INTER-AMERICAN TROPICAL TUNA COMMISSION

SCIENTIFIC ADVISORY COMMITTEE

11TH MEETING

San Diego, California (USA)
11-15 May 2020[1]

DOCUMENT SAC-11-01b

UNFUNDED PROJECTS

This document lists projects proposed by the IATTC scientific staff that are not funded. The staff's work plans for 2019-2023 and its current and planned research activities are listed in Document SAC-11-01a, and its broader and longer-term goals are set out in Document IATTC-93-06a, *IATTC Strategic Science Plan*.

CONTENTS

A. INTRODUCTION

This document presents brief summaries of 9 research projects that the staff considers important, but lacks the resources, human, technical, or financial, to undertake. The summaries include, for each project, background information, a work plan, and a status report, as well as details of its relevance and purpose, external collaborators, duration, deliverables, and an indicative budget.

Research projects that are funded and/or under way are included in IATTC-94-04; it also contains the staff's work plans, which include many of the projects listed in this document.

The staff's research activities are structured into the seven main areas of research, called *Themes*, of the proposed Strategic Science Plan (SSP; IATTC-93-06a). In addition to better accommodating a strategic planning approach, this new structure is intended to foster stronger collaboration among the different programs (recommendation 17 of the 2016 IATTC Performance Review), with researchers from different programs contributing to activities under a common *Theme*. The seven *Themes,* the strategic pillars of the SSP, are the following:

1. Data collection for scientific support of management
2. Life history studies for scientific support of management
3. Sustainable fisheries
4. Ecological impacts of fishing: assessment and mitigation
5. Interactions among the environment, ecosystem, and fisheries

[1] Postponed until a later date to be determined

6. Knowledge transfer and capacity building
7. Scientific excellence

Each *Theme* is divided into strategic *Goals*, and the principal tasks that will be carried out to achieve a particular goal within the SSP's five-year window are called *Targets* (IATTC-93-06a). The specific activities that the staff will carry out in order to fulfil those tasks are called *Projects*, which are in some cases grouped into *Work Plans* aimed at achieving a broad objective not limited to a particular *Theme* or *Goal*.

The general *Themes*, and the more specific *Goals*, reflect what the staff considers to be its primary responsibilities, and form an integral part of the five-year SSP. The more focused *Targets*, and the concrete *Projects*, are generally of shorter duration, and operate on a biennial cycle. Whether any *Projects* are undertaken under a particular *Goal* or *Target* in any given period will depend on the staff's research priorities, the human, logistic, and financial resources available, and any specific instructions from the Commission.

B. UNFUNDED PROJECTS, BY THEME

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1. DATA COLLECTION FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT C.1.a: Exploring technologies for remote identification of FADs		
THEME: 1. Data collection **GOAL:** C. Improve quality and expand coverage of data-collection programs **TARGET:** C.1. Purse-seine fleet **EXECUTION**: Bycatch Mitigation and Gear Technology Group & Stock Assessment Program		
Objectives	• Evaluate the suitability of different technologies to remotely and electronically identify FADs	
Background	• FADs may cause significant impacts species and ecosystems. • Assessing impacts require efficient collection methods for high-quality data, including correct tracking and monitoring of individual FADs throughout their lifetime. • Currently, FADs are identified using satellite-buoy identifiers, and appropriately obtaining buoys' alphanumeric serial numbers has traditionally been difficult for observers, and not possible with current EMS capabilities. • However, this information is key to merge and connect different IATTC databases. • EMS can generate certain data on FADs (e.g. deployments, removals) but only those types of data that can be collected with cameras. • An electronic system to automatically detect and identify FADs would improve the value and utility of all types of data, but particularly of data collected by EMS. • Several technologies for remote identification of objects are currently on the market. These technologies should be tested under controlled conditions to better understand their advantages and disadvantages.	
Relevance for management	Technologies to remotely identify FADs would improve data collection and analyses and the development of comprehensive management recommendations for target and non-target species in the EPO.	
Duration	12 months	
Work plan and status	• [M 1-3] Preliminary assessment of candidate technologies and providers; purchase equipment. • [M 4-9] Test technologies under controlled conditions in the Achotines lab, Panama, gradually increasing distance between the FAD and the device used for detection and the potential severity of environmental conditions: tanks, coast, bay and open sea. • [M 10-12] Report writing.	
External collaborators	Satlink and Digital Observer Services (DOS)	
Deliverables	• Reports for the FAD WG and the SAC with the summary of pros and cons of all the technologies considered, with specific proposals on preferred technologies for remote FAD identification and a future action plan.	
Budget (US$)	Purchase of technology for remote identification	20,000
	Collaborators time	30,000
	Travelling	10,000
	Total (excluding staff time)	60,000
	Staff time	10% FTE

