Australian Government

Australian Centre for International Agricultural Research

SRA Proposal

Small research and development activity

SRA	Towards Indonesian Sustainable Lake Management
SRA number	WAC/2024/119
prepared by	[redacted] (1) Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2) Badan Riset dan Inovasi Nasional (BRIN) National Research and Innovation Agency
ACIAR Research Program Manager	[redacted]

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Glossary

Term	Explanation
Biocultural wellbeing	The health, happiness, fulfilment, and prosperity of individuals and communities, understood and measured in ways that recognise the link between people and the environment
BRIN	Badan Riset dan Inovasi Nasional (National Research and Innovation Agency)
CRPG	Center for Regulation Policy and Governance.
CSIRO	Commonwealth Scientific and Industrial Research Agency
Integrated Landscape Approaches	A long-term collaborative process bringing together diverse stakeholders aiming to achieve a balance between multiple and (often) conflicting objectives
Lake Landscape	A geographical area that encompasses social, biophysical, cultural, institutional, and technical features. The area has fuzzy boundaries, and is influenced by endogenous and exogenous processes across space and time.
Sentinel and Satellite	Sentinel lake landscapes are primary sites for more prominent engagement. Satellite lake landscapes are sites where we build learning relationships for policy and practice, but engage less prominently.
Lake Landscape Governance	Decision-making processes that affect a lake landscape, including policies, practices, and institutional arrangements.
LIS	Lake Information System - a decision-support tool to support equitable and sustainable lake management
Plural value and knowledge systems	The existence of multiple types of values and knowledge held by an individual or amongst actors. Recognises that an individual may hold different and conflicting values at different points of time, and that different types of values exist (often referred to as instrumental, relational, and intrinsic). Plural knowledge systems may include a combination of traditional, indigenous, local, scientific, and western knowledge.
Policy regime	Cross-sectoral and cross-jurisdictional governance arrangements involved in carrying out policies
Political economy analysis	Framework to identify and analyse power, institutions, economic structures, political and social dynamics, and historical factors that influence decision-making, resource distributions, and drivers of environmental degradation
RAPTA	Resilience, Adaptation Pathways, Transformation Approach methodology

1 SRA outline

SRA number	WAC/2024/119
SRA title	Towards Indonesian Sustainable Lake Management
ACIAR program area	Water
Commissioned agent	CSIRO
Project type	Small Research and Development Activity
Proposed start date	1/02/2025
Proposed end date	30/06/2026

1.1 Key contacts

Activity leader: Commissioned agent

Title and name	[redacted]
Position	Research Scientist – Landscape Transition Scientist
Organisation	CSIRO

Title and name	[redacted]
Position	Group Leader – Environmental Informatics
Organisation	CSIRO

Activity leader: In-country research lead

Title and name	[redacted]
Position	Research Center for Limnology and Water Resources
Organisation	BRIN

Activity leader: In-country logistics and strategic facilitation

Title and name	[redacted]
Position	Director
Organisation	Center for Regulation Policy and Governance (CRPG)

Administrative contact: Commissioned agent

Title and name	[redacted]
Position	Contract Manager
Organisation	CSIRO

1.2 Summary

Lakes management is an identified priority under the 2022 Water MoU between Indonesia and Australia and is a priority under the agreed workplan. In 2022, representatives from both governments convened a workshop on sustainable lakes management to discuss opportunities for more substantial Australian support. ACIAR has responded to this demand with the support of a Small Research Activity to scope for a longer-term focused engagement of joint interest around a small set of lakes.

Indonesia has over 1500 lakes and 72% of freshwater storages are contained in lakes. Lakes play a vital role in the hydrological cycle to balance human use and natural systems

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and provide an important moderating function to mitigate against climate risks such as floods and water scarcity.

Population and economic growth have taken place in a loosely regulated system with deforestation and erosion in upper catchments. Sediment infill has substantially impacted the maximum water that the lake can store, in some cases by as much as 50%, which reduces ability to meet downstream irrigation demands and to mitigate flood risk. Development encroachment and intensive lakes-based aquaculture systems have significantly impacted water quality in many systems. Downstream users such as agriculture are increasingly required to manage water supply and quality issues and need to be more resilient to amplified flood risks. At a system level the loss of biodiversity has been significant. Climate change exacerbates many of these risks, with temperature and precipitation already trending upwards across important lakes such as Lake Toba (Irwandi et al., 2023). These changes threaten to disrupt the ecosystem services that sustain local peoples. Moreover, the future of climate change effects on these systems is uncertain. Presently, governance is multi-layered, sectoral and loosely coordinated and community involvement and education has not been fully realised.

These problems demand a science that articulates with these complexities. As such, our main research question is: **How can research drive improved lake decision making for a more sustainable and prosperous Indonesia.** This project aims to identify what needs to be done in a larger multi-year project through a multi-faceted approach. The project consists of four key components to answer our overarching research question:

1. **Lake Information System (LIS) Review and Development:** This component will review and assess existing lake information systems, identifying objectives that best serve Indonesia. We will be guided by the government's plans to ‘rescue national priority lakes’ (Presidential Regulation No. 60 2021) and the needs of Indonesian lake communities. Beyond diagnosing the current state, we will clarify the function and purpose of the LIS and how a full project investment will achieve this vision, considering policy and developmental requirements, and identifying the information requirements of all lake landscape actors for effective decision-making.
2. **High-Level Assessment of Priority Lakes:** This component will apply a multi-levelled assessment of the 15 priority lakes. A high-level assessment of the 15 priority lakes in Indonesia will be conducted to filter a subset of lakes that represent the environmental and developmental diversity of the 15. A co-generated multi-criteria assessment will be used to establish priorities for long-term deep engagement in a further narrowed selection of regions (i.e. lake landscapes). The aim is to develop a framework for selecting case studies and partners for the full project that best promote learning, innovation, and impact across scales to meet Indonesia’s objectives.
3. **Lakes and Catchments Governance Assessment:** This component will focus on evaluating the governance arrangements (both formal and informal) surrounding lake landscapes in Indonesia. The assessment will review the policy and regulatory landscape, identify current institutions and prevailing political and economic factors that shape lake conditions, and explore opportunities for improved decision-making. Lessons from international cases will be incorporated to suggest pathways for enhanced governance and policy reforms.
4. **Development of a Full Proposal for a Larger Multi-Year Project:** Based on the findings from the previous components, a full proposal for a larger project on priority lakes management in Indonesia will be developed. This will include a theory of change and a clear pathway to impact, ensuring that the proposed activities are aligned with long-term sustainability goals and national priorities for lakes, communities and agrifood systems.

We shall pursue these interrelated components as activities in synergy with each other. We reference the above text throughout the document as summaries (i.e. see summary 1.2.1

– 1.2.4). Through these activities the project seeks to establish a strong foundation for future efforts in improving lakes management in Indonesia, contributing to the ecological, social, and economic well-being of the country.

