Evaluation Report

Oil Palm Portfolio

Royal Roads
UNIVERSITY

CGIAR

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry

CIFOR

World Agroforestry

Cover photo: Oil palm plantation at the border of intact forest. Jambi, Indonesia. Photo: Iddy Farmer/CIFOR

DOI: 10.17528/cifor/007936

Davel R, Claus R, Ichsan M, and Belcher B. 2020. *Evaluation Report. Oil Palm Portfolio. An Outcome Evaluation of FTA's Research Portfolio on Oil Palm.* Bogor, Indonesia: The CGIAR Research Program on Forests, Trees and Agroforestry (FTA).

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List of Acronyms

AMAN	*Aliansi Masyarakat Adat Nusantara* (Indigenous Peoples Alliance)
AMDAL	Analisa Dampak Lingkungan (Environmental Impact Assessment)
ANGIN	Anticipation Grant
APL	*Areal Penggunaan Lain* (Non-Forest Estate Land)
ATR BPN	*Agraria dan Tata Ruang/Badan Pertanahan Nasional* (National Land Agency)
BAPLAN	*Badan Planologi Kehutanan* (Forestry Planning Agency)
BAPPEDA	*Badan Perencana Pembangunan Daerah* (Regional Development Planning Agency)
Bappenas	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BIG	*Badan Informasi Geospasial* (Geospatial Information Agency)
BINGO	Big international NGO
BPDPKS	*Badan Pengelola Dana Perkebunan Kelapa Sawit* (CPO Fund Management Agency)
BPK	*Badan Pemeriksa Keuangan* (Audit Board of Indonesia)
BPS	*Badan Pusat Statistik* (Statistics Indonesia)
BRG	*Badan Restorasi Gambut* (Peat Restoration Agency)
CARDS	Center for Agriculture and Rural Development Studies
CBO	Community-based Organization
CCAFS	Climate Change, Agriculture and Food Security
CHF	Swiss francs
CIFOR	Center for International Forestry Research
CIRAD	*Centre de coopération internationale en recherche agronomique pour le développement* (French Agricultural Research Centre for International Development)
ComMod ISPO	Companion Modelling on ISPO Game
ComMoDo	Companion Modelling in Indonesia Game
CPO	Crude Palm Oil
CRP	CGIAR Research Program
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
CUF	CIFOR-USAID Fellowship
DFID	Department for International Development (United Kingdom)
DRLI	Decent Rural Living Initiative
EK	Supporting Local Regulations for Sustainable Oil Palm in East Kalimantan
ERS	Engendering RSPO Standards
ETHZ	*Eidgenössische Technische Hochschule Zürich* (Swiss Federal Institute of Technology, Zurich)
EU	European Union
FFB	Fresh Fruit Bunches
FKPB	*Forum Komunikasi Perkebunan Berkelanjutan* (Sustainable Plantation Communication Forum)
FLEGT	Forest Law, Enforcement, Governance and Trade
FoKSBI	*Forum Komunikasi Kelapa Sawit Berkelanjutan Indonesia* (Communication Forum for Indonesian Sustainable Palm Oil)
FOERDIA	Forestry and Environmental Research Development and Innovation Agency
FTA	Forests, Trees and Agroforestry
GAP	Good Agricultural Practices
GAPKI	*Gabungan Pengusaha Kelapa Sawit Indonesia* (Indonesian Palm Oil Business Association)
GCS REDD+	Global Comparative Study on REDD+
GDP	Gross Domestic Product
GGGI	Global Green Growth Initiative

GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Society for International Cooperation)
GOLS	Governing Oil Palm Landscapes for Sustainability
Gov	Government respondent code
Ha	hectare
HCV	High Conservation Value
ICRAF	World Agroforestry
IFAT	International Federation for Alternative Trade
IGO	Intergovernmental Organization; Intergovernmental organization respondent code
ILUC	Indirect Land Use Change
INOBU	*Institut Penelitian Inovasi Bumi* (Earth Innovation Research Institute)
InPOP	Indonesia Palm Oil Platform
IPB	*Institut Pertanian Bogor* (Bogor Agricultural Institute)
IPOP	Indonesian Palm Oil Pledge
ISPO	Indonesian Sustainable Palm Oil
IUCN	International Union for Conservation of Nature
JA	Jurisdictional Approach
JAXA	Japan Aerospace Exploration Agency
KAN	National Accreditation Body
KEHATI	*Yayasan Keanakeragaman Hayati Indonesia* (Indonesian Biodiversity Foundation)
Kemenko	*Kementerian Koordinator Bidang Perekonomian* (Coordinating Ministry of Economic Affairs)
Kementan	*Kementerian Pertanian* (Ministry of Agriculture)
KHLK	*Kementerian Lingkungan Hidup dan Kehutanan* (Ministry of Environment and Forestry)
KNOWFOR	International Forestry Knowledge Programme
KPK	*Komisi Pemberantasan Korupsi* (Corruption Eradication Commission)
LAPAN	*Lembaga Penerbangan dan Antariksa Nasional* (National Institute of Aeronautics and Space)
LEOPALD	Low Emissions Oil Palm Development (TNC/GIZ Project)
LIFFE Options	Large-scale investments in food, fibre and energy: Sustainable options that work for forests and the poor
LIPI	*Lembaga Ilmu Pengetahuan Indonesia* (Indonesian Institute of Sciences)
LOA	Letter of Agreement
LTKL	*Lingkar Temu Kabupaten Lestari* (Sustainable District Gathering Circle)
LUCOPE	Land Use Change and Oil Palm Expansion Companion Modelling Game
MELIA	Monitoring, Evaluation, Learning and Impact Assessment
MIT	Massachusetts Institute of Technology
MoU	Memorandum of Understanding
NDPE	No Deforestation No Peat Exploitation Commitment
NGO	Non-governmental Organization; Non-governmental organization respondent code
OPAL	Oil Palm Adaptive Landscapes
PASPI	Palm Oil Agribusiness Strategic Policy Institute
PDLKWS	*Direktorat Pencegahan Dampak Lingkungan dan Kebijakan Sektor* (Directorate of Prevention of Impacts of Environment and Sector Policy)
PERDA	*Peraturan Daerah* (Provincial Regulation)
Pergub	*Peraturan Gubernur* (Governor Regulation)
PerPres	*Peraturan Presiden* (Presidential Regulation)
PNA	Policy Network Analysis
PS	Private sector respondent code
P3SEPKI	Center for Research and Development on Social, Economics, Policy and Climate Change
P&C	Principles and Criteria

QAF	Quality Assessment Framework
QoR4D	Quality of Research for Development
RANKSB	*Rencana Aksi Nasional Perkebunan Kelapa Sawit Berkelanjutan Tahun* (National Action Plan for Sustainable Oil Palm Plantations)
REDD+	Reducing emissions from deforestation and forest degradation
Res	Researcher respondent code
RPJMD	*Rencana Pembangunan Jangka Menengah Daerah* (Regional Mid-term Development Plan)
RRI	Rights and Resources Initiative
RRU	Royal Roads University
RSPO	Roundtable for Sustainable Palm Oil
RTRW	*Rencana Tata Ruang Wilayah* (spatial planning)
R4D	Research-for-development
SDG	Sustainable Development Goals
SIDA	Swedish International Development Cooperation Agency
SME	Small and Medium Enterprises
SNSF	Swiss National Science Foundation
SPK	*Surat Perintah Kerja* (Formal Work Order; issued by local government)
SPKS	*Serikat Petani Kelapa Sawit* (Oil Palm Farmers Union)
SPOI	Sustainable Palm Oil Initiative (Kementan and UNDP initiative)
SPOS	Strengthening Sustainable Palm Oil Management Program in Indonesia
SRE	Sustainability Research Effectiveness
SSHRC	Social Sciences and Humanities Research Council (Canada)
STDB	*Surat Tanda Daftar Budidaya* (Smallholder Plantation Registration Certificate)
SWD	Sense-making workshop discussion code
TDR	Transdisciplinary Research
TFA	Tropical Forest Alliance
TFCA	Tropical Forest Conservation Act
TNC	The Nature Conservancy
ToC	Theory of Change
TR	Trip report code
TUPOKSI	*Tugas Pokok dan Fungsi* (Main Tasks and Functions)
UI	University of Indonesia
UKCCU	UK Climate Change Unit (DFID)
UNDP	United Nations Development Programme
UNEP WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNIKARTA	Kutai Kartanegara University
UNMUL	Mulawarman University
UNTAMA	Antakusuma University
UNTAN	University of Tanjungpura
UPB	Panca Bhakti University
USAID	United States Agency for International Development
USD	United States Dollar
WALHI	*Wahana Lingkungan Hidup Indonesia* (Indonesian Forum for the Environment)
WCS	Wildlife Conservation Society
WRI	World Resources Institute
WWF	World Wildlife Fund