PROJECT C.2.b: Pilot study on the use of electronic monitoring (EM) for data collection aboard longline vessels greater than 20 meters length
THEME: 1. Data collection **GOAL:** C. Improve quality and expand coverage of data-collection programs **TARGET:** C.2. Longline fleet **EXECUTION**: Bycatch Mitigation and Gear Technology Group

Objectives	Establish what data EM is capable of collecting aboard longline vessels greater than 20 meters length with as much precision as the observer as for target and non-target catch data by size and species, discards, transshipments, and the potential augmentation of data for science purposes	
Background	• Tuna CPUE modelling require high resolution spatial-temporal size composition data to estimate relative abundance indices. • Current observed EPO fishing effort coverage of 5% by longline fishing vessels greater than 20 meters length, established by Resolution C-19-08 has been considered low by the IATTC staff and the IATTC Working Group on Bycatch. Instead, it's been suggested to be raised to 20%. • Logistical, financial and space constrains have caused the observer placement onboard longline vessels to be difficult. • Shortage of human observer coverage could be achieved by electronic monitoring systems (EMS). • Trials on EM for longline fishing vessels have been fully developed in other regions of the Pacific Ocean, except in the EPO.	
Relevance for management	• Improved indices of relative abundance for tuna stocks will improve tuna stock assessments and therefore advise to management. • Size-based stock status indicators for species not monitored with assessments will improve management decisions for those species.	
Duration	26 months	
Work plan and status	• [M 1-2] Solicit bids from EM companies for equipment, installation and data archiving services. • [M 3-5] Identify vessels willing to participate in the study. Purchase EM equipment. • [M 6-16] Trips with simultaneous collection of EM and observer data aboard longline vessels. • [M 17-21] Processing of EM data. • [M 22-26] Statistical comparisons and submit report.	
External collaborators	Fishing industry, technology companies	
Deliverables	Reports for the SAC and the Commission, with recommendation of minimum data fields that can be reliably collected by EM.	
Budget (US$)	Identify vessels - purchase EM equipment	115,000
	EM and observer data collection trips	25,000
	Processing of EM data	30,000
	Travel	20,000
	Total	**190,000**

2. LIFE-HISTORY STUDIES FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT E.2.a: Investigate spatiotemporal variability in the age, growth, maturity, and fecundity of yellowfin tuna in the EPO		
THEME: Life-history studies for scientific support of management **GOAL:** E. Life history, behavior, and stock structure of tropical tunas **TARGET:** E.2. Reproductive biology of tropical tunas **EXECUTION**: Life-history and Behavior Group		
Objectives	Estimate age, growth, maturity, and fecundity of yellowfin from four distinct areas of the eastern Pacific for use in spatially-structured stock assessment models	
Background	• Current estimates of age, growth, maturity, and fecundity of yellowfin are based on otolith and ovarian tissue samples collected over 30 years ago. • During 2009-2016 observers collected otolith and ovarian tissues samples at sea throughout the EPO • Tagging and morphometrics data indicate there are multiple stocks of yellowfin in the EPO, probably with different life history characteristics • Heavily-exploited fish stocks often show trends towards earlier maturation • Spatially-structured stock assessments should incorporate geographically-explicit life-history parameters	
Relevance for management	Spatially-structured stock assessments based on geographically-explicit life history parameters will provide a more accurate basis for the staff's management advice	
Duration	5 years; initiated in 2017	
Work plan and status	• 2017-2021: Preparation and reading of otolith samples for age estimates • 2019-2021: Preparation and reading of ovarian tissues for fecundity estimates • 2021: Analyses of age and growth and reproductive biology data, and preparation of manuscripts The life-history group will be very occupied with the tagging program (E.4.a) in 2020 and have very limited time for this project. A laboratory technician will be needed to avoid major delays with this project.	
External collaborators		
Deliverables	• Presentation for SAC-12, 2021 • Updated, geographically-explicit life-history parameters for use in spatially-structured stock assessments	
Budget (US$)	Laboratory technician (1 year)	60,000

