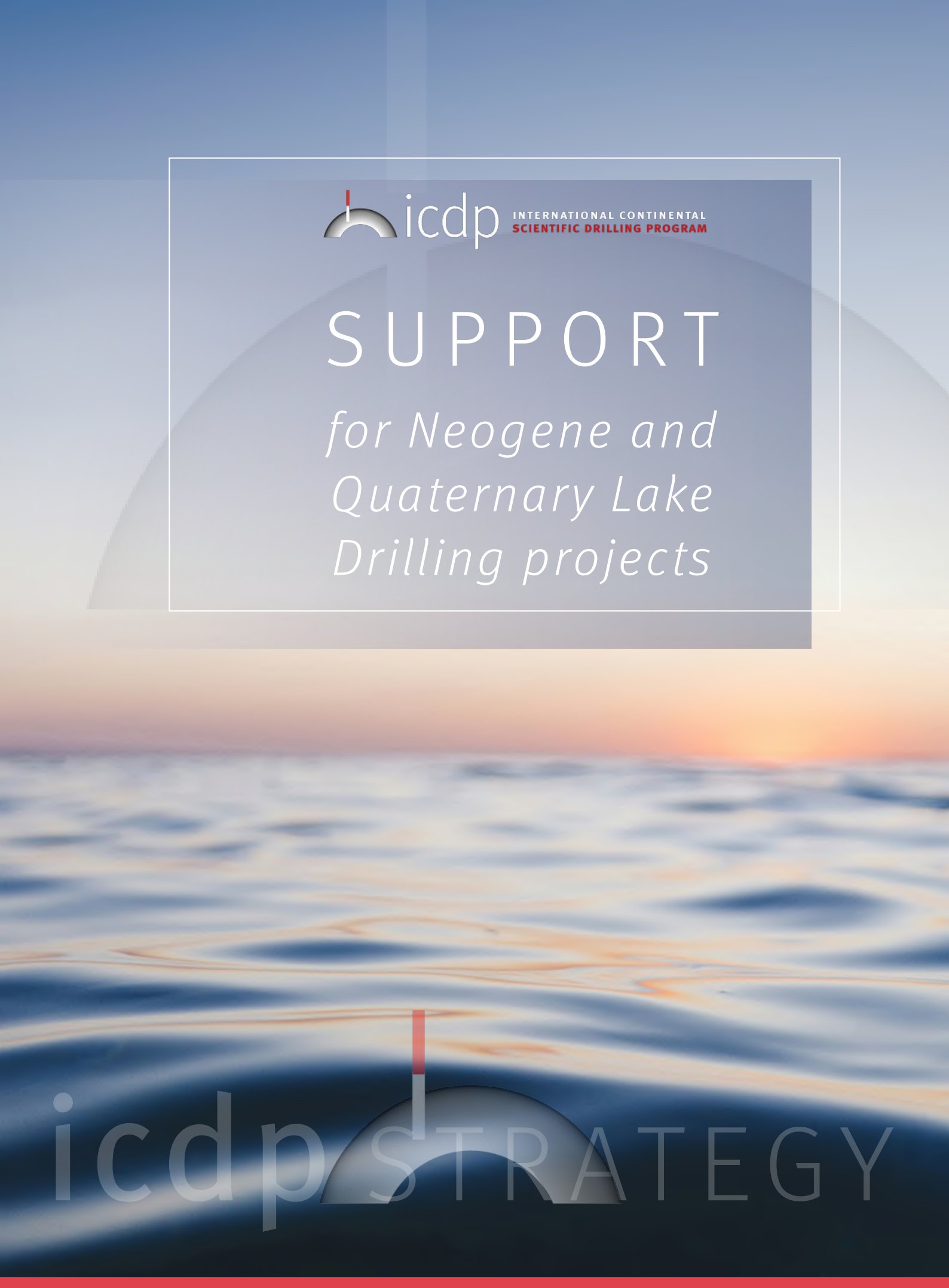
icdp INTERNATIONAL CONTINENTAL SCIENTIFIC DRILLING PROGRAM

SUPPORT

for Neogene and Quaternary Lake Drilling projects

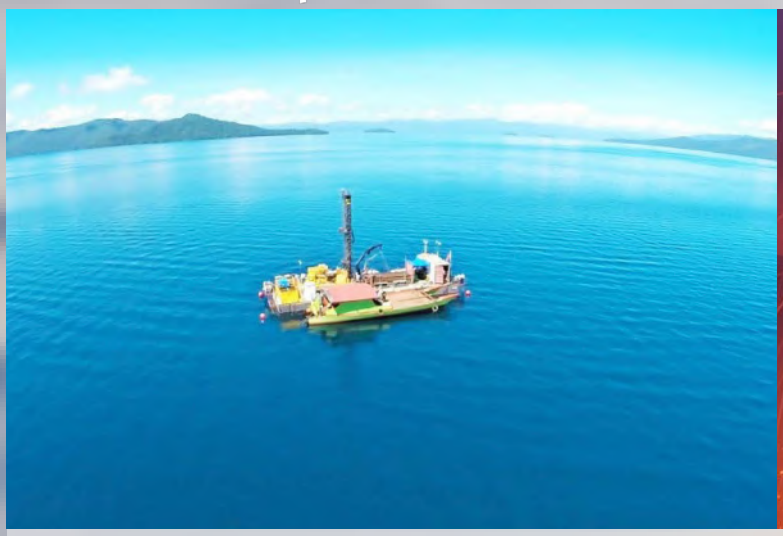


01 INTRODUCTION

4 key research themes of icdp

The International Continental Scientific Drilling Program (ICDP) offers international science teams the opportunity to compete for funds and operational support for drilling and drilling-related operations. This support is being provided based upon the ICDP Science Plan 2020-2030 that defines our four key research themes. The questions outlined for each theme address fundamental science, but many also link to wider societal challenges encompassed in the United Nations Sustainable Development Goals. The program boasts a strong and active participation of twenty-two member nations plus UNESCO and has undertaken more than 60 drilling projects and run over 80 workshops.