Executive Summary

Introduction

Oil palm production is in many ways emblematic of key economic, social, and environmental challenges and opportunities. The rapid growth of global palm oil demand, and the rapid expansion of oil palm plantations in the tropics, including in Indonesia, has put the crop at the centre of several controversies. As a major producer, Indonesia's oil palm production constitutes a significant portion of the country's agricultural gross domestic product (GDP), exports, and source of employment and livelihoods. The Government of Indonesia has instituted several productivity targets for oil palm and introduced incentives to facilitate private companies' access to and expansion of plantations and inclusion of smallholders. Rapid expansion has not come without consequences. The industry has become under increased scrutiny, attributing oil palm expansion to increased instances of fires, deforestation, peat exploitation, and consequential reduction in biodiversity. Various policy initiatives and multi-stakeholder processes have responded in an effort to improve standards for sustainable production. Increasing sustainability standards, while in theory are beneficial to the development of the sector, have posed compliance challenges for smallholders, risking unintended disenfranchisement. The Forests, Trees and Agroforestry (FTA) and its partners have undertaken research in an effort to better understand Indonesia's governance of and policy processes for oil palm management, the biophysical characteristics and ecological implications of oil palm production, and social realities of oil palm expansion. The extensive research undertaken since 2010 intended to contribute to improved policies and practices in favour of more environmentally conscious and socially inclusive oil palm development.
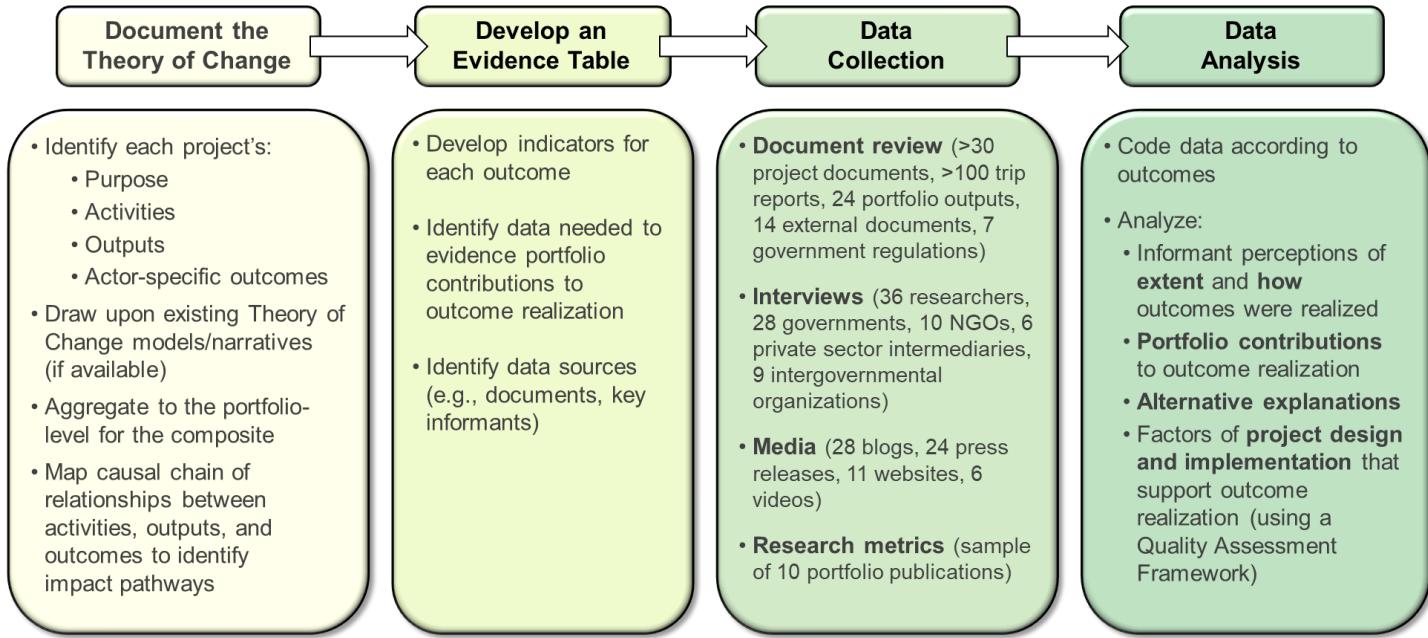
The CGIAR research program (CRP) FTA has a strong organizational commitment to systematically assess and learn from efforts to influence policies and practices (i.e., realize outcomes) on the basis of rigorous science. FTA's Monitoring, Evaluation, Learning and Impact Assessment (MELIA) team are responsible for leading assessments of FTA initiatives to: i) demonstrate the program's effectiveness; and ii) generate lessons to improve the design and implementation of research-for-development (R4D) programs in the future. The cases under evaluation were selected primarily for their learning potential. There were indications that the projects employed successful approaches to policy engagement that will provide useful lessons for other FTA research. The assessment also offers an opportunity to apply a theory-based evaluation methodology to a multi-project research portfolio under the Sustainable Value Chains and Investments Flagship 3 research portfolio. Oil palm is relevant to FTA Priorities 2 (Plantations and Tree Crop Commodities), 16 (Inclusive Finance and Business Models), 18 (Public and Private Commitments to Zero Deforestation), and 20 (Effectiveness of Approaches to Sustainable Supply).

This report assesses the project design, implementation, and outcome realization of FTA's research portfolio on oil palm in Indonesia. Four projects from the portfolio were selected for in-depth assessment: Supporting Local Regulations for Sustainable Oil Palm in East Kalimantan (EK), Governing Oil Palm Landscapes for Sustainability (GOLS), Oil Palm Adaptive Landscapes (OPAL), and Engendering RSPO Standards (ERS). The report documents and empirically tests whether and how intended portfolio outcomes were realized, with specific attention to the characteristics of projects' design and implementation that contributed to changes in policy and practice within Indonesia's oil palm sector.

Methodology

The outcome evaluation follows the theory-based evaluation approach described by Belcher, Davel, and Claus (2020) (Figure 1). The evaluation uses a composite portfolio theory of change (ToC) (Figure 2) as the main analytical framework. A ToC is a set of projected causal relations, hypotheses, and assumptions that model how and why a project or program is expected to contribute to a change process. The evaluation team combined key elements of the four projects ToCs into one composite ToC to capture the activities, outputs, and intended contributions of the oil palm

research portfolio (see Table 1 for the list of outcomes). Not all projects had explicit ToC narratives or models, so document review and conversations from inception meetings held in December 2019 were drawn upon to situate these projects within the composite ToC. The inception meetings also functioned to define the scope of the evaluation, identify possible sources of evidence to test the ToC, and initiate data collection. The evaluation team conducted 82 interviews with 89 respondents and reviewed a series of relevant documents.

Document the Theory of Change	Develop an Evidence Table	Data Collection	Data Analysis

• Identify each project's:
  • Purpose
  • Activities
  • Outputs
  • Actor-specific outcomes
• Draw upon existing Theory of Change models/narratives (if available)
• Aggregate to the portfolio-level for the composite
• Map causal chain of relationships between activities, outputs, and outcomes to identify impact pathways
	• Develop indicators for each outcome
	• Identify data needed to evidence portfolio contributions to outcome realization
	• Identify data sources (e.g., documents, key informants)
		• **Document review** (>30 project documents, >100 trip reports, 24 portfolio outputs, 14 external documents, 7 government regulations)
		• **Interviews** (36 researchers, 28 governments, 10 NGOs, 6 private sector intermediaries, 9 intergovernmental organizations)
		• **Media** (28 blogs, 24 press releases, 11 websites, 6 videos)
		• **Research metrics** (sample of 10 portfolio publications)
			• Code data according to outcomes
			• Analyze:
			  • Informant perceptions of **extent** and **how** outcomes were realized
			  • **Portfolio contributions** to outcome realization
			  • **Alternative explanations**
			  • Factors of **project design and implementation** that support outcome realization (using a Quality Assessment Framework)

Figure 1. Methodological steps of the Outcome Evaluation Approach (Belcher, Davel, & Claus, 2020).