3. SUSTAINABLE FISHERIES

PROJECT H.1.d(ext): Improve indices of abundance and length composition based on longline data		
THEME: Sustainable fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Improve the yellowfin and bigeye indices of relative abundance from longline data • Determine methods to identify targeting in longline fisheries • Develop spatio-temporal models for creating indices of relative abundance from longline data • Develop appropriate longline length-composition data for the index of abundance and for the catch	
Background	• Indices of relative abundance derived from longline CPUE data are the most important piece of information in the bigeye and yellowfin stock assessments • Only the Japanese data are currently used to create these indices • The characteristics, tactics, and spatial distribution of the fishery have changed over time • The same length-composition data are used for the index and for the catch, but these could differ • New methods, such as spatio-temporal modelling, have been developed and should be used in the creation of the indices • Research and a workshop in 2019 have substantially progressed the work towards achieving the objectives. • Additional research is needed to finalize indices of abundance and composition data • Access to operational-level data for longer time periods is essential for advancing the research. Several CPCs have indicated that they will grant such access to the staff under strict confidentiality. • Research conducted to resolve issues in using the longline CPUE and composition data needs to be presented and discussed with scientists of the relevant CPCs	
Relevance for management	The indices have a direct impact on the stock assessment, and any improvements in the indices will directly improve the management advice for bigeye and yellowfin	
Duration	Winter 2020	
Work plan and status	• Jan-Feb 2020: work with CPC scientists to progress longline research • Jan-Feb 2020: one-week workshop to discuss the results of the research conducted to resolve issues in using the longline CPUE data	
External collaborators	• CPCs involved in the longline fishery, mainly China, Japan, Korea, Chinese Taipei • Invited speakers	
Deliverables	• Workshop report • Indices of relative abundance • Length compositions • Project report to SAC-11, 2020	
Budget (US$)	Workshop and research expenses and invited participant travel costs	50,000

PROJECT H.1.f: Workshop on improving spatio-temporal methods for tuna CPUE and length composition standardization		
THEME: 1. Sustainable Fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Develop guidelines for tuna CPUE standardization with spatio-temporal methods, including specification of complex correlation structures. • Develop guidelines for tuna length composition standardization with spatio-temporal methods, including the specification of length bin and among-length bin correlation structure. • Develop standard model diagnostics to assess model fit, and to compare to fitted models from other methods. • Develop workplan for addressing remaining issues and improving methods.	
Background	• Spatio-temporal modeling is a new technique for developing indices of relative abundance and length composition that shows considerable promise. • To date its application to tuna species has proved problematic because of the sparse coverage of fishery-dependent data relative to the species' habitat, expansion and contraction of fisheries, preferential sampling, and because the effects of habitat spatial heterogeneity on catch rates require complex correlation structures on multiple scales that are difficult to implement. • Currently, there are only limited guidelines for model development and selection, and a lack of standard diagnostics available to assess model fit, especially as regards evaluation of spatio-temporal correlation structures. • These shortcomings have severely limited adoption of this new technique, even though it has been shown to hold promise for some species in certain regions.	
Relevance for management	Modelling guidelines, diagnostics, and methodological improvements will make the technique accessible to more fisheries scientists, thereby improving tuna CPUE and length composition standardization methodology and assessments worldwide.	
Duration	Three days in late spring/summer 2021, after SAC-12.	
Work plan and status	• Fall 2020: invite experts, secure venue. • Winter 2021: workshop preparation. • Summer 2021: conduct workshop, write workplan. • Summer/Fall 2021: write workshop report, manuscript on model diagnostics.	
External collaborators	Shannon Cass-Calay, Southeast Fisheries Science Center, NMFS James Thorson, Alaska Fisheries Science Center, NMFS Nicholas Ducharme-Barth, SPC [not fully confirmed] Paul de Bruyn, IOTC	
Deliverables	• Report for SAC-13 and the Commission that outlines modeling guidelines and model diagnostics appropriate for spatio-temporal methods for tuna CPUE and length composition standardization. • Workplan for addressing remaining issues and improving methods. • Manuscript on model diagnostics for spatio-temporal methods to be submitted to a peer-reviewed fisheries journal.	
Budget (US$)	Regional workshop (includes travel/accommodations for several invited experts; coffee breaks for all workshop participants)	$50,000
	Total	**$50,000**