icdp *Science Themes*



Environmental Change

Geohazards

Environmental Change is a key theme addressing the question of *'How can we improve our understanding of past environmental change(s) in order to better understand and prepare for future environmental change?'*. Records of the interactions between Earth's internal processes, with the biosphere and physico-chemical Earth-surface processes throughout Earth history are encoded in sediments — they hold the key to understanding how past and future environmental change alter the Earth's surface.

Our 4 KEY OBJECTIVES

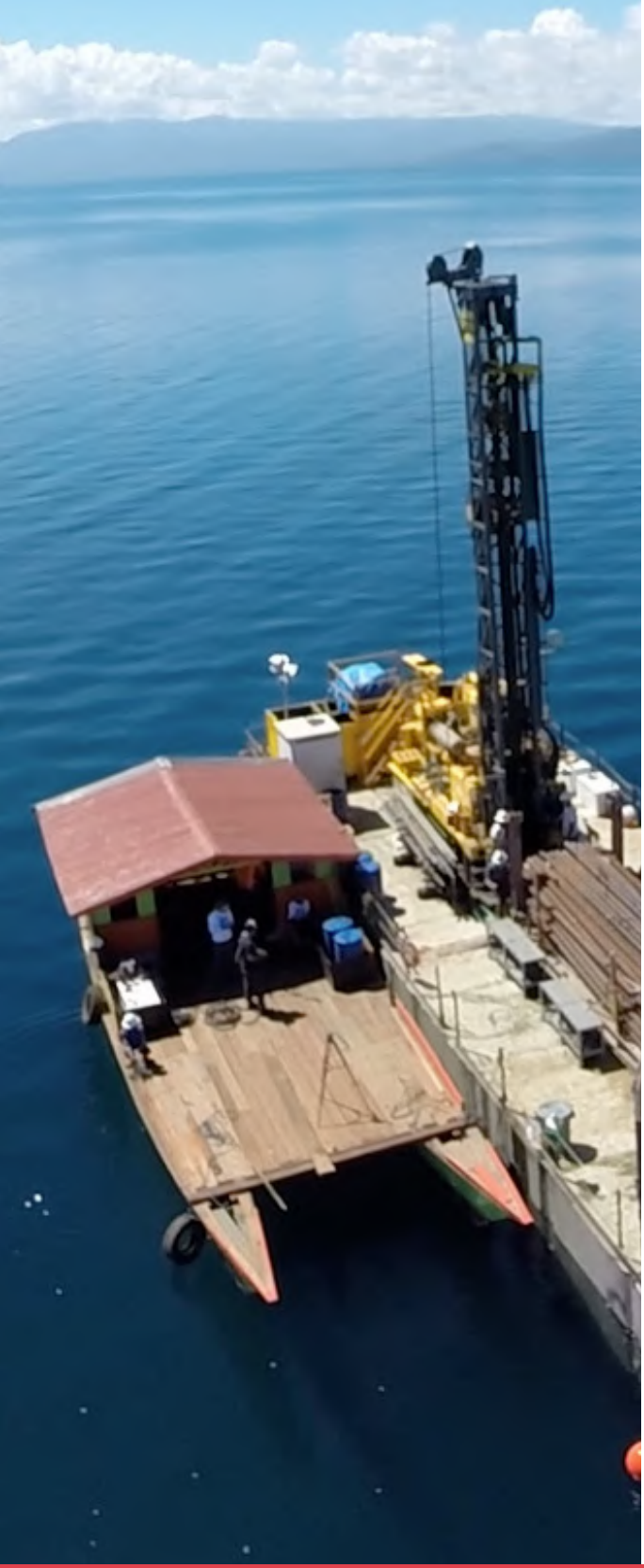
Geodynamic Processes,
Geohazards,
Georesources,
Environmental Change