The outcome assessment was guided by the following evaluation questions:

1a. To what extent and how were portfolio outcomes realized?

1b. Are the higher-level changes likely to be realized?

1c. Could the outcomes have been realized in the absence of the portfolio?

1d. Were there any positive or negative unexpected outcomes?

1e. Were the assumptions pertaining to why these changes were expected sustained?

Project design and implementation were characterized using a framework adapted from Belcher et al.'s (2016) Transdisciplinary Research Quality Assessment Framework (QAF). The QAF assessed the degree to which the portfolio incorporated recognized characteristics of transdisciplinary research (TDR), organized under the principles of *Relevance*, *Credibility*, *Legitimacy*, and *Positioning for Use*. The results of the QAF analysis and outcome assessment were combined to draw connections between research design and implementation and portfolio contributions to outcome realization. The projects assessments were guided by the following questions:

2a. What elements of the research design and implementation supported outcome realization, and how?

2b. To what extent and how did the portfolio engage effectively with relevant stakeholders?

2c. To what extent were the research findings sufficiently relevant to achieve the stated objectives?

2d. To what extent and how are target audiences aware of and using portfolio outputs?

3a. What lessons can be learned from the portfolio to enhance research design, management, and assessment of research-for-development programs in the future?

Like the evaluation conducted by Delahais & Toulemonde (2017), this evaluation acknowledges that the portfolio is not the sole driver of or contributor to changes in Indonesia's oil palm sector. The evaluation therefore looks to identify and quality the types of contributions made by the portfolio, understand how changes manifested, situate and link

portfolio contributions to developments and changes observed in the sector, as well as consider alternative explanations for outcome realization.

Evaluation Limitations
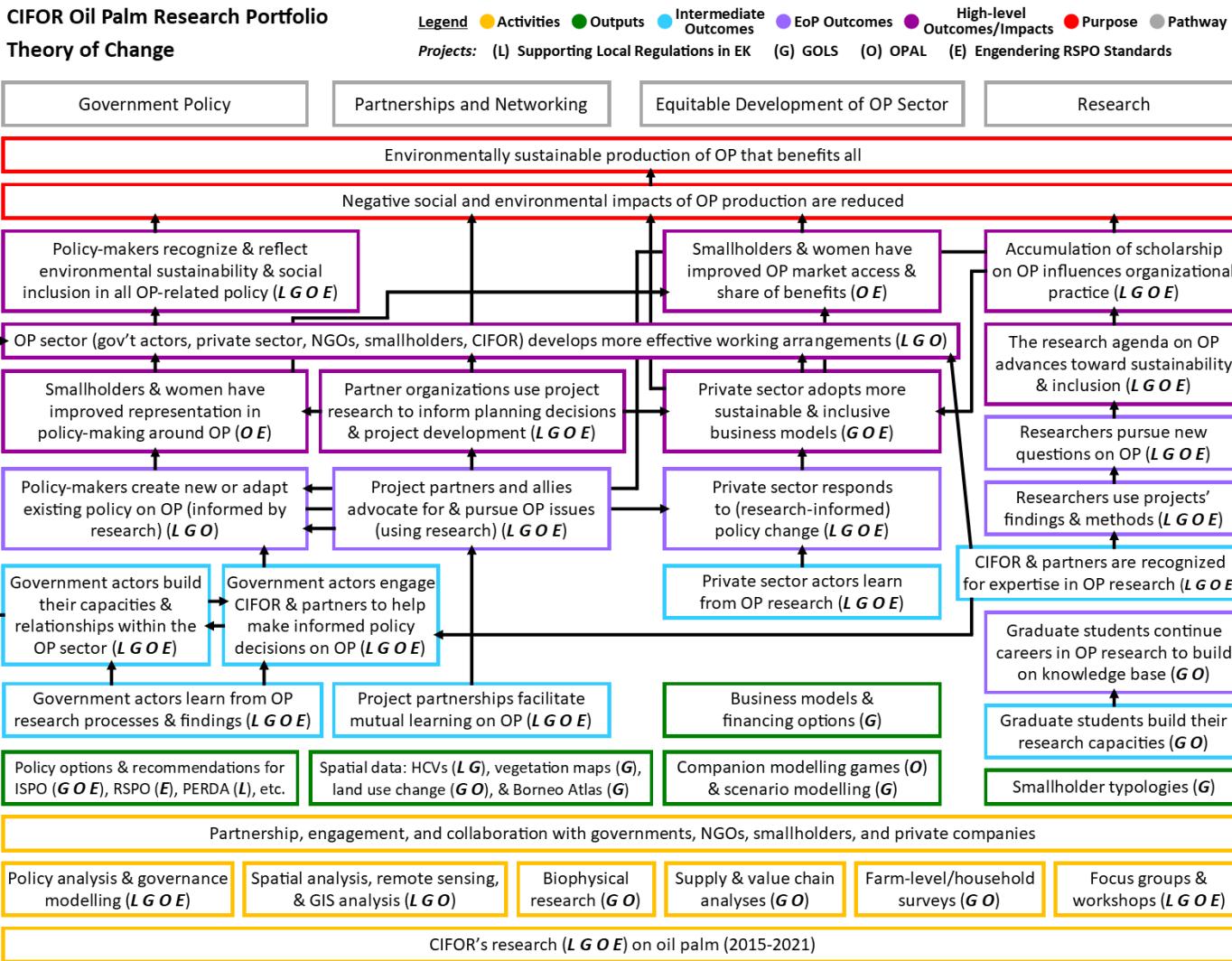
The evaluation relies on a retrospectively developed composite ToC as the main analytical framework. A retrospectively developed ToC makes it difficult to discern initial intentions from evolved thinking about the expected contributions of research activities, however, it is appropriate to evaluate on the most up-to-date ToC. Obtaining collective ownership of a composite ToC among project researchers was likewise challenging. Effort was made to draw connections between project-level ToCs and reflect them at the portfolio-scale (see Table 7 in Appendix 2), but the abstraction and extrapolation can make connections with projects difficult to grasp.

Expert judgement from interview respondents was used as part of the analysis, and this form of primary data was subject to limited recall of the projects under evaluation. Accessibility of some stakeholder groups for interviews, particularly companies, was a challenge. Low portfolio engagement with companies may also explain difficulty in accessing respondents for the evaluation. In response, representation of company perspectives relies heavily on documentation and a small number of interviews with private sector intermediaries. Moreover, we observed differences between Indonesian and international respondents in terms of the directness of their responses. In general, most responses from Indonesian respondents were less direct, while international respondents were more forthright with their opinions and critiques.

Some projects in the portfolio were still underway during the evaluation. Therefore, the evaluation provides a snapshot of a continual process. Time lags between the conclusion of a project and observable changes are inevitable, but intermediate changes during the process can be more observable in a project that is ongoing. Moreover, it is possible that further changes have or will occur following the publication of this evaluation. For example, outcomes assessed to be partially realized at the time the evaluation was written may later become fully realized as processes advance and changes materialize. This evaluation captures evidence of progress prior to July 2020.

Project Theory of Change

Figure 2 describes the portfolio's composite ToC. The overall purpose of the portfolio was to contribute to sustainability and equity of the oil palm sector. The research intended to provide knowledge that would inform policy development and influence how oil palm is produced in order to reduce environmental impacts and increase economic prosperity and equity through better social inclusion. The portfolio conducted biophysical (visualizations of areas, implications of expansion) and social (smallholder characteristics, community experiences, policy analyses, scenario modelling) research. The research aimed to influence behaviour change of key actors, by adding to their knowledge, influencing attitudes, and building skills and relationships. Outcomes were anticipated through four interconnected pathways: government policy, partnerships and networking, equitable development of the oil palm sector, and research. Through the government policy pathway, governments were expected to integrate new information into policy for sustainability to ensure good agricultural practice (GAP) is rewarded and harmful agricultural practice is reprimanded. Through the partnership and networking pathway, partners and allies were expected to advocate for and increase collective action toward sustainability and equity objectives in the sector. Through the equitable development of the oil palm sector pathway, oil palm companies and smallholders were expected to change practices to be more sustainable and inclusive; this pathway is responsive to pressures exerted by governmental policy change, advocacy campaigns, market-driven incentives, and private sector-led sustainability and corporate social responsibility (CSR) objectives. Through the research pathway, other researchers were expected to take up and advance the research agenda on oil palm.