1.3 Partnership capabilities

Team Leads	Organization	Capabilities & Contributions
[redacted]	CSIRO	Co-project leader, landscape transition scientist. Research lead on the broad-based Indonesian and lake landscape contexts. Contributing to overarching approach, strategy, tactics, including cross-country and inter-institutional engagement. Contributing the mainstreaming of sustainability, equity, resilience into the research components and objectives.
[redacted]	CSIRO	Co-project leader, digital systems specialist. Commissioned organization administrative lead, and research lead for deploying appropriate water capabilities. Contributing project management and internal coordination and thinking around impact for LIS research implementation.
[redacted]	BRIN	Co-project leader, limnologist. Contributing to in-country research project coordination and water-relevant sustainability thinking, strategy, and tactics. Lead for linking CSIRO and BRIN engagement with relevant in-country capabilities.
Commissioned Organisation Research Team Contributions		
[redacted]	CSIRO	Expert water resource planning. Leading LIS system review and development component of research.
[redacted]	CSIRO	Sustainability science, institutional analysis, systems analysis. Leading governance assessment activities and ensuring LIS system development builds from and contributes to sustainable and equitable lakes governance arrangements. Contributing to policy, enterprise and practice considerations.
[redacted]	CSIRO	Strategic designer. Leading project delivery design and facilitating iterative Theory of Change activities - documenting assumptions, logic, and interventions. Tracking and stress-testing the clarity of goals, problems, and change-logic for the research.
[redacted]	CSIRO	Expert water science. Advising and identification of other capabilities that would contribute to fit-for-purpose information systems that support lake sustainability (such as fisheries, aquaculture, environmental/ecological economics)

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Partner Team Contributions		
[redacted]	BRIN; Research Center for Limnology and Water Resources	Surface water hydrology, hydro-ecological guidelines for restoration, Stakeholder networking. Contributing to the development of the LIS governing architecture and internal LIS components.
[redacted]	BRIN; Research Center for Limnology and Water Resources	Lake water quality management. Contributing the end-user efficacy of the LIS, ensuring data and inputs come from wide range of actors affecting water quality and capture the relevant ecological variables and dynamics.
[redacted]	BRIN; Research Center for Limnology and Water Resources	Nutrient transport and catchment management. Contributing to ecological monitoring, fieldwork and data management.
[redacted]	BRIN; Research Center for Limnology and Water Resources	Urban and regional planning, land use/land cover modeling and environmental carrying capacities. Contributing to land-use and future climate scenario modelling
[redacted]	BRIN; Population Research Center, specializing in Human Ecology	Natural Resource Governance and Management. Supporting the governance assessment and theory of change work. Contributing to entrepreneurial and business model thinking, contributing to aspects of values, equity and wellbeing,
Third Party Contributions		
[redacted]	Center for Regulation Policy and Governance (CRPG)	Third party lead, director CRPG, water law and policy. Brings over 15 years of experience in Indonesia's water law and governance. Will link project to key policy actors in government, civil society organizations, and private sector players. Dr Mova will guide and advise project implementation and will be supported by an as yet assigned Project Manager and Legal Analyst with experience in stakeholders' engagement. This analyst shall assist the team's preliminary analysis and stakeholders mapping of Indonesia's lakes.
[redacted]	Center for Regulation Policy and Governance (CRPG)	Logistics and financial administration, facilitating stakeholder engagement. The project's logistical and administrative needs will be managed by our Administrator and Event Organizer, Mr Agus Setiawan, who has a proven track record in organizing complex workshops and managing stakeholder relations.

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2 Justification

2.1 Partner country and Australian research and development issues and priorities

The ACIAR Water Program aims to improve the lives and outcomes of rural communities through policy and place-based interventions through efficient, sustainable water use to support agricultural production in a context of an increasingly uncertain climate.

This project is an identified priority under the Water MoU between Indonesia and Australia. The proposal responds to a request for support from the Indonesian Government (see letter of support from the Ministry of National Development Planning - BAPPENAS) and has been developed with the support of three Commonwealth Government agencies (DFAT, DCCEEW and DAFF).

The Government of Indonesia has sought support from Australia for a study to bridge the gap between scientific knowledge and practical (and supported) solutions to the complex and pressing problems affecting Indonesian lakes and adjacent local communities. BRIN has developed knowledge portals such as SIDanau (https://sidanau.brin.go.id/) to engage the community, knowledge providers and decision-makers in lake management. This is a good base because up until now, there was no single platform for information on Indonesia's lakes. The experience of developing the platform provides an opportunity to go further and provide the indicators that Indonesia's society needs to evaluate their restoration and intervention programs.

Further, the findings of this study will support lake stakeholders to develop strategies to mitigate and adapt to environmental pressures, including mitigate and adapt to climate change impacts (e.g. temperature related heat stress and increased flood risk) and uncertainties in the effect of these changes on the ecology and environmental functions of the region. Individual lakes and lake communities face many unique issues, which need careful consideration, tailored strategies and approaches. For target lake systems, interventions are anticipated to improve livelihood outcomes for communities reliant on healthy lake systems for their livelihoods, to build resilience to shocks and improve capabilities to thrive in the face of uncertain climate change impacts.

Strategic alignment:

This proposal aligns with several Sustainable Development Goals and accords with DFAT's Climate Change Action Strategy (2020-25).

The proposal is well-aligned to Australia's 2023 International Development Strategy and the Australia-Indonesia Development Partnership, which prioritises equitable and sustainable economic transition, climate resilient communities and strong institutions.

The proposed project is an identified priority under the Australia – Indonesia MoU on Water. Priority lakes management is also identified through a Presidential Decree (Perpres 60/2021 on Rescue of National Priority Lakes).

This project extends ACIAR's programmatic footprint into Indonesia through a systems lens. It is aligned with the ACIAR 10-Year Strategy (2018-27), by focusing on reducing poverty in rural communities, promoting economic growth through resilient local enterprises and markets, adapting to climate challenges, enhancing gender equality, and strengthening scientific and decision-making capacities.

Research strategy:

Lake systems in Indonesia provide most freshwater resources. Lake health is key to the livelihoods of many smallholder farmers and rural communities. Healthy lakes perform vital ecosystem functions and services including mitigating flood risk and supporting water security. Healthy lakes and their constituent ecosystems are more resilient to changes in climate, which is essential for future-proofing Indonesia's society against the uncertainties of climate change.

ACIAR is well-positioned to work with Australian and Indonesian collaborators to identify R4D needs that draw on Australia's expertise and add value to existing Indonesian and partner investments, in particular, to facilitate discussion on the balance across institutional and community capacity building, and technical interventions.

Relevant ACIAR work

- WAC 2022 152 Climate resilient and adaptive water allocation in Pakistan.
- ADP 2015 043 Agricultural Policy Research to Support Natural Resource Management in Indonesia's Upland Landscapes.
- FST 2021 145 Retaining the Jewels in the Crown: Kalimantan Peat Forest Remnants.
- FST 2016 144 Improving community fire management and peatland restoration in Indonesia

Relevant external work in progress

- DFAT has supported development of a Water Information System Roadmap for Afghanistan, which was developed by CSIRO and the Bureau of Meteorology[3]. The framing and architecture for this project relevant.
- CSIRO AquaWatch Mission, focused on establishment of an integrated ground-to-space national freshwater and coastal water quality monitoring system for Australia[4].
- Indonesian Government initiatives such as the 'Sustainable Development Management of Limboto Lake', one of the 15 priority lakes.
- Global Environment Facility has funded ~USD$500m in South Pacific nation projects (including Indonesia) to broadly support National Food Systems Transformation Pathway outcomes.
- Compendium of Concrete Deliverables and Actions; Ministerial Declaration 10th World Water Forum Bali, 21 May 2024: A list of commitments -- actions, projects and resource allocations can be found at https://worldwaterforum.org/outcomes including lake specific projects in Indonesia.
- The Australian Water Partnership supports the UN Food and Agriculture Organization (Water Scarcity Program) through technical engagements around catchment water resource assessment, planning and allocation. These are run in conjunction with Indonesian government partners (Bappenas), Alluvium and Water Stewardship Indonesia.

Potential Development Scaling Actors

- DFAT - through the Water MoU with Indonesia and new investment directions.
- Indonesian Government – extension of the project to all priority lakes and beyond.
- Multilateral Development Corporations – for example FAO's Asia Pacific Water Scarcity Program and ADB's Asia Pacific Water Resilience Initiative.

3 Objectives and deliverables

3.1 Objectives

The project's indicative overarching goal is to enable advancements to improved environmental condition to support lake livelihoods and communities.

The project's key objectives are to co-develop a shared understanding of current gaps and opportunities in Lake Information Systems between Indonesian and Australian research collaborators [Obj 1]. It will establish agreement on the selection of lakes for ongoing research, aiming to enhance decision-making systems for sustainable lake management [Obj 2]. The project also seeks to identify and address governance opportunities and constraints for improved stewardship, with a focus on fostering collaboration and commitment among stakeholders [Obj 3]. Ultimately, it will define collaborative research priorities for a partnership to advance sustainable and equitable lake management [Obj 4].