To identify current knowledge gaps in environmental change from Lake Drilling and to define funding priorities for ICDP, a Task Force of key scientists and ICDP representatives was formed to develop a funding strategy for future ICDP Lake Drilling. This resulting guideline is based on the outcome of a community workshop on future ICDP proposals on Lake Drilling research.

Georesources

Geodynamic Processes

02 FUNDING PRIORITIES in the ICDP



- **World-Class Science**

  In order to gain ICDP support, each proposed drilling project must undergo a strict review process in which panels of international experts evaluate its scientific merits, managerial maturity, and societal relevance. In each case, the guiding principle that must first be assessed is whether or not a proposed drilling project addresses key research questions which the Earth science community have not yet been able to answer. The PIs of a proposed drilling project must also demonstrate how their plan is relevant to the grand science challenges facing humankind.

- **World-Class Site**

  Projects funded by ICDP address questions of global importance to the Earth science community and society at large. Accordingly, Lake Drilling should prioritise locations that are considered to be 'World-Class Sites,' where one or more fundamental questions in environmental and climate science can be successfully tackled and thereafter the findings transferred to other locations and/or parts of the world.

- **World-Class Opportunity**

  ICDP values linkages between previous drilling projects and the science generated with new drilling opportunities. Accordingly, proposals that demonstrate the integration of scientific knowledge gained from previous drilling projects with new strategic targets that fill gaps in time or space may be prioritized for ICDP support. Each case must clearly enable scientists to understand underlying processes of overarching importance and must go beyond answering a specific, local question, or providing insights to a limited research avenue. As in all ICDP projects, the data acquired must be made fully available to the (ICDP) community.