Figure 2. Portfolio Theory of Change

Results

Outcome Evaluation: *To what extent and how were outcomes realized?*

Overall, the portfolio clearly contributed to the partial or full realization of 18 of the 21 outcomes from the composite ToC. All intermediate outcomes relating to changes in knowledge, skills, and relationships were realized, with the exception of private sector learning. Most end-of-project outcomes in each pathway were realized to some degree. In the government policy pathway, some targeted policy changes have begun at the provincial level (e.g., provincial regulation (PERDA) in East Kalimantan) and international level (e.g., the Roundtable for Sustainable Palm Oil's (RSPO) reflection of gender considerations), and there is evidence of portfolio and partner contributions to national policy processes currently underway. In the partnerships and networking pathway, partners and allies have used portfolio research to advocate for oil palm issues. In the equitable development pathway, only a couple oil palm companies have responded to changes in RSPO policy on gender. In the research pathway, researchers built new and expanded upon existing research capacities as well as used portfolio data, methods, and analyses.

There is evidence of full or partial realization of some of the portfolio's higher-level outcomes, but some also remain unrealized. Many of these higher-level changes are dependent upon factors and processes outside the portfolio's influence, but there is evidence that portfolio contributions have been made.

Overall, the most influential mechanisms leveraged by the portfolio relate to the production of new knowledge and the reputation of CIFOR and its partners. Numerous interview respondents appreciated the neutral, credible, and research-based information that CIFOR can offer to support constructive dialogues and collective action in a contentious sector (Gov3, Gov14, Gov20, IGO2, IGO4, IGO6, PS1, PS2, Res3, Res5, Res25, Res28). Mechanisms relating to knowledge co-production, capacity development, coalition-building, alignment with parallel issues and initiatives, use of policy windows, and influencing the research agenda also played a role in realizing outcomes and supporting the uptake of portfolio outputs.

Table 1. Summary of portfolio's outcome realization and portfolio contributions (corresponds with outcomes listed in Figure 2)

Outcome	*Outcome Assessment and Portfolio Contribution*
Government actors learn from OP research processes and findings	Realized, clear portfolio contribution
Government actors build their capacities and relationships within the OP sector	Realized, clear portfolio contribution
Government actors engage CIFOR & partners to help make informed decisions on OP	Realized, clear portfolio contribution
Policy-makers create new or adapt existing policy on oil palm (informed by research)	Realized, clear portfolio contribution
Smallholders and women have improved representation in policy-making around oil palm	Partially realized, clear portfolio contribution
Policy-makers recognize and reflect environmental sustainability and social inclusion in all OP-related policy	Partially realized, clear portfolio contribution
Project partnerships facilitate mutual learning on OP	Realized, clear portfolio contribution
Project partners & allies advocate for & pursue OP issues (using research)	Realized, clear portfolio contribution
Partner organizations use project research to inform planning decisions and project development	Realized, clear portfolio contribution
The OP sector (governments, private sector, NGOs, smallholders, CIFOR) develops more effective working arrangements	Partially realized, unclear portfolio contribution
Private sector actors learn from OP research	Insufficient evidence, preliminary results indicate partial realization with clear portfolio contribution
Private sector responds to (research-informed) policy change	Partially realized, clear portfolio contribution
Private sector adopts more sustainable and inclusive business models	Partially realized, clear portfolio contribution
Smallholders and women have improved oil palm market access and share of benefits	Not realized, too early to assess
Graduate students build their research capacities	Realized, clear portfolio contribution
Graduate students continue careers in oil palm research to build on knowledge base	Realized, clear portfolio contribution
CIFOR & partners are recognized for expertise in OP research	Realized, clear portfolio contribution
Researchers use projects' findings and methods	Realized, clear portfolio contribution
Researchers pursue new questions on oil palm	Realized, clear portfolio contribution
The research agenda on OP advances toward sustainability and inclusion	Partially realized, clear portfolio contribution
Accumulation of scholarship on OP influences organizational practice	Not realized, too early to assess

Through the portfolio, CIFOR and its partners positioned themselves as relevant knowledge producers, active conveners, and engaged partners in ongoing processes focused on sustainable and inclusive oil palm production in Indonesia. Incorporating principles of sustainability and supporting representation of minority groups in multiple levels of government policy are important for governance of Indonesia's oil palm sector.

Progress toward higher level outcomes relies on the implementation and/or enforcement of research-informed policies and the continuity of collective action that supports sustainability and inclusion in the sector. With the guidance of governmental regulation, private sector commitments, and research to inform sustainable and inclusive practices, oil

palm production – by large companies and smallholders alike – has the potential to expand development opportunities for Indonesia and exert fewer pressures on its ecosystems. Together, assessments of the portfolio's contributions to changes within the research agenda and the potential for research to influence sustainable and inclusive oil palm practice indicate likelihood for the future realization of reduced negative social and environmental impacts of oil palm production. Barriers to this optimal scenario persist, however, including political and economic priorities regarding oil palm production, competing interests, "*sectoral ego*" (Gov11, Gov16, Gov20), and impending legislation that could undermine sustainability initiatives in the oil palm sector.

The portfolio of research was conducted in the context of a dynamic sector with many actors, making it challenging to assess impact against a counterfactual. We therefore relied on expert judgement from respondents to assess what would have happened in the absence of the portfolio. When presented with a hypothetical scenario of the status of the oil palm sector without the portfolio, respondents had varying perceptions of the influence of the portfolio's contributions. Most could clearly attest to or articulate specific knowledge and social process contributions made by the portfolio, others were unsure or felt they could not prove their impressions, and some did not believe notable changes resulted from the portfolio's research. Most respondents stated they did not believe the outcomes could have been realized to the same extent in the absence of the portfolio, particularly with respect to changes in governments' and partners' knowledge, the research pathway, as well as progress made in decision-making or policy development.

Project Assessment: *What elements of the research design and implementation supported outcome realization, and how?*

As a highly debated topic in Indonesia, given the high potential for economic gains and corresponding high potential for ecological and social risk, oil palm was a relevant sector in which to conduct research. With significant knowledge gaps in spatial data, characteristics and locations of smallholder landholdings, women's experiences in oil palm communities, and an overall lack of scientific bases for policy development, the aims of the portfolio were well-aligned to produce relevant information. However, some respondents perceived the relevance of the research to be hindered by an overall lack of consideration for the realities of the political economy in the sector. Some respondents held perceptions that forestry researchers were pursuing an agenda that fell outside their jurisdiction (as oil palm is associated with agriculture), propelling some scepticism.

The portfolio convened actors from smallholder communities, multiple levels of governments, IGO partners, NGOs, private sector, and researchers for pre-project scoping, partnership, training, data collection, as well as dissemination and knowledge sharing. Some projects used engagement at the end of the project to share results (e.g., GOLS, ERS), some used engagement as part of the research process (e.g., OPAL), and others facilitated engagement processes as part of the main project activities (e.g., EK Project). Some projects in the portfolio had explicit engagement strategies to reach and engage diverse stakeholder groups, while others did not. According to interview respondents, most key stakeholders were engaged by the portfolio in some way; respondents identified the Ministry of Trade, Ministry of Industry, National Land Agency (ATR BPN), National Development Planning Agency (BAPPENAS), and the Indonesian Biodiversity Foundation (KEHATI) to be relevant actors on the topics covered by the portfolio, but the portfolio did not appear to engage these actors.

Most respondents were aware of at least one output produced by the portfolio, but this varied in degree of awareness; some could identify a general subset of the research while others could describe in detail key pieces of knowledge. Portfolio partners, participants, and target audiences are using outputs generated by the portfolio; only a few respondents noted to have not used any outputs. Data, maps, typologies, scenarios, analyses, and recommendations have been used. However, barriers persist which affect uptake and use of portfolio outputs – some that lie within and others that lie outside the portfolio's control.