3.2 Activities

We will work with partners to explore and address issues related to lakes. Our goal is to build a long-term research project that has a significant positive impact on selected lakes across the country. We will start with four main activities:

1. **Review Lake Information Systems**: Understand how we collect and manage data about lakes.
2. **Assess Priority Lakes**: Identify and study the most important lakes to understand their issues in more detail.
3. **Evaluate Governance**: Analyse the formal and informal decision-making processes affecting lakes and their surroundings.
4. **Develop a Full Proposal**: Create a detailed plan for a larger, multi-year project.

These activities will help us build a strong foundation for future efforts to improve lake management in Indonesia, benefiting the ecological, social, and economic well-being of lake communities.

We will carry out these activities through a series of workshops and engagement processes:

- **Workshop 1**: An initial workshop in Lake Toba in February 2025, with research partners and key national actors. We will also engage with local and regional stakeholders.
- **Between Workshops**: Maintain engagement with partners and key actors, attend conferences, and engage with local lake landscape stakeholders to gather information, conduct interviews, and build relationships.
- **Workshop 2**: A follow-up workshop in Australia after the World Lake Conference in July 2025 to review gathered information.
- **Workshop 3**: A final workshop in Indonesia in October 2025 to develop the full proposal, with stakeholder input.

Throughout the project, we will continue to engage through:

- **Fortnightly Virtual Meetings**: Regular meetings with project partners and occasional guest speakers to share lessons from international case studies.
- **Meetings with Government Agencies**: Maintain communication and updates with key government actors.
- **Informal Meetings**: Build relationships, explore partnerships, and gather information through informal meetings with various stakeholders.

These engagements over 12 months will strengthen our social and research capabilities and ensure meaningful involvement with lake-related partners. These engagements are reflected in our methodological framework (**Figure 2**), and overarching strategic project design (Figure 7).

Based on a February contract start date, the project schedule is shown in Figure 1 and the list of deliverables in Table 1.

Table 1. Deliverables for the SRA

#	Title	Date
1	Lake Information System draft review report (methods in 3.2.1). Approximately 40 pages including review of existing system, needs analysis and recommendations for lake information system development.	15 February 2026
2	Report on case study selection and intervention change-logic (methods in 3.2.2)	31 October 2025
3	Lake governance assessment framework (methods in 3.2.3)	31 January 2026
4	Project proposal, incorporating participatory Theory of Change material (methods in 3.2.4), LIS review report and draft final report	31 January 2026
5	Final Report	30 June 2026

The methodology section details how we will develop the deliverables.

Title: Indonesian Lakes Project: A scoping study

Project	Start date 1/2/2025	2025												2026											
ACTIVITIES		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Project Activities																									
Task 1.1	Preparation (establish project governance, research plan and ethics)																								
Task 1.2	Inception (**first** meeting of partners, literature review)																								
Task 1.3	Issue validation (**second** meeting of partners, deploy survey instrument)																								
Task 1.4	Proposal writing (**third** meeting of partners, theory of change documents)																								
Task 1.5	Concluding activities (revising final report, acceptance of full proposal)																								
Deliverables																									
Deliv 1.1	Lake Information System draft review report																								
Deliv 1.2	Report on case study selection																								
Deliv 1.3	Lake governance assessment framework																								
Deliv 1.4	Project proposal and draft final report																								
Deliv 1.5	Final report																								

Figure 1. Project plan for tasks and deliverables of the SRA

3.3 Intellectual property and other regulatory compliance

See Intellectual Property Register at Appendix A.

4 Methodology

We will co-design the methodology with stakeholders using participatory methods and adapt the approach with the ultimate goal of transformative change for lakes. Our overarching research question is: **how can research drive improved lake decision making for a more sustainable and prosperous Indonesia?** We begin this work from a hypothesis: that the holistic methodological framework for approaching the problems of Indonesia's priority lakes, would be well-guided by innovations in place-based, sustainability transition science, what we indicatively call landscape transition science (Langston et al., submitted). This science helps define a research endeavour that combines numerous methodological entry-points for solving complex, wicked problems in locally embedded ways, and is responsive to plural kinds of knowledge and value systems.

Lakes are part of landscapes (social-technical-ecological systems) affected by internal and external drivers of change. Lake sustainability issues are cross-sectoral; environmental stewardship of lakes and catchment areas involves numerous actors. Lakes can exist in different formal land-use types (i.e. within state forest lands and shaped by forestry concessions, and tenure insecure local peoples, and other land uses shaped by estate crops like oil palm, or smallholder agricultural land), with overlapping institutions. Within these landscapes, lakes face several challenges to their ecological health, water quality, and functions that benefit local communities. Therefore, achieving a proposed objective of "improved environmental condition for livelihoods and communities" requires dealing with these broader landscape contexts – which define how watersheds, catchments, basins form and function. These broader landscape contexts also must anticipate future climate change effects. We approach 'lakes in the landscape' issues cognizant of the full spatio-temporal drivers of landscape resilience, which include prosperity and wellbeing. Landscape transition science in this context is a grounded approach to being value-centred, for the purpose of innovating the knowledge and rules that make lake decision-systems meaningful and legitimate. As such, we will consider businesses, cultural traditions, and ways to improve well-being in relation to past experiences, current issues, institutional arrangements, and future climate impacts.

BRIN has developed information systems with the intent of supporting decision that reverse degradation trajectories of lakes (i.e. https://sidanau.brin.go.id/). BRIN's systems are novel in the use of 'organic' data - generated through participatory, citizen-science involvement, and is openly accessible, and easily understandable. BRIN is interested in advancing these approaches to define the qualities of lakes worth conserving and restoring, responsive to plural and just values systems. CSIRO has developed methodologies that would respond to this need, and advance transformative change for lake systems (i.e. "RAPTA", Resilience, Adaptation Pathways, Transformation Approach). This methodology has been applied in similar contexts to lakes, (see examples), including in Indonesia's peatlands. Careful entwining of our methodological and technological capabilities will allow us to create some inertia towards institutional learning for sustainability transformations of lake landscapes. Integrating values, knowledge, and rules (three interlinked loops in RAPTA - Figure 2) has been identified as where science can effectively engage with decision-making systems, and their underlying drivers of change. RAPTA is one example of a methodological instrument for advancing landscape transition science; we have adopted it to ground and demonstrate how our research embeds into values-systems and institution building processes. We anticipate that the current unfolding changes in Indonesia's machinery of government (federal and local elections) may impact our ability to form durable connections during this SRA. However, these dynamics provide opportunities to support our local partners to embed our work into impactful policy and decision-making settings as the new institutional structure settles. We outline our adaptive actor-engagement strategy in sections 4.1.4 and 4.1.5.