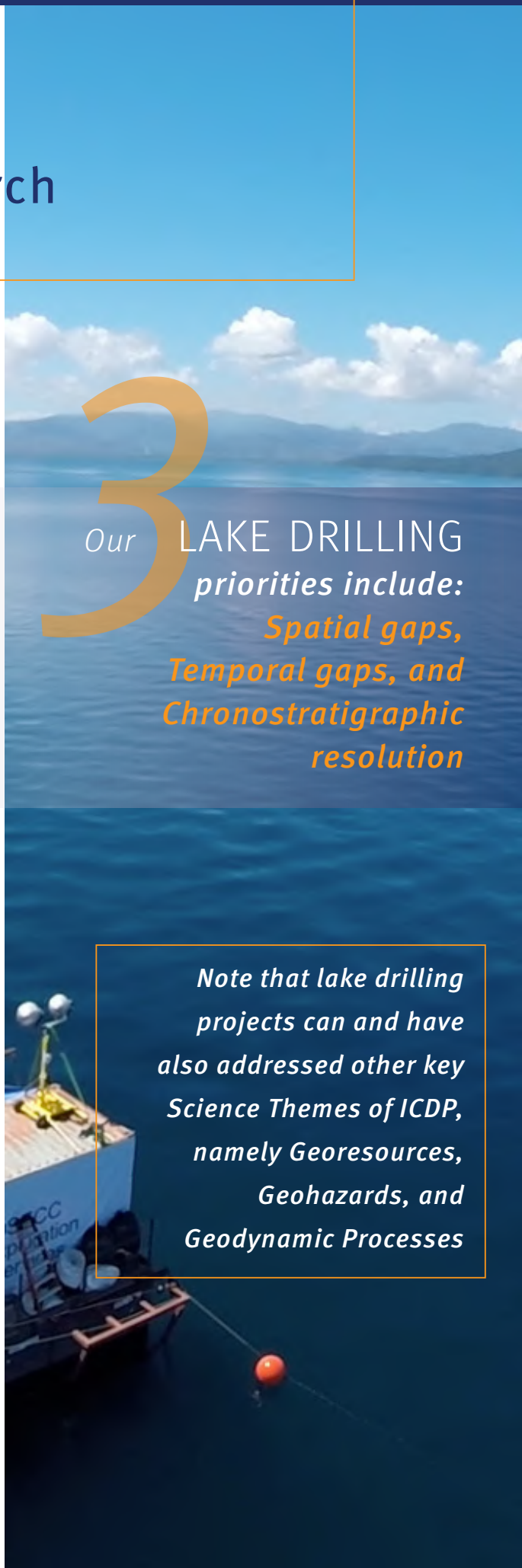
03 PRIORITIES
in Lake Drilling Research

Three important aspects related to Lake Drilling have been prioritised:

Spatial gaps:
Spatially arrayed sites along latitudinal, longitudinal, or altitudinal gradients can be used to reconstruct the dynamics of major features of atmospheric circulation or the response of the landscape or biosphere to other key environmental forcings that vary across space. These transects are crucial for resolving long-standing questions about the relative importance of tropical and high-latitude climate processes, the magnitude and regional impact of variation in meridional circulation, and the sensitivities of systems along altitudinal gradients to climate forcing factors.

Temporal gaps:
Continental climate records for periods of time not yet drilled are needed to develop complete climate and hydrologic models. If the project seeks to fill critical time gaps, then the integration of the lacustrine and terrestrial archives with existing proxy data records from other Lake Drilling projects should be demonstrated.

Chronostratigraphic resolution:
Long and continuous sedimentary records offer exciting opportunities to study paleoclimate change at a variety of temporal scales and resolutions.