Overall, the portfolio's design and implementation align with TDR effectiveness principles and criteria of relevant, credible, and legitimate research that was well positioned for use to contribute to outcomes. However, each project variably satisfied transdisciplinary criteria across the four principles; combining these analyses with the outcome assessments indicated that satisfaction of different TDR qualities can lead to different kinds of changes. Careful consideration for the integration of TDR criteria, in connection with intended outcomes, is key to strategic research project design and implementation for impact. The following criteria strongly influenced what projects achieved and respondents' perceptions of the projects; when projects performed well, these aspects corresponded with positive feedback, and when not done well, these aspects were criticized: relevant communication; clarity in the research framework, questions, considerations for limitations, and generalizability of results; effective collaboration and genuine and explicit inclusion; and practical application. These criteria should therefore be the focus of developing new projects that aim to change policy and practice in the oil palm sector. The results highlight lessons for future research design and implementation, as well as opportunities to improve cohesion among research projects focused on a particular topic, sector, or geography in terms of how they are designed and implemented.

The assessment also highlights a lack of coherence among projects. This is not surprising as the projects were developed independently and they reflect divergent expectations and requirements by individual project funders. Nevertheless, it represents a missed opportunity for projects to be better aligned to contribute to outcomes. The results highlight opportunities to improve cohesion among research projects focused on a particular topic, issue, sector, or geography.

Lessons Learned

Together, the analyses of outcomes and project design and implementation elicited several conclusions about research design, influence, and evaluation. The portfolio contributed to notable achievements in each pathway; yet, despite these achievements, realized changes were diffuse and there were missed opportunities that highlight scope for more intentional coordination, cohesion, and coherence across research efforts on oil palm issues in Indonesia in the future. Recognizing that much of CGIAR, FTA, and CIFOR research relies on bilateral funding, these lessons should be taken within that reality. The assessment concludes with the following lessons and recommendations:

Lesson 1: Engagement and collaboration contribute to outcome realization. When possible, projects should be designed to engage target audiences, participants, and partners appropriately in project design, or early on in project implementation, to facilitate a spirit of collaboration, partnership, and ensure mutual benefits.

Lesson 2: Multiple channels of communication that are tailored for relevance and accessible to intended audiences help realize policy outcomes. Research communications should be timely and responsive to other system processes, and are more effective at sharing knowledge when outputs are tailored to and translated for the needs of each target audience.

Lesson 3: Capacity-building supports research uptake across pathways. Opportunities for capacity-building in research participants, partners, and target audiences should be considered and integrated in project design and implementation.

Lesson 4: Research planning should deliberately focus on solution development and implementation support. Projects should prioritize opportunities to address knowledge gaps or problems deemed important by stakeholders. Boundary partners should be identified based on their ability to use research outputs and support solution development, testing, and/or implementation.

Lesson 5: Projects/programs use Theory of Change inconsistently, and connections between projects are not always coherent. Researchers and program managers should fully utilize Theory of Change as a core element of project planning and adaptive management.

Lesson 6: Clarity in research focus and connection to a relevant social problem are paramount. The research focus and its connection to a relevant problem should be clear.

Lesson 7: There is scope for improved coordination and synergy across related projects to increase the potential for impact. When possible, research efforts should be coordinated and integrated by overlapping issues, target audiences, geographies, and intended outcomes to maximize possible influence. Existing relationships should be considered and sustained to support effective implementation of new projects.

Lesson 8: Reliance on individual champions (as opposed to institutional relationships/partnerships) leaves research uptake susceptible to turnover. Organizations should consider developing institutional relationships and partnerships that support the institutional capacity and fill knowledge gaps that are necessary to realize intended outcomes.

Lesson 9: The lack of official endorsement hinders research uptake by governmental actors/agencies. When the government is intended to benefit or use the research, it is important that researchers establish formal partnerships and foster processes to co-generate data to increase the likelihood of use.

Lesson 10: More research is needed on relevant topics to support solutions that help realize sustainability and equity in Indonesia's oil palm sector. Respondents identified and suggested areas for future research efforts, such as providing needs-based solutions for companies and independent smallholders to adopt sustainable practice; the impact of peat restoration on oil palm emissions and smallholders; costs, benefits, impacts of certification systems and other policies and how to implement them; and entry points to support smallholder formalization. These topics should be considered when designing new research projects on the topic of oil palm.

Introduction

This report presents an outcome evaluation of the Forests, Trees and Agroforestry (FTA) research portfolio on oil palm in Indonesia. Four projects, representing approximately 7 million USD of investment, were selected to represent the portfolio: Supporting Local Regulations for Sustainable Oil Palm in East Kalimantan (EK), Governing Oil Palm Landscapes for Sustainability (GOLS), Oil Palm Adaptive Landscapes (OPAL), and Engendering RSPO Standards (ERS). The portfolio aimed to better understand Indonesia's governance of and policy processes for oil palm management, the biophysical characteristics and ecological implications of oil palm production, and social realities of oil palm expansion. The research intended to support policies and practices in favour of more environmentally sustainable and socially inclusive oil palm development. This evaluation assesses the extent to which and how the portfolio contributed to changes in policy and practice in Indonesia's oil palm sector. The purpose of this evaluation is to critically assess the portfolio by collecting and analyzing information about each project's activities, outputs, and outcomes to support learning for research effectiveness.

The Center for International Forestry Research (CIFOR) is the leading partner in the CGIAR research program (CRP) FTA. The FTA CRP contributes to the mission of the CGIAR, the world's largest global agricultural innovation network that connects scientific knowledge with programs to reduce poverty, hunger, and environmental degradation. CIFOR's research portfolio on oil palm is part of FTA's Flagship research program that investigates sustainable value chains and investments to support forest conservation and equitable development (FTA Flagship 3). Oil palm is of relevance to FTA Priorities 2 (Plantations and Tree Crop Commodities), 16 (Inclusive Finance and Business Models), 18 (Public and Private Commitments to Zero Deforestation), and 20 (Effectiveness of Approaches to Sustainable Supply).

The CGIAR and FTA have strong organizational commitments to systematically assess and learn from their efforts to influence policies and practices (i.e., realize outcomes) on the basis of rigorous science. This involves understanding how FTA knowledge is understood and used by specific audiences in their decision-making processes, and investigating how these decisions contribute to changes in the state of the environment, rural livelihoods, and health and well-being (i.e., contribute to impacts).

FTA's Monitoring, Evaluation, Learning and Impact Assessment (MELIA) team is responsible for leading appropriate, real-time ex-post and ex-ante assessments of FTA initiatives to: i) demonstrate the program's effectiveness; and ii) generate lessons to improve the design and implementation of research-for-development (R4D) programs in the future.

As part of this mandate, the FTA MELIA team conducts participatory qualitative evaluations of initiatives that appear to have achieved policy or practice influence. These evaluations aim to understand how and why this influence occurred and understand the relative contribution of FTA research to observed changes in policy or practice. This is done using theory-based evaluation.

The FTA MELIA team works with scientific staff across FTA to select topics for evaluation and impact assessments based on the following considerations:

- thematic relevance to FTA priority research areas
- significance of FTA investment in the topic and/or whether FTA is a recognized leader in this area
- the maturity of the project and the evaluability of the work
- the need to reflect a diversity of outcome levels and types (project outcomes – both policy and practice – as well as programmatic impact)
- the need to reflect a diversity of evaluation methodologies and approaches
- the willingness of the project managers to engage in and learn from the evaluation process
- the learning potential of the case (what can the FTA program more broadly learn from the example)

- ensuring a broad coverage of FTA partner organizations and flagship research programs
- capitalizing on existing FTA and project-level MELIA investments (i.e., theories of change for project design, use of outcome monitoring tools, etc.)

The four projects were selected for their learning potential. There were indications that the four projects representing the portfolio employed successful approaches to policy engagement that could generate lessons for future research. The evaluation aimed to provide insights on FTA's contributions to address key global challenges related to the protection of forests, deforestation, rural poverty, and livelihoods. In particular, the cases illustrate pathways to improving environmental and economic conditions for people through improved knowledge and research about oil palm to guide collective action, policy, and practice. Lessons from the evaluation of the portfolio will have relevance for FTA's ongoing integrated outcome evaluation on its impacts.