PROJECT H.1.g: Workshop on improving metrics and their scoring for the IATTC risk analysis		
THEME: 1. Sustainable Fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Develop more objective, transparent, and automated scoring of metrics for weighting models. • Improve metrics used for weighting models in the IATTC risk analysis.	
Background	• Uncertainty is an inherent quality of fisheries stock assessment and management • Uncertainty should be taken into consideration when making management decisions • Model uncertainty is a major component of the total uncertainty • Ensemble modelling requires defining weights for each model • The IATTC staff has developed a risk analysis approach to provide management advice that takes into consideration model uncertainty • The current method used to weight models it subjective • There are several groups that are currently working on diagnostics or ensemble modelling, and bringing them together with other stakeholders in a workshop would greatly benefit the effort to improve the IATTC risk analysis.	
Relevance for management	• More objective, transparent, and automated scoring of metrics for weighting models will greatly improve the risk analysis currently used for managing tropical tunas in the EPO. • It will also increase understanding and acceptance by stakeholders	
Duration	Three days in Fall/Winter 2021, after SAC-12.	
Work plan and status	• Spring 2021: invite experts, secure venue. • Summer 2021: workshop preparation. • Fall/Winter 2021: conduct workshop. • Winter: write workshop report, manuscript on model scoring metrics.	
External collaborators	Scientists from other tRFMO's and other fisheries management organizations	
Deliverables	• Report for SAC-13 and the Commission that outlines more objective, transparent, and automated metrics for scoring models. • Manuscript on model scoring metrics to be submitted to a peer-reviewed fisheries journal.	
Budget (US$)	Regional workshop (includes travel/accommodations for several invited experts; coffee breaks for all workshop participants)	$50,000
	Total	**$50,000**

Project I.1.a: Development, communication and evaluation of management strategies (MSE) for tropical tuna fisheries in the EPO involving managers, industry, scientists and other stakeholders.	
THEME: Sustainable fisheries **GOAL:** I. Test harvest strategies using Management Strategy Evaluation (MSE) **TARGET:** I.1. Conduct a comprehensive MSE for bigeye tuna and plan MSEs for the other tropical tuna species, including the multi-species fishery for tropical tunas **EXECUTION**: Stock Assessment Program	
Objectives	• Continue technical development of MSE for tropical tunas. • Provide training and enhance dialogue / communication among scientists, industry, managers and other stakeholders regarding the MSE process for tropical tunas through the facilitation of a series of workshops. • Elicit alternative candidate reference points, harvest control rules, and performance measures from stakeholders to be tested in addition to the interim ones.
Background	• The Performance Review of the IATTC, the proposed Strategic Science Plan, and the SAC all recommended improving knowledge sharing, human-institutional capacity building and communication of scientific advice. • MSE is a major objective of the IATTC and other organizations. Part of the MSE process is highly technical and done by scientists. Another part, such as defining objectives, performance metrics and candidate management strategies, requires input and participation of managers and other stakeholders. Those two parts evolve in synergy. • Stakeholder participation throughout the MSE process is central to its success and will be facilitated by the understanding of the MSE process, its components and by strengthening the communication among scientists, managers and other stakeholders. • Initial workshops on MSE where held in 2015, 2018 but were restricted to Latin-American developing countries and focus on understanding of the process. Further MSE training workshops for the tuna Industry were held in 2019. The first IATTC MSE Workshop was held in 2019. • Currently no dedicated channels of communication about MSE within the IATTC. • Current funding for technical and dialogue work expires end of 2020. SAC-10 supported the MSE Workplan and recommended continued funding support for this work.
Key reference(s)	• Resolution C-16-02; IATTC Review; CAF-05-04_Appendix-1; SAC-07-07h; SAC-08-05e(ii); SAC-08-05e(iii); SAC-10 Recs; MSE Workplan, Resolution C-19-07; 1st MSE WS Report
Relevance for management	• Key elements of IATTC's current management strategy, such as its control rule and reference points, along with alternatives, are currently being evaluated via MSE. • The technical support will allow for better model development and directly influence the relevance of the MSE results. • Workshops will improve scientists, managers and other stakeholder communication and important input for the technical work. • The current proposal will advance a comprehensive MSE process for tropical tunas to assess the performance of the interim Harvest Control Rule (HCR) and alternatives. • Results will facilitate adopting a permanent HCR for tropical tunas as per Res. C-16-02
Duration	• Current MSE Workplan extends to 2023, proposal broken down on 12-month basis.
Work-plan	• Continue technical development of MSE and support of IATTC Staff. • Development/tailoring of MSE Workshop materials and online resources to EPO tropical tuna fisheries including presentations and hands-on working sessions. • Conduct annual Workshops with managers, industry and other stakeholders to improve understanding of the MSE process, elicit objectives, performance metrics, alternative control rules, and risk, as well as to show initial results and gather feedback.