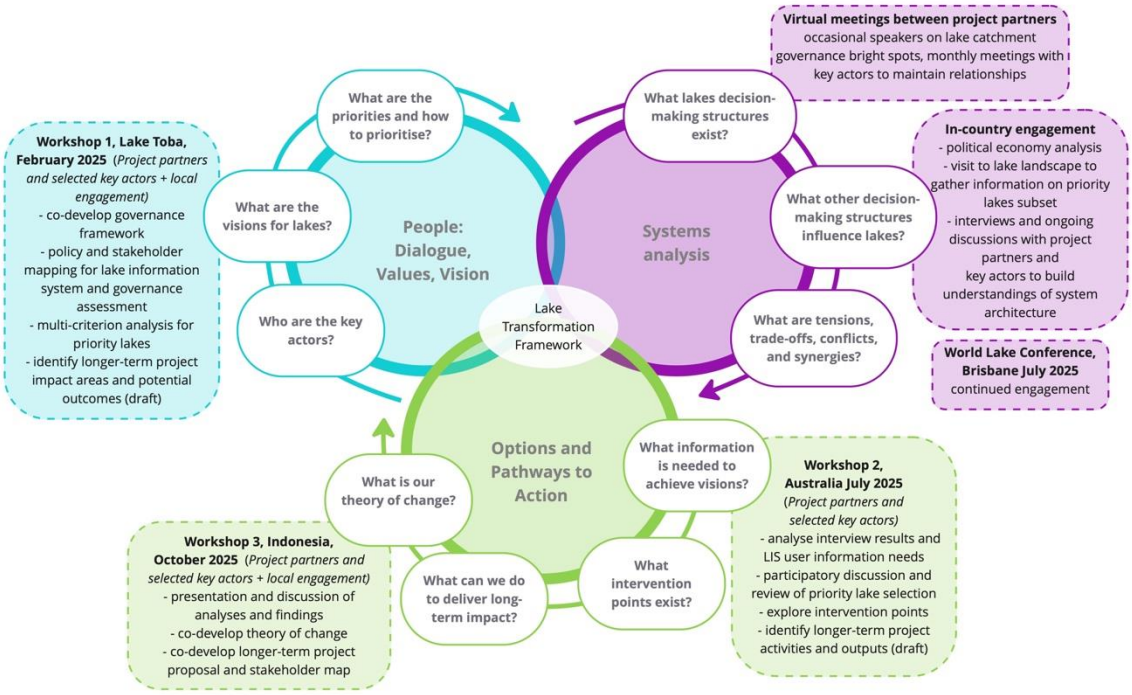

Figure 2. Lake Transformation Framework for this SRA. Adapted from the RAPTA methodology framework. Sourced from O'Connell et al. (2019) *Resilience Adaptation Pathways and Transformation Approach*.

Indonesia's 15 national priority lakes are spread across several provinces, each with their own cultural, environmental and economic attributes (see Figure 3). Since Reformasi, Indonesia's natural resource governance has become increasingly polycentric and decentralised, yet remained siloed and sectoral. This has given rise to complexity and ambiguity. Indonesia's historic and current development trajectory has also led to competition over land and water, with detrimental impacts on the environment. These are key factors that should be considered when considering how to shift lake landscapes into an improved state.

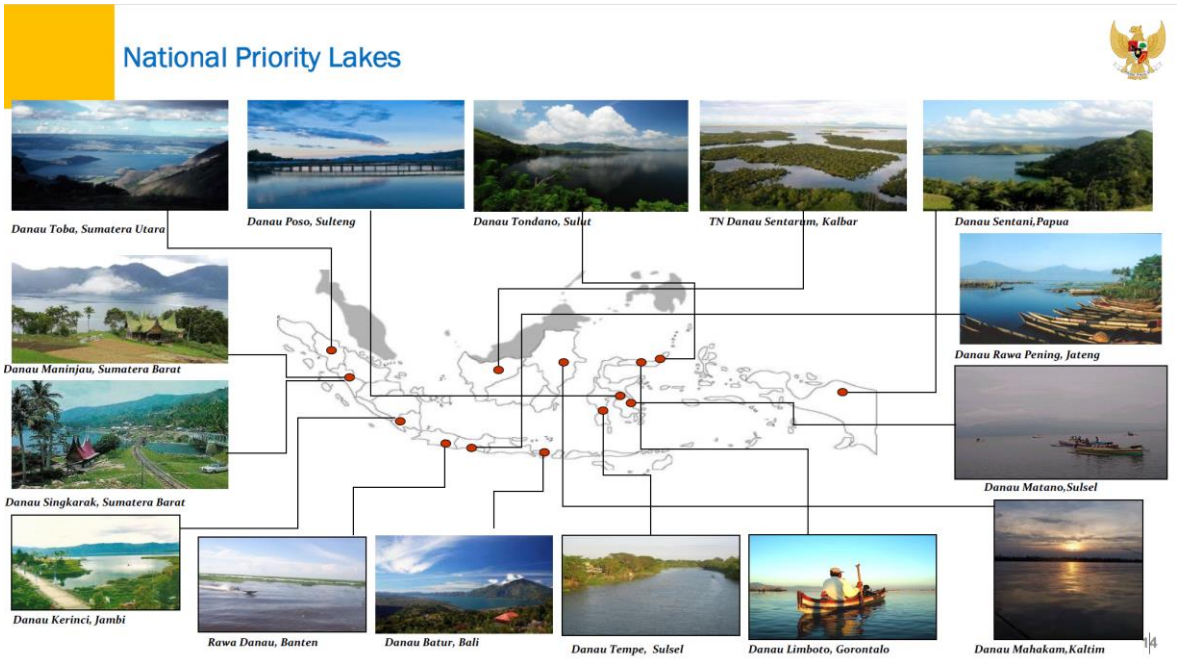

Figure 3. National Priority Lakes (courtesy GoI background material)

4.1 Lake Information System Review Method

See summary 1.2.1

The Indonesian government is working on managing lakes better at both national and local levels. These actions include creating Integrated Lake Management Plans for priority lakes and incorporating them into regional and national development plans. These plans cover things like land management, water quality, biodiversity, waste management, sustainable farming and fishing, and improving people's lives.

LISs should help with making decisions and supporting everyone involved in lake management. LISs can help improve governance, make management choices clearer, and provide information to keep lakes healthy and support communities.

We will review the LIS and align it with governance assessments (see Figure 4). First, we will look at existing plans and policies and identify the LIS objectives through workshops and interviews with Indonesian partners. Second, we will identify who uses the LIS and what information they need. This will involve mapping stakeholders, holding workshops, and reviewing past activities and policies. We will also identify non-users who influence the LIS but don't use it regularly.

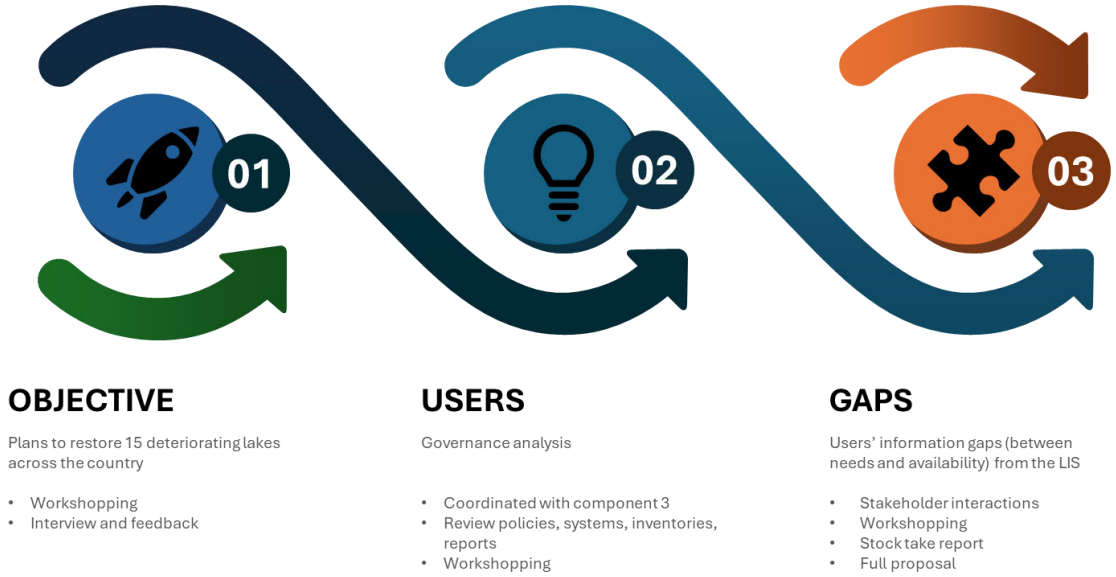

Figure 4. Lake Information System Review Steps

Based on this, we will create an interview guide to find out what information the LIS should provide and identify any gaps. These interviews will be done before the second workshop. By combining LIS user questions with governance assessments, we aim to understand how the LIS can support decision-making for the range of key lake actors.

Lake information is currently available through the SI Danau (sidanau.brin.go.id), launched by BRIN in May 2024. This information integrator system is a platform for storing, retrieving, and sharing information. Efforts are ongoing to analyse and use it to make informed decisions. We will check the current state of data and information in this system. Since lake information is spread across different agencies, we will gather LIS-related information. Working with BRIN and local staff to collect input from other agencies and stakeholders to understand existing data and users.