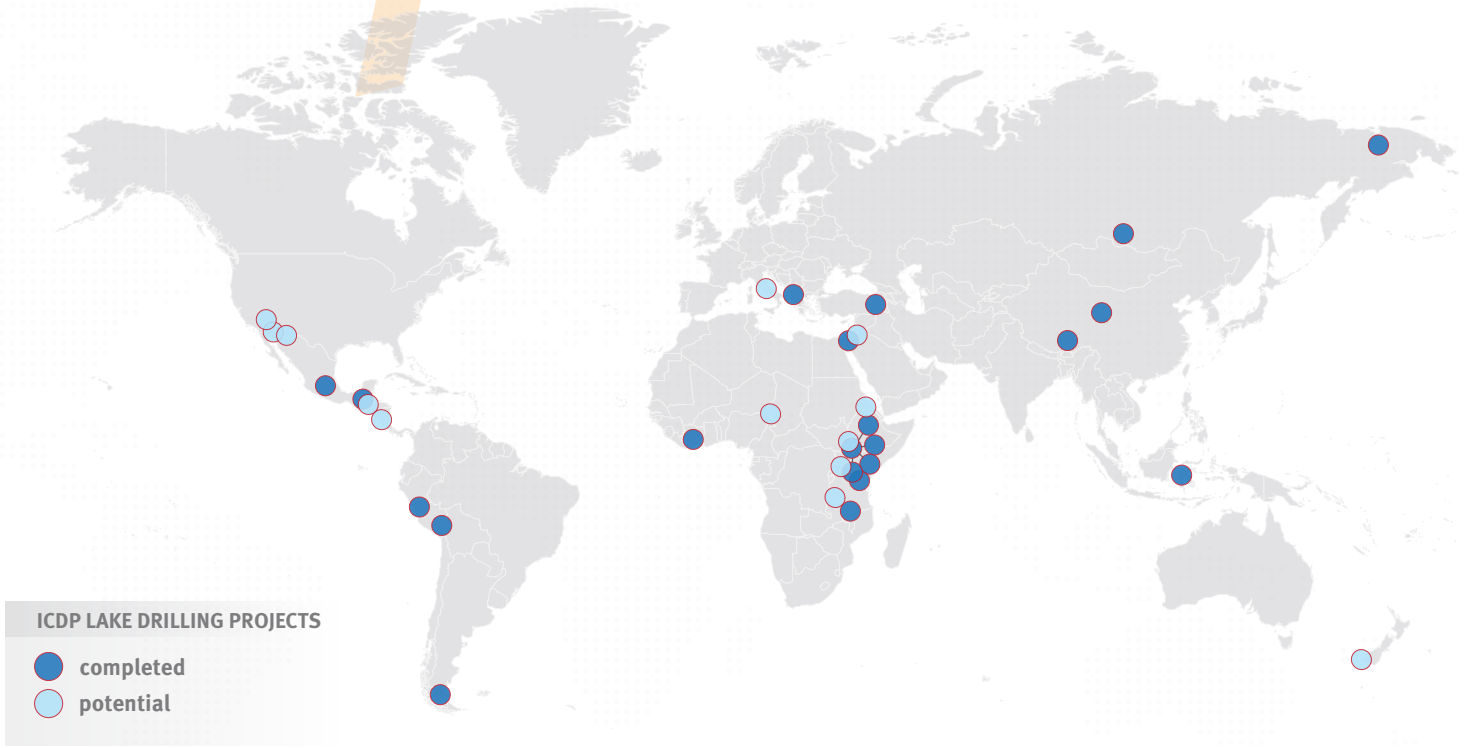


3 *Our* LAKE DRILLING ***priorities include: Spatial gaps, Temporal gaps, and Chronostratigraphic resolution***

Note that lake drilling projects can and have also addressed other key Science Themes of ICDP, namely Georesources, Geohazards, and Geodynamic Processes

LAKE DRILLING PROJECTS:
completed and pending

04



Lakes and lacustrine strata drilled within ICDP

Lake Baikal
Lake Titicaca
Lake Bosumtwi
Lake Malawi
Lake Qinghai
Lake Peten Itza
Laguna Potrok Aike
Lake El'gygytgyn
Lake Van
Dead Sea
Lake Ohrid
Lake Towuti
Hominin Sites and Paleolakes
Chalco Basin
Crater Lake Challa
Lake Junin
Lake Nam Co

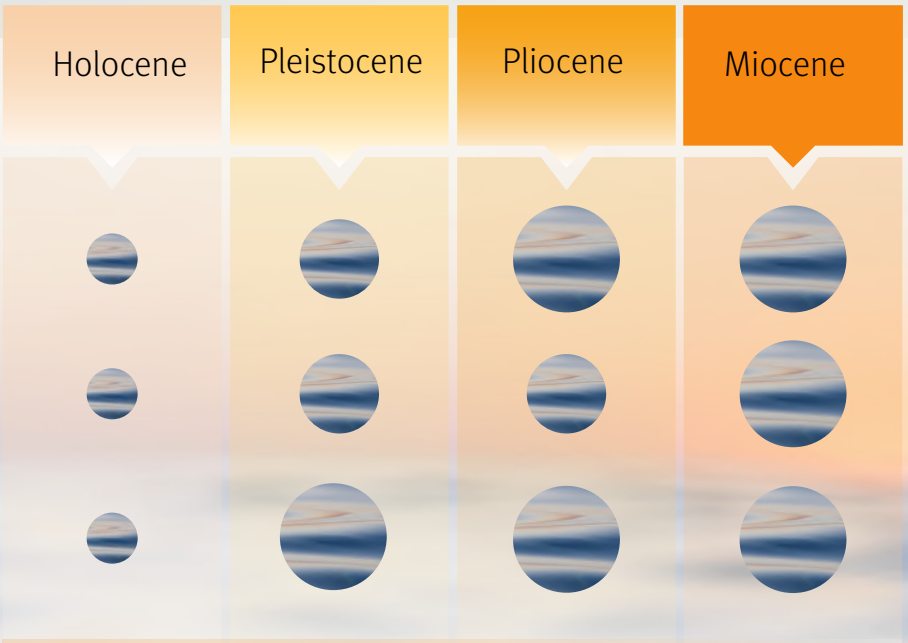
Potential Future Lake Drilling Projects

Lake Izabal Drilling Project
Lake Chad Drilling Project
Lake Turkana Drilling Project
Lake Victoria Drilling Project
PlioWest Drilling Project
Lake Kinneret Drilling Project
Lake Tanganyika Drilling Project
Lake Fucino Sedimentary Succession
New Zealand Fjord Sediments

05 COMMONALITIES
in Lake Drilling Research

Lake Drilling projects seek to document paleoclimatic, hydrologic, biologic, seismic, and tectonic processes, from the Holocene to the Miocene. To maximize project success, ensure that the best possible data are acquired, and to promote the long-term utilization of these data, the following components have been recognized:

Knowledge gaps across time relative to priorities identified for Lake Drilling research



Records documenting environmental responses across major transitions in Earth's history are of paramount importance

Research addressed by successful Lake Drilling projects should integrate some key issues affecting the Earth system, such as paleoclimate, hydrology, geomicrobiology, biodiversity, hominin evolution, tectonics, or seismicity and elucidate how they are linked to key scientific challenges.