<table>
<tr><td>Collaborators</td><td>• External contractor, other external tuna and communication experts</td></tr>
<tr><td>Challenges encountered and anticipated</td><td>• Need for additional workshops to cover specific topics related to IATTC's MSE work.
• Turnover of commissioners and their staff makes important to revisit workshops.
• Lack of own funding for participants to attend
• Changes to timeline due to COVID or other unanticipated events
• The technical and communications work is conducted by a contractor whose funding expires at the end of 2020. The current delay in IATTC meetings due to COVID is a challenge for the continuation of funding of the MSE work beyond 2020.</td></tr>
<tr><td>Deliverables</td><td>• Reporting to SAC of MSE development, progress, and evaluation results.
• Series of Workshops, Workshop reports and associated training and online materials.</td></tr>
<tr><td>Budget (Option 1) 12 months</td><td>
<table>
<tr><th>MSE Development and Communication</th><th>Duration: 12 months</th><th>Cost (US$)</th></tr>
<tr><th>Item</th><th>Detail</th><th></th></tr>
<tr><td>Contractor</td><td>Facilitating of workshops, technical work</td><td>137,500</td></tr>
<tr><td>Workshops</td><td>Logistic costs for IATTC Staff, contractor (travel, lodging). Other costs covered by host CPC/sponsor.</td><td>60,000</td></tr>
<tr><td>Total</td><td></td><td>197,500</td></tr>
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<tr><td>Budget (Option 2) 24 months</td><td>
<table>
<tr><th>MSE Development and Communication</th><th>Duration: 24 months</th><th>Cost (US$)</th></tr>
<tr><th>Item</th><th>Detail</th><th></th></tr>
<tr><td>Contractor</td><td>Facilitating of workshops, technical work</td><td>275,000</td></tr>
<tr><td>Workshops</td><td>Logistic costs for IATTC Staff and contractor (travel, lodging). Additonal costs covered by the host CPC/sponsor. If need to cover participants costs, then it would be higher.</td><td>120,000</td></tr>
<tr><td>Total</td><td></td><td>395,000</td></tr>
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<tr><td>Budget (Option 3) 36 months</td><td>
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<tr><th>MSE Development and Communication</th><th>Duration: 36 months</th><th>Cost (US$)</th></tr>
<tr><th>Item</th><th>Detail</th><th></th></tr>
<tr><td>Contractor</td><td>Facilitating of workshops, technical work</td><td>412,500</td></tr>
<tr><td>Workshops</td><td>Logistic costs for IATTC Staff, contractor (travel, lodging). Other costs covered by host CPC/sponsor.</td><td>180,000</td></tr>
<tr><td>Total</td><td></td><td>592,500</td></tr>
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4. ECOLOGICAL IMPACTS OF FISHERIES: ASSESSMENT AND MITIGATION