We will use a systems approach to explore five areas: data ingestion and database, modelling, service delivery, capacity development, and institutional systems. The results of this review will help us prepare a full proposal to strengthen the LIS as a decision-support tool for lake management. The steps involved will include:

1. Understanding lake-related information systems in Indonesia through interviews, focusing on LIS objectives and user needs. This will be facilitated by CRPG and analysed in the second workshop.
2. Compiling responses into a report for stakeholder review.
3. In the third workshop, reviewing responses with key actors and partners, explore key themes, and provide input into the full proposal design.

4.2 Framework for Selecting Priority Lake Cases

See summary 1.2.2

We will undertake a two-stage high-level review of Indonesia's 15 priority lakes. The first review will build upon previous work (such as the criteria used to determine the original 15 lakes, articulated in Presidential Decree regulation no.60 2021). This stage will filter the 15 lakes down to four that best represents the diversity among them. Stage two will involve diving deeper into the complex dynamics of those four representative lakes. We will explore

the growth of thinking and changes in priorities among concerned policy-makers and scientists.

A participatory multi-criteria assessment will establish which values are worth prioritising for a selection of lakes for longer project engagement (Foran et al., 2019; Straton et al., 2011). This selection will involve two primary sites (sentinel lake landscapes) for comprehensive embedding and two additional sites (satellite lake landscapes) for cultivating relationships and knowledge exchange. This approach ensures learning across diverse contexts and reduces project risks if one site becomes untenable. The process is designed to be robust and repeatable for similar exercises elsewhere in Indonesia.

We will engage in high-level workshops to:

1. Review options with stakeholders to filter a subset of four representative lakes.
2. Present information about these lakes and their upstream catchments.
3. Describe potential criteria for selecting the final lakes.
4. Ask stakeholders to rate the importance of these criteria.
5. Share the results and seek feedback on the outcomes.

Initial criteria will include environmental dimensions (such as biophysical characteristics and climate vulnerabilities), developmental dimensions (such as institutional arrangements and human development), and opportunities (such as current projects and initiatives). We will develop these criteria anticipating climate change, to future-proof lake management pathways.

We shall apply landscape transition science to understanding these interrelated environmental and development dimensions. This multi-scalar thinking around sustainability transformations links the more conventional frameworks (such as Driver-Pressure-States-Impacts-Response (DPSIR) frameworks), with futures thinking, and value-centred approaches, to enable learning pathways for lake transformations (as outlined in **Figure 2**). The multi-criteria assessment forms part of the deliberative process of these learning and action pathways.

Finally, we will collate responses into a report for review by stakeholders, including the methodology for future high-level choice exercises.

4.3 Lakes and Catchments Governance Assessment

See summary 1.2.3

The governance assessment will elucidate how decisions are made regarding lakes, catchments, and their surrounding landscapes. The assessment will involve key actors and institutions directly engaged in lake governance, as well as the formal and informal actors and institutions that influence the conditions of lake landscapes, such as multi-scalar economic, social, and bio-physical drivers of change. The main activities of the governance assessment will be completed during workshops *with* key people, guided by participatory systems inquiry (Burns, 2012). This will help to:

- Create greater understanding of how science can be positioned to steer positive change in the system through policy and practice.
- Understanding ‘how change happens’ in the context of complexity and uncertainty.
- Highlight pragmatic ways forward, explicitly acknowledging the roles of both formal and informal decision-making systems.
- Generate information for the LIS review, including key policy objectives, actors (users and non-users) and information required for the LIS to be fit for purpose.

The governance assessment will be co-designed in workshop 1. We aim to combine (i) normative aspects of effectiveness, inclusivity, transparency, accountability, and (ii) critically interpretive aspects of power and worldviews. We propose an interdisciplinary approach to governance assessment will involve a nested diagnosis with three stages:

1. Characterise and map Indonesia lake and catchment governance using a policy regime lens (including identification of users).
2. In-depth understanding of decision-making through political economy analysis.
3. Actor network analysis to position the project within decision-making systems and uncover potential leverage points for change.

The governance assessment framework will be designed for use in the full project. The diagnosis will be completed in this project to collect preliminary information and refine and adapt the framework ready for use at the landscape-scale. The diagnosis starts with mapping lake and catchment governance through a policy regime lens (May & Jochim, 2013). A policy regime is the governance arrangements that are involved in carrying out policies. As lake and catchment governance crosses sectors and jurisdictions, this approach will allow us to capture the full range of policies that influence lake landscapes. In **workshop 1**, we aim to characterise the lake and catchment governance regime in Indonesia, mapping key actors, commitments, institutions, and interests. In this workshop, we will define what we mean by “lake landscape governance”.

After workshop 1, we will then focus on in-depth understanding of governance arrangements, described as a political economy analysis. This layer of analysis will uncover the prevailing political and economic processes and practices that shape lake conditions at the landscape-scale. Political economy analysis can help to make sense of lake stewardship, identify values that actors hold over lakes, and where values conflict with sustainability. The preliminary analysis will be a combination of a desktop and field engagement with a sub-set of lakes, linking local context to provincial, national, and international arrangements. The field engagements will be facilitated by CRPG, to link BRIN and CSIRO with relevant people and knowledge bases in the landscape This will involve engagement with local lake landscapes actors, meeting with leaders and stakeholders to understand local context, management practices, and drivers of change. Engagement with national-level actors will occur during conferences and organized meetings online or in Jakarta. We will compare findings in Indonesia with international bright spots of catchment governance, helping to identify lessons and opportunities for improvement.

We will then conduct actor network analysis to better understand how research and governance interventions can drive change. Network analysis allows for exploration of how information and innovation is shared, how influence or power is exerted, and where potential leverage points for change exist (Prell et al., 2009; Riggs et al., 2020; Terhorst et al., 2024). Network analysis has been used in water governance to reveal informal decision-making processes and points of intervention for collaborative governance (Stein et al., 2011). The network analysis activity will be carried out prior to workshop 2, using questionnaires with key actors at national, regional, and landscape scales (aligning with LIS user questionnaires). Interviews will be conducted in-person when possible and online, led by BRIN and CRPG. For local and regional actors, interviews will take place during lake landscape visits, timed to have least impact on local communities. Results will be analysed in workshop 2 and used to guide the Theory of Change in workshop 3.

4.4 Development of a Full Proposal for a Larger Multi-Year Project

See summary 1.2.4

The initial SRA work is built around the idea that there are three interrelated dimensions of work to be fulfilled in the larger project.

1. **Data and Information:** Bridging information gaps to support decision-making for lake management, monitoring, evaluation, and learning.
2. **Shared Commitments:** Continually connecting consensus-making with information pathways
3. **Projection and Scenarios:** Cumulative and stakeholder-led impact assessment for continual assessment of the effectiveness of lake management

Using co-design principles, we will apply participatory Theory of Change methods to lay out a pathway for our actions in ways that integrate the above domains of work. We will examine the converging and diverging mental models among the research collaborators and make assumptions explicit.

We will continuously discuss, co-develop and document the activities and outputs for this project, so that a consistent record is kept of progress towards achievement of outcomes. This information will also be used as the basis for the full proposal for a larger multi-year project. By continuously documenting the outcomes achieved by the current project activities and noting the further ambitions and objectives which can be achieved from a larger multiyear project across governance, information systems and case studies, the project team will be able to best coordinate their research efforts in the short and long term.