The evaluation follows the method presented in Belcher, Davel, & Claus' (2020), using a Theory of Change (ToC) as the analytical framework. The ToC articulates the theoretical relationships and sequence of steps through which a research project or program intends to realize outcomes and impacts. The evaluation is an empirical test of the extent to which and how outcomes modelled in the ToC were realized. Research design, implementation, and outputs are assessed using a research quality framework adapted from Belcher et al.'s (2016) Transdisciplinary Research Quality Assessment Framework (QAF). The QAF framework is used to highlight elements of the research process that worked well to realize outcomes and where future considerations should be made when designing and implementing research.

The evaluation has two main objectives, to:

1. Assess the portfolio's influence;
    i. Document and test intended outcomes and pathways;
    ii. Draw conclusions about the extent to which intended outcomes were realized and understand the mechanisms by which they were realized, with specific attention to research project design and implementation; and
2. Provide an opportunity for learning and reflection for researchers on promising research design and implementation practices, and lessons to guide future research.

Outcome evaluations aim to assess two aspects of a research project or program: i) whether or not outcomes have been realized; and ii) the extent of a project's contributed to realized outcomes . The second component is especially challenging when projects are situated in complex systems, with multiple actors and processes that affect outcomes in some way (Mayne, 2001; 2012; Forss, Marra, & Schwartz, 2011). This evaluation addresses these challenges by explicitly considering alternative explanations for results, seeking stakeholder perspectives, and applying expert judgement to assess the portfolio's contribution.

Research contributions are typically framed in terms of new knowledge and innovations, testing and improving theory and methods, conceptual framework development, and theoretical and empirical analysis, among others. In addition to knowledge, research activities can facilitate and support social processes of change, such as building social and scientific capacities, influencing public discourse and research agendas, and creating new fora or facilitating solution negotiations as ways to influence policy and practice (Belcher & Hughes, forthcoming).

The report begins with a brief overview of CIFOR's research portfolio on oil palm, focusing on the four projects selected for analysis. The methodology section details the guiding evaluation questions, the analytical framework used, and how data were collected and analyzed. The results section presents the results of the outcome assessment and the QAF analysis. The discussion section answers the evaluation questions using evidence from interviews and document review. The lessons section discusses the implications of the evaluation findings and offers recommendations. The appendices provide detailed supplemental information on the evaluation methods and results.

Case Study Overview

Oil palm production is in many ways emblematic of key economic, social, and environmental challenges and opportunities. The rapid growth of global palm oil demand, and the rapid expansion of oil palm plantations in the tropics, including in Indonesia, has put the crop at the centre of several controversies (Doc39; Rival & Levang, 2014). As a major producer, Indonesia's oil palm production constitutes a large portion of the country's agricultural gross domestic product (GDP) and had an export value reaching USD 23 billion in 2017 (Palm Oil Agribusiness Strategic Policy Institute (PASPI), 2018; Reily, 2018). According to the 2013 agricultural census, approximately two million smallholders cultivate oil palm (Statistics Indonesia (BPS), 2013). Along with associated industries, the Indonesian Palm Oil Business Association (GAPKI) claimed to have employed up to 7.8 million laborers across various palm oil value chains (PASPI, 2018). The Government of Indonesia has several production and productivity targets for oil palm. In the early 2010s, the Government of Indonesia set a production target of 40 million tons of crude palm oil (CPO) by 2020 (Purnomo et al., 2020). For the same timeframe, the government also set the productivity targets, known as the 35:26 Vision, which aims to produce 35 tons per hectare (ha) of fresh fruit bunches (FFBs) with a 26 percent oil extraction rate (Kementan, 2013). To meet these targets, the government introduced several incentives to facilitate private sector access to and expansion of plantations and inclusion of smallholders through company partnership schemes.

The research portfolio on oil palm in Indonesia covers many cross-cutting themes, such as changing landscapes and land use, environmental degradation and biodiversity loss, policy and technical regulations, governance arrangements, value chains, sustainability and inclusion standards, and smallholder diversity and livelihoods, among others. The research aims to address important basic and applied knowledge gaps to inform policy and practice in the sector by from international donors, governments, non-governmental organizations (NGOs), private sector, and other researchers.

Table 2. General details about each project assessed in the evaluation

Project	Research Topic(s)	Targeted Policy Influence	Budget	Duration
Supporting Local Regulations for Sustainable Oil Palm in East Kalimantan (EK)	High conservation areas; engagement for transparent and inclusive policy-making	Provincial (PERDA)	$105,000 USD	2 years (2015-2017)
Governing Oil Palm Landscapes for Sustainability (GOLS)	Governance arrangements; environmental sustainability in oil palm-dominated landscapes; socially inclusive production; scenarios and social/environmental trade-offs	National (ISPO)	$2.5 million USD	4 years (2015-2019)
Oil Palm Adaptive Landscapes (OPAL)	Understanding stakeholder perspectives on oil palm production and decision-making	National (ISPO)	3 million CHF	6 years (2015-2021)
Engendering RSPO Standards (ERS)	Gendered experiences of oil palm production; addressing gender gaps in RSPO	International (RSPO)	$20,000 USD	1 year (2016-2017)

Projects from CIFOR's research portfolio on oil palm dating back to 2010 were considered for the assessment, including: Bioenergy, Biofuels, Sentinel Landscapes, LIFFE Options, Corporate Commitments to Sustainability, and Fire and Haze. The evaluators reviewed available project documentation, selecting projects starting in or after 2015. Older cases were not included because data availability was limited. The evaluation also excluded projects that did not indicate targeted policy pathways, had insufficient documentation, or could not easily isolate the Indonesian component (as several projects constitute multi-country studies). Excluded projects still feature in the evaluation where they serve as inputs to the four projects under assessment. As inputs, the assessment will be able to understand how projects within the portfolio are connected (e.g., scope, identification of knowledge gaps, engagement of actors, new

opportunities, etc.).

Table 2 provides general details of the four projects included in the assessment: the EK Project, GOLS, OPAL, and ERS. Collectively, these four projects investigate a range of oil palm issues, and they engage with diverse government, NGO, and private sector actors. The projects demonstrate CIFOR's policy-engaged approach to research at multiple policy-levels in Indonesia. For example, the EK Project aimed to contribute to the development of a PERDA, a provincial-level policy. GOLS targeted the Indonesian Sustainable Palm Oil (ISPO) certification, a national-level policy. OPAL aimed to influence multi-level policy-makers' awareness and understanding of the implications of existing policies and their implementation on different actors within the palm oil sector, as well as increase community understanding of socio-ecological systems in oil palm landscapes. The ERS Project targeted the Roundtable on Sustainable Palm Oil (RSPO), an international multi-stakeholder initiative that has developed a set of international oil palm certification standards. Together these four projects represent a range of approaches, outcomes, actors, promising practices, and barriers. The outcomes of these four projects are inter-related, with substantial actor overlap as CIFOR aimed "*to connect all these projects on palm oil, for them to be seen as one body of work, rather than as specific projects*" (Res18). Some direct project connections were clear, as the EK Project and GOLS activities in East Kalimantan fed into OPAL, and ERS had some overlap with GOLS. This facilitated the development of a composite ToC for the four projects. The disadvantages of a sole focus on these four projects is that the assessment cannot speak to the portfolio as a whole; the work on bioenergy (which for the most part dealt with a separate policy sphere) will not be investigated in-depth. The case selection contains projects demonstrating the shift in CIFOR's approach as an organization – in particular the shift from disciplinary academic research to more transdisciplinary research engaging directly with specific national policy processes.

Methodology

This evaluation examines whether and how FTA's research portfolio on oil palm contributed to environmental and social change in Indonesia and beyond. The assessment uses a theory-based evaluation approach described by Belcher, Davel, and Claus (2020) to model the intended outputs, outcomes, and impacts; test whether those results were realized; and analyze the mechanisms of change. The method has been developed and applied in other FTA project evaluations (see Belcher, Suryadarma, & Halimanjaya, 2017; Halimanjaya, Belcher, & Suryadarma, 2018; Ramirez, 2018; Ramirez & Belcher, 2018; Belcher et al., 2019; Claus, Davel, & Belcher, 2019; Ramirez & Belcher, 2019).

