:** Kochi Core Center  
**MARUM:** Center for Marine Environmental Sciences  
**MEXT:** Ministry of Education, Culture, Sports, Science and Technology  
**MoU:** Memorandum of Understanding  
**MSP:** Mission-specific platform  
**NSF:** National Science Foundation  
**NSP:** New Science Plan  
**ODP:** Ocean Drilling Program  
**OFEG:** Ocean Facility Exchange Group  
**PEP:** Proposal Evaluation Panel  
**PMO:** Program Member Office  
**R/V:** Research Vessel  
**RWTH:** Rheinisch-Westfälische Technische Hochschule Aachen  
**SAS:** Science Advisory Structure  
**SEDIS:** Scientific Earth Drilling Information Service  
**SIPCOM:** Science Implementation and Policy Committee  
**SME:** Small to Medium-Sized Enterprise  
**TAMU:** Texas A & M University  
**USIO:** US Implementation Organization

# ECORD Members