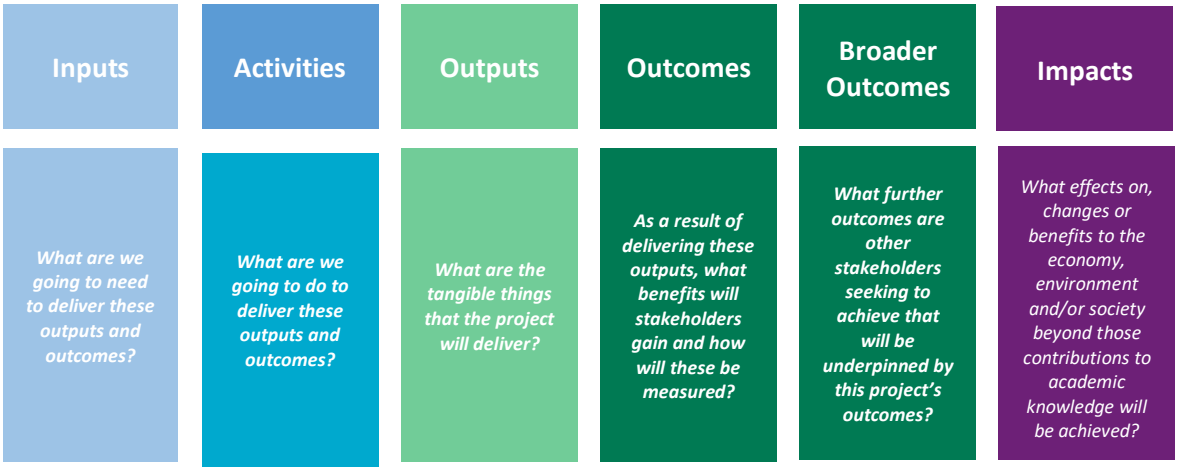

Figure 5. Strategic Design Impact Framework

To record progress and develop future project plans, the project team will discuss and co-develop ideas related to future impacts and outcomes which can be achieved, and the various inputs activities and outputs which will be required to achieve them. Extensive engagement with the broader stakeholder networks will ensure current and future project plans deliver benefit to communities impacted by lake management activities, and ensure value for researchers and investors.

Utilising a strategic design impact framework (Figure 5), the larger multi-year project plans will be co-developed iteratively throughout the course of this project. Stakeholders will be engaged in co-design activities and collaborations to identify future areas of impact and collectively define the preferred outcomes, required outputs, necessary activities and breadth of inputs required to successfully deliver the larger project. Effectively, at each engagement point in the project (workshops, interviews, meetings), stakeholders will be asked to reflect on:

- **Areas of impact** – *what effects on, changes or benefits to the economy, environment and/or society, beyond immediate contributions to academic knowledge, can be achieved through the longer-term project?*
- **Broader outcomes** – *what further outcomes are other stakeholders seeking to achieve, which can be informed or underpinned by the longer-term project's outcomes?*
- **Outcomes** – *as a result of undertaking this longer-term project, what benefits will stakeholders gain and how will we measure these achievements in the future?*
- **Outputs** – *what are the tangible things that the longer-term project can deliver? Who might be responsible or accountable for these, and who might benefit?*
- **Activities** – *what are we going to do to deliver the longer-term project outputs, achieve the outcomes and head towards impact? Who will be involved, and how might they best be included?*
- **Inputs** – *what resources will be required for the longer-term project to action the activities, deliver the outputs and achieve the outcomes? Where might these resources be located, and how might we connect and/or leverage them for maximum efficacy and efficiency?*

The information generated by stakeholders at each project activity point will be documented and reviewed by the Research Leadership Team, communicated to the Project Leadership Team, and regularly reported to the Steering Committee for feedback (see 5.4). This information will inform the development of the larger multi-year project plans, and include extensive reference to stakeholder roles, responsibilities and capabilities. Further, opportunities for capacity building and diversity inclusion methods will be identified and integrated into the broader project planning process. This will ensure that the current and future projects engage extensive stakeholder networks and account for inclusion of diverse genders and cultures in all levels of program delivery.

An example of the strategic design impact framework in action has been drafted for this initial project, to demonstrate at a high-level what a future plan for the longer-term project might include – with reference to indicative broader outcomes and impacts. Please see Figure 6 for details.

1. Using co-design, build and apply a Theory of Change to help define the broad scope and finer detail to guide and build the proposal.
    a. Built in concert with key actors identified in above activities.
2. Build collaborative commitment through international conference events, workshops, and virtual meetings. During events, we will present as a collaborative research initiative to the relevant audience.
3. Workshop (3) – come together and workshop, brainstorm, and write a project proposal, in line with the Theory of Change above.

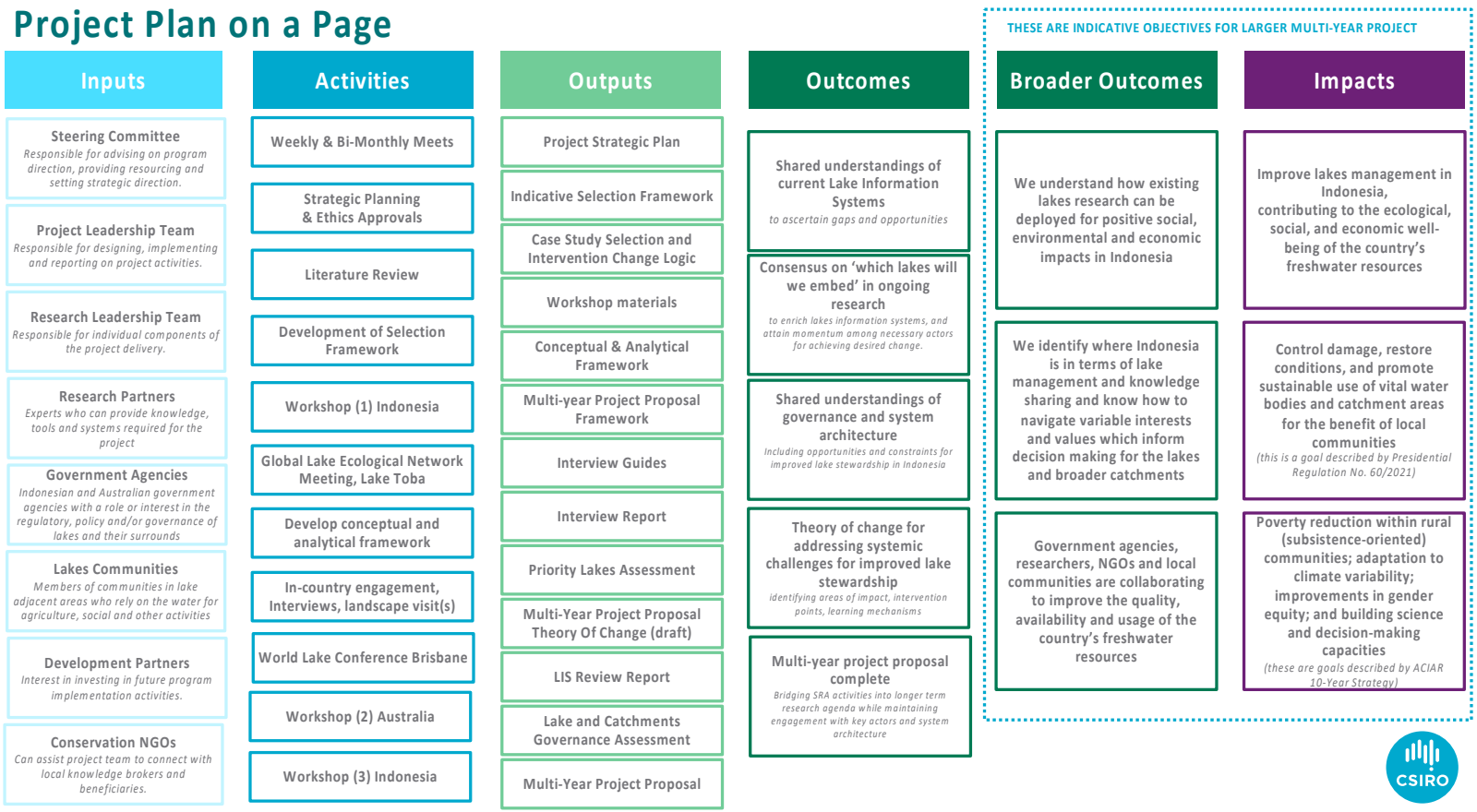

Figure 6. Strategic Design Impact Framework, with an example of this current project's proposed inputs, activities, outputs, outcomes and indicative broader outcomes and impacts (these will be reviewed and refined in the first stages of the project with all collaboration partners and are provided here as a draft concept only).