Successful proposals also need to address technical issues, including the continuity of strata and the extent to which they might yield an uninterrupted history of deposition, as well as the potential for precise dating of sedimentary layers. Proposals also need to address key organizational challenges, including planned approaches for the acquisition of matching funds from various sources, obtaining a reliable and sustainable technical solution for drilling and coring, and a relational risk assessment to ensure proper project execution.

POWER OF REGIONAL NETWORKS

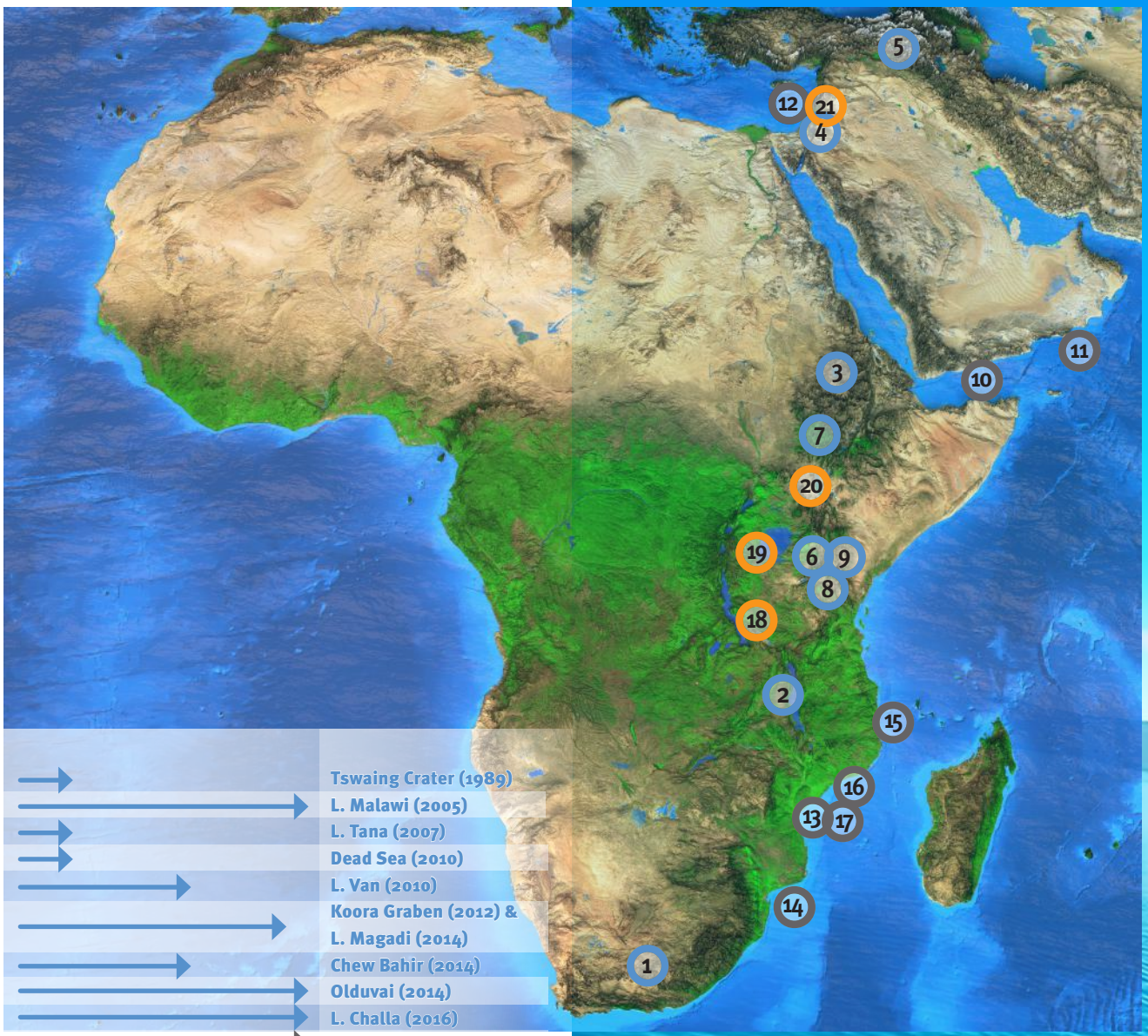
East African Lake Drilling

Over the past 30-40 years, East African Lake Drilling projects have been a keystone of ICDP, where 10 lake projects have been targeted (see page 08). Much of our understanding of the paleoclimate history of this region has come from detailed studies of the numerous sediment core records collected from these projects and the surrounding ocean basins and have become iconic points of reference for understanding how climate in this region has evolved and how it has impacted ecosystems and human prehistory. These projects are an example of how a strategic network of sites in a region can form a rich foundation for identifying critical knowledge gaps and for continued exploration of sophisticated science questions of international relevance.