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5. INTERACTIONS AMONG THE ENVIRONMENT, THE ECOSYSTEM, AND FISHERIES

PROJECT O.1.a: A pilot fishery-dependent ecological sampling program for EPO tuna fisheries		
THEME: Interactions among the environment, the ecosystem and fisheries **GOAL:** O. Improve understanding of the EPO ecosystem **TARGET:** O.1. Conduct trophodynamic studies for defining key assumptions in EPO ecosystem models **EXECUTION**: Biology and Ecosystem Program		
Objectives	• Undertake a pilot fishery-dependent sampling program to collect biological and ecological information for species impacted by EPO fisheries to improve our understanding of the potential ecological effects of fishing and climate change. • Use collected data to develop ecological indices and parameterize ecological risk assessment and ecosystem models for supporting EBFM.	
Background	Studies on trophic ecology, using stomach contents, stable isotopes and fatty acids, are essential for parameterizing ecosystem models and for developing ecological indices to assess the ecological impacts of fishing. Mid-trophic forage species for example form critical trophic linkages from the bottom to the top of the food web, but are poorly understood, therefore limiting overall efficacy of forecasting changes in ecosystem structure under fishing and/or climate change scenarios. Before an EPO ecological sampling program can be established, a pilot study is needed to determine what is feasible and cost-effective using fishery-dependent methods.	
Relevance for management	Accurate depictions of trophic connections are the foundation of ecosystem models that represent and quantify the complexity of ecological interactions among species or functional groups. Improving our understanding of the trophodynamics of the pelagic EPO by undertaking comprehensive trophic ecology studies for populating ecosystem models provides an important step towards evaluating ecological sustainability under the Antigua Convention.	
Duration	18 months	
Work plan and status	• Jan-Apr 2021: identify priority species, develop determine research logistics (e.g. cost, storage, supplies, etc.), and finalize a sampling protocol for the pilot study • May-Dec 2021: undertake fishery-dependent sampling of fish and elasmobranch stomachs and other tissue for trophic analyses; develop database to house sample information; systematically store stomach contents for later identification • Jan-Mar 2022: produce a report documenting sampling collections and a feasibility analysis for a larger-scale ecological sampling program.	
External collaborators	CPCs, purse-seine fishers, universities, government agencies.	
Deliverables	• Development of a cost-effective ecological sampling program for the EPO based on field-based results from the pilot project. • An ecological database to store trophic and ecological information for a larger-scale ecological sampling program to support ecological objectives of the IATTC	
Budget (US$)		**85,000**

6. KNOWLEDGE TRANSFER AND CAPACITY BUILDING

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7. SCIENTIFIC EXCELLENCE

PROJECT X.1.c: Workshop on good practices in fisheries stock assessment		
THEME: Scientific excellence **GOAL**: X. Promote the advancement of scientific research **TARGET**: X.1. Continue the annual CAPAM workshops **EXECUTION**: Stock Assessment Program		
Objectives	Initiate the development of a good practices guide for the application of stock assessment models	
Background	• Assumptions made in stock assessments vary widely among applications • There is no clear agreement on the best assumptions • There has been substantial progress made recently in understanding stock assessment models • CAPAM has held (or will hold) workshops on all the key population and fishery processes • CAPAM's major focus is the Program on Good Practices in Stock Assessment Modeling • The workshop will provide the background information to develop the good practices guide	
Relevance for management	• Stock assessments are the basis for the staff's management advice • Several aspects of the stock assessments need to be improved • A good practices guide will help improve the assessments	
Duration	18 months	
Work plan and status	• Fall 2021: invite keynote speakers • Winter-Summer 2022: prepare background materials • Fall 2022: conduct workshop, write workshop report • May 2023: report to SAC-14	
External collaborators	Invited speakers	
Deliverables	Workshop report	
Budget (US$)	Workshop expenses and invited participant travel costs	50,000