5 Operations

5.1 Actor engagement strategy

We foresee the need to anticipate substantial changes in the lake-relevant institutional arrangements over the coming 6 months. This is an ongoing result of the new cabinet emerging from current elections, which has changed how many ministries exist, their scope, and how they coordinate and are governed. We shall engage CRPG as third party, to facilitate CSIRO and BRIN engagement activities in Indonesia. CRPG, as in-country partner, would connect with key people as the institutions change, act as policy innovation brokers, and manage operating funds for workshops and similar.

The initial draft of stakeholder mapping (see Figure 7 overleaf) shows that we will work to tie-together BAPPENAS and the relevant Coordinating Ministry for the Ministries of Environment and Forestry, Public Works, and other lakes relevant ministries. We will seek to build connective tissue between these organizations by using the workshops as deliberative policy-innovation platforms. We will connect with the lakes taskforce roundtables that were setup in the previous administration to strategize the best institutional pathway forward. In high-level workshops, we shall consider which line ministries (e.g. the Ministry of Home Affairs), and key actors with whom we should prioritize engagement for in the long term, at national level, and landscape level. This is presented as a high-level actor engagement map in Figure 7.

Beyond the high-level strategy, we will facilitate engagements at multiple levels and in multiple settings. In addition to the high-level workshops (which function as punctuated events bringing the research team and relevant key actors together in settings that are useful for exposure and understanding), regular fortnightly meetings using appropriate communications technologies (tele-conferencing and other telecommunications), and on the ground interactions with lake-relevant actors. Regular meetings will bring together the project team but will also bring-in advisory and resource personnel with invaluable expertise and experience (Indonesian, Australian, and International) on water and lake landscape resource governance. These resource personnel will interact with the team, and when appropriate and feasible, key actors (such as those listed in column two of Figure 7), and shall provide insights to what solutions are feasible and relevant to the challenges facing Indonesia's national priority lakes and our research. BRIN and partner organizations will conduct both purposeful and opportunistic meetings (and when feasible, joined by CSIRO researchers) in order to scan the actor-playing field and ensure we position this research, and its objectives and actions in the right places, with the right people, to fit our purpose (to enable advancements to improved environmental condition to support lake livelihoods and communities).

Also, as identified in section 4.1.4 above, a wide range of stakeholders will be engaged at each point of project delivery, and throughout, during regular meetings and field-based interactions. Understandings of who to engage, when and how, will be iteratively explored by research members throughout the project, with assistance of the in-country partner. The information generated by stakeholders at each project activity point will be documented and reviewed by the Research Leadership Team, communicated to the Project Leadership Team, and regularly reported to the Steering Committee for feedback. This information will inform the development of the larger multi-year project plans, and include extensive reference to stakeholder roles, responsibilities and capabilities. Further, opportunities for capacity building and diversity inclusion methods will be identified and integrated into the broader project planning process. This will ensure that the current and future projects engage extensive stakeholder networks and account for inclusion of diverse genders and cultures in all levels of program delivery.

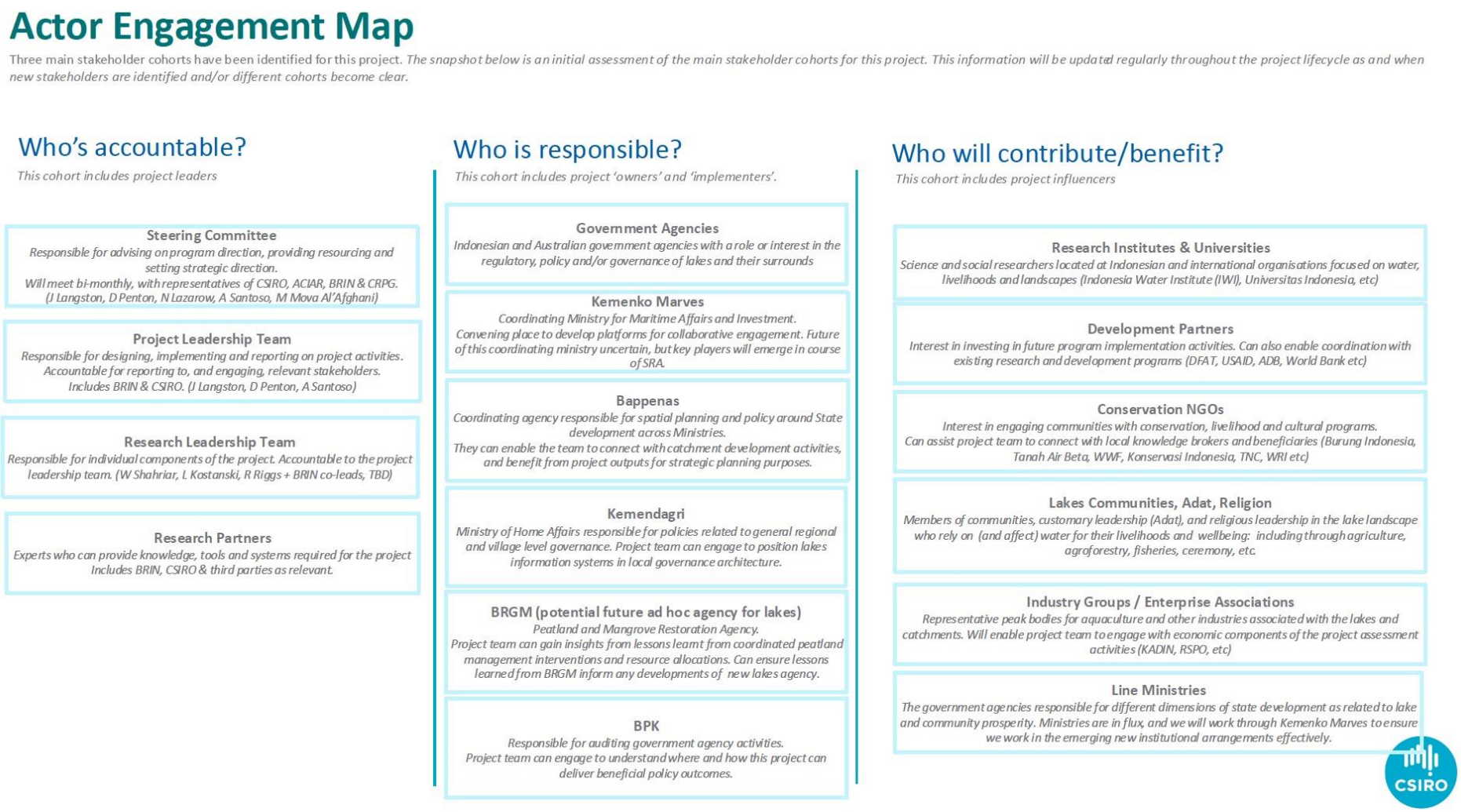

Figure 7. Stylised high-level actor engagement map (actual people will be identified during SRA process)

5.2 Ethics

We will be submitting ethics approval applications. This process requires submissions by CSIRO to its human research ethics committee and by BRIN to the relevant Indonesian ethics committee. Additionally, we will obtain the necessary Indonesian research permits to ensure compliance with local regulations.

5.3 Gender and equity mainstreaming

In the development and review of lakes governance, gender mainstreaming (UN Women, 1995) will be implemented as a core strategy to ensure that both women's and men's perspectives, needs, and contributions are equitably integrated into all stages of the process. This aligns with the ACIAR Research Proposal Gender Guidelines (Caffery, 2017) and Principle 3 of the Integrated Water Resource Management (IWRM) framework (ICWE 1992), which emphasises the importance of equitable and inclusive water resource management that accounts for the needs and roles of all stakeholders, including both women and men (Dublin Statement, ICWE 1992). Further consideration and localisation to the context of Indonesia might acknowledge how intersecting factors such as gender, ethnicity, religion, disability, age and socioeconomic status shape the diverse experiences of marginalisation and access to resources across different communities.