New drilling project proposals that address the following areas are encouraged:

- *Combined hydrology and ecosystem response over extensive gradients of latitude and longitude, particularly during critical time intervals of global climate change.*
- *Paleohydrology and temperature records related to orbital and suborbital drivers of climate change.*
- *Lake Drilling and model experimental results for interpreting biogeographic and ecosystem history, including both aquatic and terrestrial biomes.*
- *Implications of paleorecords and model experiments for near-future climate change.*

Existing & proposed Long Paleorecords from the Afro-Syrian Rift Region



1. Tswaing Crater (1989)
2. L. Malawi (2005)
3. L. Tana (2007)
4. Dead Sea (2010)
5. L. Van (2010)
6. Koora Graben (2012) & L. Magadi (2014)
7. Chew Bahir (2014)
8. Olduvai (2014)
9. L. Challa (2016)
10. DSDP231 (1972)
11. ODP721/722 (1987)
12. ODP967 (1995)
13. MD96-2048 (1996)
14. IODP-U1474 (2016)
15. IODP-U1476 (2016)
16. IODP-U1477 (2016)
17. IODP-U1478 (2016)
18. L. Tanganyika
19. L. Victoria
20. L. Turkana
21. L. Kinneret

0 — 1Ma

ICDP Sites
Ocean Drilling Sites
Proposed ICDP Sites

Adapted from Cohen et al. (2022)
Annu. Rev. Earth Planet. Sci. 50: 451-76

07 SOCIETAL ASPECTS

attention and promotion

Public and wider stakeholder involvement needs to have an important role in all ICDP-supported Lake Drilling projects and likewise public outreach and education are essential. Consequently, every proposal should include an outreach and engagement plan to address these needs and should also address project-specific issues. The involvement of local stakeholders is a critical aspect to community acceptance and can be used to garner attention for, and promotion of, science in everyday life.

This is especially true in East African and other sensitive lake environments, where water quality and water resources (drinking/agricultural water, food) are essential to the local communities yet under increasing threat in a warming climate. Given that lakes are primary water resources, ecological refugia, and often provide crucial natural resources for local populations, research on hydrological aspects is mandatory for any drilling project closely related to modern lakes.

08 PROPOSALS

submission and evaluation

ICDP offers international science teams the opportunity to compete for funds to support drilling operations. All proposals must be submitted via email by the annual deadline of 15 January.

ICDP considers four types of proposals for evaluation: 1) preliminary proposals, 2) workshop proposals, 3) full proposals, and 4) Land-to-Sea proposals. An independent panel of science experts - the ICDP Science Advisory Group (SAG) - evaluates all proposals submitted based on their scientific merits as well as review criteria outlined above, and gives recommendations to the ICDP Executive Committee (EC) and Assembly of Governors (AOG) for final decision making. The ICDP Operational Support Group (OSG), located in Potsdam, Germany, handles all aspects of the proposal submission and organizes the review process.

Successful proponents of full proposals receive an ICDP grant to cover parts of the drilling and operational costs. In addition, the OSG provides a full suite of services for initiating and planning scientific drilling projects, as well as their management and execution, including scientific instrumentation and downhole logging services. Regular ICDP training courses on handling, studying and interpreting drill cores and well logs are also part of their OSG repertoire.

Details about submission, evaluation, and implementation of ICDP projects are available on the ICDP website at **www.icdp-online.org**.

ACKNOWLEDGEMENTS

This brochure is based on discussions and conclusions of the ICDP Lake Drilling Task Force:

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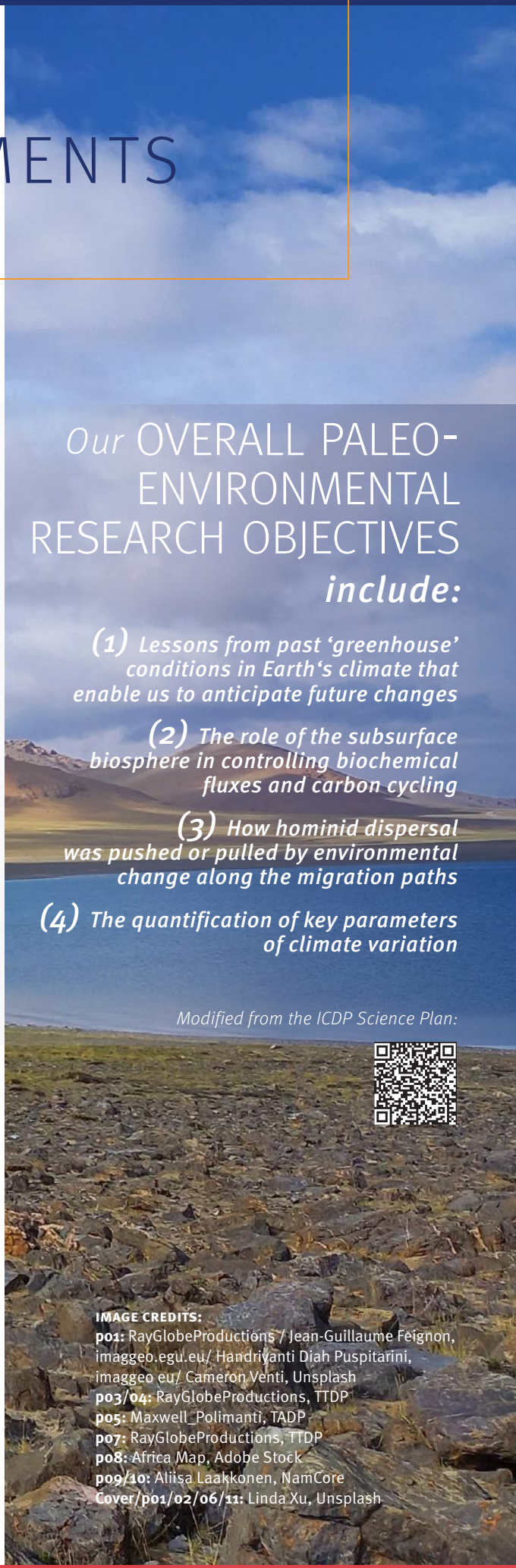

Our OVERALL PALEO-ENVIRONMENTAL RESEARCH OBJECTIVES ***include:***

(1) Lessons from past 'greenhouse' conditions in Earth's climate that enable us to anticipate future changes

(2) The role of the subsurface biosphere in controlling biochemical fluxes and carbon cycling

(3) How hominid dispersal was pushed or pulled by environmental change along the migration paths

(4) The quantification of key parameters of climate variation

Modified from the ICDP Science Plan:

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32 icdp LAKE DRILLING ACTIONS

up to now

PROJECT	WORKSHOP	DRILLING	STATUS
Baikal Drilling Project		1998/99	completed
Lake Titicaca Drilling Project	1998	2001	completed
Lake Bosumtwi Drilling Project	2001	2004	completed
Scientific Drilling in Lake Malawi	1999	2005	completed
Lake Qinghai Drilling Project	2003	2005	completed
Lake Peten Itza Scientific Drilling	2003	2006	completed
Potrok Aike Maar Lake Sediment Archive Drilling Project	2006	2008	completed
Lake El´gygytgyn Drilling Project	2001/04	2008	completed
Lake Van Drilling Project	2006	2010	completed
The Dead Sea Drilling Project	2002	2010	completed
Scientific Collaboration On Past Speciation Conditions in Lake Ohrid	2008	2013	completed
Hominin Sites and Paleolakes Drilling Project	2008	2013/14	completed
Towuti Drilling Project	2012	2015	completed
Lake Junín Drilling Project	2011	2015	completed
Deep Drilling of the Chalco Basin	2012	2016	completed
Climate and Ecosystem Dynamics on the East African Equator	2012	2016	completed
The Nam Co Drilling Project	2018	2024	completed
Drilling the Eger Rift	2004	2019	operative
Lake Chad Deep Drilling Project	2016		pending
Lake Tanganyika Drilling Project	2018		fundraising
Drilling Overdeepened Alpine Valleys	2013	2021	operative
Central American bridge between two continents and two oceans	2020		pending
Drilling Pliocene Lakes in Western North America	2021		pending
Lake Izabal Basin Research Endeavor	2022		pending
Deep Drilling in the Turkana Basin	2022		pending
Lake Victoria Drilling Project	2022		pending
Weihe Basin Drilling Project	2021		fundraising
Fucino Sedimentary Succession	2023		pending
New Zealand Fjordland Sediments	2023		pending
Afar Dallol Drilling - ONset Of Sedimentary Processes	2023		pending
Investigating Miocene Mediterranean-Atlantic Exchange	2016		fundraising

This ICDP brochure including a list of all authors is also available online on the ICDP website

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