Guiding Evaluation Questions

1. Research Outcome Evaluation

   a. *To what extent and how were portfolio outcomes realized?*
   b. *Are the higher-level changes likely to be realized?*
   c. *Could the outcomes have been realized in the absence of the portfolio?*
   d. *Were there any positive or negative unexpected outcomes?*
   e. *Were the assumptions pertaining to why these changes were expected sustained?*

2. Research Project Assessment

   a. *What elements of the research design and implementation supported outcome realization, and how?*
   b. *To what extent and how did the portfolio engage effectively with relevant stakeholders?*
   c. *To what extent were the research findings sufficiently relevant to achieve the stated objectives?*
   d. *To what extent and how are target audiences aware of and using portfolio outputs?*
   e. *What lessons can be learned from the portfolio to enhance research design, management, and assessment of research-for-development programs in the future?*

Outcome Evaluation Approach

We use the theory-based evaluation approach described in Belcher, Davel, and Claus (2020) (see Figure 1 in the Executive Summary for a visual representation of the approach) to assess research contributions in complex socio-ecological systems. The method takes a systems perspective by acknowledging that any intervention operates simultaneously with other actors and social processes, and recognizes that causal processes are often non-linear (Belcher, Davel, & Claus, 2020).

The evaluation uses a composite ToC (Figure 2), which aggregates the activities, outputs, and intended contributions of the four projects, as the main analytical framework. A ToC is a model of a change process. It provides a description and explanation of how and why a project or program is expected to lead or contribute to a process of change. The ToC details the main activities and outputs, identifies key actors involved in the change process, specifies their actions as a sequence of steps or stages (i.e., outcomes) in the process, and exposes the theoretical reasoning for the expected changes (Earl, Carden, & Smutylo, 2001; Vogel et al., 2007). The ToC aims to explain who (i.e., individuals and organizations) is expected to do what differently and why as a result of the project.

The approach uses empirical data to test the ToC and its underlying assumptions. The focus of the evaluation is on the collection of end-of-project outcomes. End-of-project outcomes are outcomes that are reasonable to expect and observable at the time of the evaluation, and therefore are testable. The ToC also models high-level outcomes to support the causal logic from end-of-project outcomes to impacts and project purpose. The distinction between end-of-project and high-level outcomes is made because higher-level results are expected to require more time to manifest and depend on variables beyond the influence of the project (Belcher, Davel, & Claus, 2020; Halimanjaya, Belcher, & Suryadarma, 2018).

Like the evaluation conducted by Delahais & Toulemonde (2017), this evaluation acknowledges that the portfolio is not the sole driver of or contributor to changes in Indonesia's oil palm sector. The approach therefore looks to identify and quality the types of contributions made by the portfolio, understand how changes manifested, situate and link portfolio contributions to developments and changes observed in the sector, as well as consider alternative explanations for outcome realization. To assess the influence of portfolio contributions, the evaluation critically considers alternative explanations (i.e., external factors and processes contributing to the same outcomes as the portfolio), contextual contingencies, and barriers to higher-level outcome realization, and uses expert judgement on what would have happened in the absence of the portfolio's research.

Developing the Composite Theory of Change

The composite ToC used in the evaluation was developed retrospectively. Some of the projects under review had explicit ToCs in place (e.g., GOLS, OPAL), but others did not (e.g., EK, ERS). In order to assess the portfolio as a whole, a composite ToC was developed to represent the four projects. As a first step, the evaluation team reviewed existing project ToC models or narratives (Doc4, Doc9b, Doc9c) to begin to frame and group similar activities and outcomes together in a draft composite ToC. For projects without ToCs, relevant project documentation including proposals and final reports were reviewed to identify their respective activities, outputs, and intended outcomes. The evaluation team held meetings with key project staff in December 2019 to get a better understanding of the portfolio, and these discussions were another useful source to capture details of each project's activities, outputs, and intended outcomes. These meetings enabled the evaluation team to fill in any gaps in the ToC and ask for further detail (e.g., actor-specific outcomes, who was engaged and how). The evaluation team aggregated outcomes that overlapped in terms of intended changes among actor groups (i.e., actor-specific outcomes) and type of influence (i.e., pathways). Following the aggregation process, some outcomes were added for logical flow (i.e., preceding or successive changes that were implicit in documentation or likely intended by one or more projects). Some outcomes were added because they logically applied to all projects (n.b., research pathway outcomes are often underdeveloped or missing from

ToCs). Both the document review and discussions informed iterative construction of the composite ToC to represent the portfolio, helped situate the projects in the composite ToC, and clarified anticipated pathways to impact. See Table 7 in Appendix 2 to see how project-specific outcomes were aggregated in the composite ToC. The resulting model is presented and described following the methodology section (see Figure 2).

Validation of the composite ToC was a crucial step in the process. The composite ToC was shared with project staff in January 2020 and again in April 2020 as part of a validation process to ensure the composite model accurately reflected the individual projects and represented the portfolio as a whole. The composite ToC aligns with the FTA Flagship 3 ToC impact pathways, to:

- Inform political decision-makers and policy dialogues via research-informed policy options;
- Engage multi-stakeholder processes to improve policy and/or certification instrument implementation; and
- Support private sector initiatives and commitments to sustainability.

Quality Assessment Framework

In addition to an assessment of outcomes, the evaluation assesses how the portfolio was designed and implemented to draw connections between what projects did and what they achieved. The evaluation team assessed characteristics of the four projects' design and implementation using a revised version of Belcher et al.'s (2016) Transdisciplinary Research QAF[1]. The QAF organizes criteria to assess the degree to which each project employed transdisciplinary research (TDR) characteristics in their design and implementation under the four principles of *Relevance*, *Credibility*, *Legitimacy*, and *Positioning for Use*. *Relevance* refers to the appropriateness of the problem positioning, objectives, and approach to the research for intended users. *Credibility* pertains to rigour of the design and research process to produce dependable and defensible conclusions. *Legitimacy* refers to the perceived fairness and representativeness of the research process. *Positioning for Use* refers to the utility and actionability of the research's knowledge and social process contributions. The QAF principles and criteria are presented in Appendix 5. Four evaluators reviewed project documentation and interviews prior to scoring. Each evaluator scored the criteria independently on a three-point scale (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; 2 = the criterion was fully satisfied); and averages were calculated for final scores. The scores indicate the degree to which TDR characteristics were present in each project. This method was used to help identify aspects of project design and implementation that supported outcome realization.

Data Collection

To empirically test each step in the composite ToC and assess the portfolio's design and implementation, data were collected via interviews, document review, and research metrics (see Appendix 1 for a full list of data sources). Data collection was guided by project staff who provided suggestions on interview respondents and other sources of evidence required to empirically test whether the outcomes were realized. Additional respondents were identified from trip reports and snowball sampling. A total of 82 semi-structured interviews with 89 respondents from five different respondent categories (Table 3) were conducted. Some respondents joined multiple interviews, and some interviews were conducted with more than one respondent. Interview questions were formulated to ascertain respondent perceptions of the problem context, key challenges and developments, decision-making, and the projects' approaches and contributions (see Appendix 3 for the interview guide). Interviews were recorded with respondents' permission and transcribed; for interviews where recording was not possible (n=14), detailed notes of the discussions were made during and/or directly following the interview.

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[1] Similar principles are incorporated in the CGIAR Quality of Research for Development (QoR4D) framework (ISPC, 2017).

Table 3. Respondent and interview details

Respondent Group	Number of Respondents	Number of Interviews Conducted
Researcher[2]	36	36
Government[3]	28	24
Non-governmental Organization (NGO)	10	8
Private Sector[4]	6	6
Intergovernmental Organization (IGO)[5]	9	8
Total	**89**	**82**

Over 200 documents were collected as potential sources of evidence. The document review included materials for internal use (e.g., proposals, progress reports, e-mail correspondence, trip reports, etc.), dissemination (e.g., CIFOR Forests News, newsletters, policy briefs, final reports, peer-reviewed publications, videos, etc.), and external documents (e.g., policy documentation, press releases, newsletters, blogs, etc.) to supplement and/or triangulate interview data.