The project will formally report on gender outcomes as per templates provided by ACIAR, including a breakdown of staff by level and gender. Monitoring, Evaluation, Learning and Reporting

During the scoping study, our approach to project design and monitoring focuses on ensuring that research activities are aligned with intended outcomes, maintaining high standards of quality throughout. We will implement clear protocols to guarantee that all processes are scientifically rigorous and relevant to the project's goals. Deliverables will be tracked through a structured plan, ensuring they meet stakeholder expectations and contribute valuable insights. Engagement activities will be carefully designed to foster collaboration and continuous feedback, ensuring all stakeholders remain informed and engaged. This approach ensures that all activities are thoroughly monitored and optimised for success.

5.4 Governance and risk management

A streamlined governance structure will be implemented to ensure effective oversight while maintaining flexibility. The project will be guided by a steering committee (as shown in Figure 7), comprising the CSIRO leadership team, BRIN's coordinating leader, CRPG, and ACIAR project lead, with meetings scheduled every eight weeks. This structure supports rapid decision-making and agile responses to emerging findings and challenges.

Given the nature of the work, which involves engagement with Indonesian stakeholders across government, research institutions, and at the local level, we recognise that there are inherent uncertainties, explored below. Resources may need to be adjusted as new information emerges from the field, allowing the project to stay responsive and relevant.

Key risks include potential changes in government agency structures or priorities, the unavailability of key personnel for critical workshops, and the time required to negotiate agreements between diverse parties. We are aware that the current elections affect the institutional arrangements in Indonesia in ways that may hamper delivery of this project among a durable set of institutions. However, as institutions reconfigure in response to cabinet changes and new priorities, we will seize opportunities to embed our research into emergent institutional arrangements and to nudge the narrative for our intended impact where strategic (including at national and landscape scale).

Broader risks, such as geopolitical shifts, natural disasters, or economic instability, could also impact the project's progress. Mitigation strategies include maintaining a flexible timeline, adjusting scope and labour on specific activities to control costs, and potentially reducing the number or scale of workshops, participants, or locations. Strong early relationships and continuous communication with stakeholders will ensure that risks are managed proactively. The project team will also stay in close contact with ACIAR Country Office and DFAT Post.

Finally, the SRA builds momentum towards a longer follow-on project. Should ACIAR agree to fund the planned follow-on project, there will be a period of reduced project activity while ACIAR, CSIRO and other parties design and agree to contracts. This period would be an ideal period for seeking aligned funding to support Australia/Indonesia engagements such as knowledge sharing, study tours or conference attendance.

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7 Appendix A: Intellectual property register

7.1 Administrative details

Project ID	WAC/2024/119
Project title	Towards Indonesian Sustainable Lake Management
Assessment provider	[redacted]
If not Australian project leader, provide title	
Date of assessment	10 December 2024

7.2 Categories of intellectual property and brief description

Plant or animal germplasm exchange

Does the project involve:	**Yes**	**No**
provision of germplasm by Australia to a partner country?		☑
provision of germplasm from a partner country to Australia?		☑
provision of germplasm from or to an IARC or another organisation and a project participant?		☑
use of germplasm from a third party		☑
material subject to plant breeders/variety rights in Australia or another country?		☑

If “yes” to any of the above, for each applicable country provide brief details of the material to be exchanged:

- If the germplasm exchange can be finalised before the project commencement, provide a Materials Transfer Agreement.
- If the specific germplasm to be exchanged cannot be identified until after project commencement, indicate the type of material likely to be exchanged.

Country	**Details of plant or animal germplasm exchange**

Proprietary materials, techniques and information

Does the project involve provision (from one party to another) of:	**Yes**	**No**
research materials or reagents (e.g. enzymes, molecular markers, promoters)?		☑
proprietary techniques or procedures?		☑
data		☑
proprietary computer software?		☑

“Data” means all data produced, acquired or used by a Party for the purposes of conducting the Project including technical know-how and information reduced to material form by that Party.

If "yes" to any of the above, for each applicable country provide:

- brief details of the materials or information, the organisation providing, and the organisation receiving the materials
- a copy of any formal contract between the parties.

Country	**Details of proprietary materials, techniques and information**

Other agreements

Is any aspect of the project work subject to, or dependent upon:	Yes	No
other materials-transfer agreements entered into by any project participant?		☑
confidentiality agreements entered into by any project participant?		☑

If "yes" to any of the above, for each applicable country provide:

- brief details of the agreements and conditions
- a copy of any such agreement before project commencement.

Country	Details of other agreements

7.3 SRA, background and third party Intellectual Property

This includes, but is not limited to patents held or applied for in Australia and/or in partner countries and/or in third countries. For example, Foreground IP includes any new germplasm, reagents (such as vectors, probes, antibodies, vaccines) or software that will be developed by the project and any data that is created under the Project that will be reduced to a material form.

SRA IP (IP that is expected to be developed during the project)

The following material is to be developed as part of the Project:

Type of material	Description (name of document, subject or other identifying information)
Publications/ Reports	• *Technical report on lake governance assessment framework (see 3.2.3)* • *Technical report including project proposal, incorporating participatory Theory of Change material (see 3.2.4), and LIS review report (see 3.2.1)*
Communication Materials	• *Fact/Information sheets* • *Project website (TBD)*
Analysis	• Report on case study selection and intervention change-logic (see 3.2.2) • *Theories of action/change for policy engagements in Indonesia*

Background IP (IP that is necessary for the success of the project but that has already been created and is owned by parties to the project)

Any agreements in place regarding Background IP including any data that is brought to a Project by a Party that will be used for the purposes of the Project and the creation of Foreground IP should be provided to ACIAR prior to project commencement.

	Yes	No
Is there Background IP?	☑	
If “yes”, are there any restrictions on the project's ability to use the Background IP?		☑
would there be any restriction on ACIAR or the overseas collaborator claiming their rights to IP for the project based on the Background IP? (Refer to ACIAR Standard Conditions)		☑

If "yes", for each applicable country provide brief details of: the source of the Background IP; whether the Commissioned Organisation and/or Australian collaborators and/or developing country collaborators own it; any conditions or restrictions on its use.

Country	Details of background IP
Australia	Resilience Adaptation Pathways and Transformation Approach (RAPTA) A sustainability transformations methodological framework developed by CSIRO. O'Connell, D., Maru, Y., Grigg, N., Walker, B., Abel, N., Wise, R., Cowie, A., Butler, J., Stone-Jovicich, S., & Stafford-Smith, M. (2019). *Resilience Adaptation Pathways and Transformation Approach*. https://researchprofiles.canberra.edu.au/en/publications/resilience-adaptation-pathways-and-transformation-approach
Australia	Previous water information system roadmaps for Afghanistan: "National Water Information System development: a roadmap for Afghanistan"; and Nepal: "Sustaining Nepal Basin Information System"
Australia	Draft manuscripts for gender in water policy including assessment system provisionally titled: "Measuring how water-related policies of the global South consider gender: Insights from trialling a new policy gender index in Nepal"
Indonesia	The SIDANAU system developed by BRIN is a website dedicated to the delivery of information on Indonesian lakes.

Third Party IP (IP that is owned by or licensed from other parties)

Agreements governing the use of third party IP can be related to research materials, research equipment or machinery, techniques or processes, software, information and databases.

	Yes	No
Is there any relevant Third Party IP that is essential to the project?		☑
If "yes", would there be any restriction on ACIAR claiming its rights to IP for the project? (Refer to ACIAR Standard Conditions)		

If "yes", for each applicable country provide brief details of: the source of the Third Party IP; the applicable country/ies; the circumstances/agreement/arrangement under which the IP is to be obtained or used by the project partners (for example, material transfer agreement, germplasm acquisition agreement, confidentiality agreement, research agreement or other arrangements); any conditions or restrictions on its use.

Country	Details of third party IP

Other contracts, licences or legal arrangements

	Yes	No
Are there any other contracts, licences or other legal arrangements that relate to the project?		☑

If "yes", for each applicable country provide brief details.

Country	Details of other contracts, licences or legal arrangements