Bibliometric (e.g., citations) and altmetric data (e.g., clicks, downloads, views, social media mentions, etc.) were also collected as indications of the usage of CIFOR outputs and the extent to which outcomes in the research pathway were realized. Data were gathered in March and April 2020 from Altmetric, PlumX, Google Scholar, and Scopus. Altmetric data include usage (e.g., clicks, downloads, views, etc.), captures (e.g., bookmarks, favourites, readers, etc.), mentions (e.g., blog posts, comments, reviews, news media, etc.), social media (e.g., likes, shares, tweets, +1s, etc.), and citations (e.g., citation indexes, policy citations, etc.). To analyze the relevance and use of portfolio outputs, a sample of seven tailored products were selected to represent each project (and component where necessary) (see Table 14 in Appendix 10 for the list of tailored products sampled).

Analysis

The interview transcripts were coded thematically and analyzed using NVivo to systematically organize data corresponding to each evaluation question. Deductive coding was employed, using codes adapted from previous evaluation experiences and new codes framed by portfolio outcomes specified in the composite ToC (see Table 1 in the Executive Summary for a complete list of portfolio outcomes). The coding process organized objective and subjective data from a variety of sources to help understand contextual factors, project contributions, and how outcomes were realized. Data were coded in NVivo to analyze both outcome realization and characteristics of research design and implementation (see Appendix 4 for the codebook).

Evaluation Limitations

Access to some respondents proved challenging overall within the time period and resources available for the evaluation. Many of the project staff involved in the projects under evaluation were no longer employed by CIFOR, which limited the access, time, and inputs that could reasonably be requested from them. While it would have been ideal to carry out fieldwork in all locations where research in the portfolio was conducted to gain a comprehensive picture of the change processes to which all projects contributed, resources limited the scope for in-person interviews.

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[2] The researcher respondent group includes current and former CIFOR researchers, research partners, and external academics (both Indonesian and international). Not all CIFOR researchers interviewed were directly involved in the projects under assessment.

[3] The government respondent group includes subnational and national governmental representatives from the Government of Indonesia.

[4] The private sector respondent group includes representatives from intermediary organizations (e.g., farmer associations, private sector conveners, consulting firms, etc.) who aim to influence the private sector by involving and working with them directly.

[5] The IGO respondent group includes representatives from international government organizations (e.g., donors, international governmental delegations) and intergovernmental development agencies.

Based on consultation with project staff, field visits for the evaluation were prioritized in East Kalimantan. Respondents in other locations were reached by phone when possible. Respondents were suggested by project researchers. As such, the sample of respondents may be biased towards success stories. To account for this shortcoming, additional respondents mentioned in project documentation (such as trip reports), and suggested by respondents (snowballing) were also included in the sample. Some of the identified key respondents had been interviewed recently under other CIFOR initiatives (e.g., previous evaluations, a policy network analysis (PNA) carried out by the Global Comparative Study on REDD+ (GCS REDD+)), or interviews carried out by GOLS researchers). In cases where it was judged that interviews would have a negative impact on CIFOR's relationships, respondents were not pursued. The evidence base was particularly weak for company and smallholder representation in the sample of interviews conducted, indicative that relationship development with these groups was relatively lower than with government and NGO actors. Respondent recall of project outputs, engagements was also a challenge, given the variability in project timelines, and particularly in instances where the findings were delivered in a single meeting. Deriving a narrative that connects portfolio outputs with outcomes was therefore challenging and required some interpretation by the evaluation team. Moreover, we observed differences between Indonesian and international respondents in terms of the directness of their responses. In general, most responses from Indonesian informants were less direct, while international respondents were more forthright with their opinions and critiques. These shortcomings have implications for the basis of data on which the assessments and conclusions are drawn.

The lack of an original portfolio-level ToC and overarching research strategy for oil palm required the evaluation team to retrospectively document a composite ToC for the portfolio. Project researchers had limited time to dedicate to this process, and it was not possible for all researchers to participate in evidence table development. A snowball approach was used to identify data needs and potential respondents, implying that some information sources to evidence the ToC may have been overlooked. The evaluation is a snapshot in a continual process; the full contributions of the oil palm research portfolio will take time to manifest, and will be subject to the influence of external contextual factors. Moreover, it is possible that further changes have or will occur following the publication of this evaluation. For example, outcomes assessed to be partially realized at the time the evaluation was written may later become fully realized as processes advance and changes materialize. This evaluation captures evidence of progress prior to July 2020.

Portfolio Theory of Change

The overall purpose of the portfolio was to improve sustainability and equity in the oil palm sector (Figure 2). It was anticipated that research would provide knowledge that would inform policy development and influence how oil palm is produced in order to reduce environmental impacts and increase economic prosperity and equity through better social inclusion

Portfolio Activities and Outputs

The research portfolio included policy analyses, spatial analyses, gender analyses, and scenario modeling to create policy-relevant knowledge for managing oil palm plantations.

Component 1 of GOLS undertook policy analysis and governance modeling to inform options for public-private governance arrangements and the sustainable management of oil palm value chains through ISPO. Component 1 also produced recommendations for financing options under the CPO Fund. GOLS also focused on theoretical debates related to hybrid governance, the debates on smallholder readiness for ISPO and high conservation value (HCV) areas, developed visualization tool to hold concession holders to account for No Deforestation No Peat Exploitation (NDPE) commitments (the Borneo Atlas), and provided input into the negotiations of the Indonesian government with the European Commission on the proposed ban on palm oil.

In partnership with Oxfam Novib, the ERS Project conducted fieldwork in West Kalimantan to document experiences and develop knowledge about gender issues in the palm oil sector with the intention to influence RSPO policy. The project developed recommendations to make the RSPO auditing processes more gender-sensitive and improve RSPO principles and criteria (P&C) to promote greater inclusion in the industry. RSPO members, staff, and academics were engaged in workshops, RSPO processes, and conferences to transmit the knowledge and build a supportive network.

Pairing policy analysis with spatial analysis to identify, map, and assess HCV areas in East Kalimantan, the EK Project worked with partners to develop policy recommendations in the form of an academic script[6] that advocated for HCV area inclusion in a provincial-level PERDA[7] regulation. As part of the EK Project, researchers actively participated in a multi-stakeholder platform to channel information on the importance of HCVs and increase awareness of reconciliation between development and environmental interests in oil palm expansion.

Component 2 and 4 of GOLS, and the OPAL Project, also undertook spatial analyses which provided governments with sophisticated spatial data, large-scale vegetation maps, carbon stocks, and scenario modelling to identify HCV areas and assess oil palm expansion and other land-use change. For example, the Borneo Atlas is a visualization tool that georeferences oil palm concessions over time and overlays them with instances of deforestation. GOLS also produced recommendations to ISPO using scenario modelling, which are intended to inform decision-makers of potential changes over time, the consequences of business-as-usual, and the implications of policy options.

Component 3 of GOLS combined spatial data with household surveys to investigate smallholder heterogeneity and smallholder compliance gaps. Better knowledge of smallholder typologies can help target policy and technical assistance to the particular needs and capacities of smallholders.

All projects engaged with a diverse range of government, NGO, smallholders, and private company actors as either participants or target audiences in workshops or meetings for scoping, data collection, or presentation of findings. In OPAL, workshops functioned as part of their engagement activities. The project developed Companion Modelling games fbased on policy, spatial, biophysical, supply and value chain, and household survey analyses, and used the games in several role-playing workshops with government, smallholder, and private sector actors. The Companion Modelling games developed for Indonesia (e.g., ComMoDo, LUCOPE, ComMod ISPO) depict oil palm landscapes, with players taking on different roles under varying policy, economic, and environmental conditions to build understanding among players of the factors that influence local decision-making or compliance capacities.

Intended Outcomes

Impact pathways are characterized by the main actor group or domain of activity that is influenced or impacted by the research. The portfolio contributed to outcomes and impacts through four interconnected pathways: a *government policy* pathway, a *partnerships and networking* pathway, an *equitable development of the oil palm sector* pathway and a *research* pathway. Each pathway is described to demonstrate how outcomes were intended and expected to manifest as a result of the four project activities and outputs.
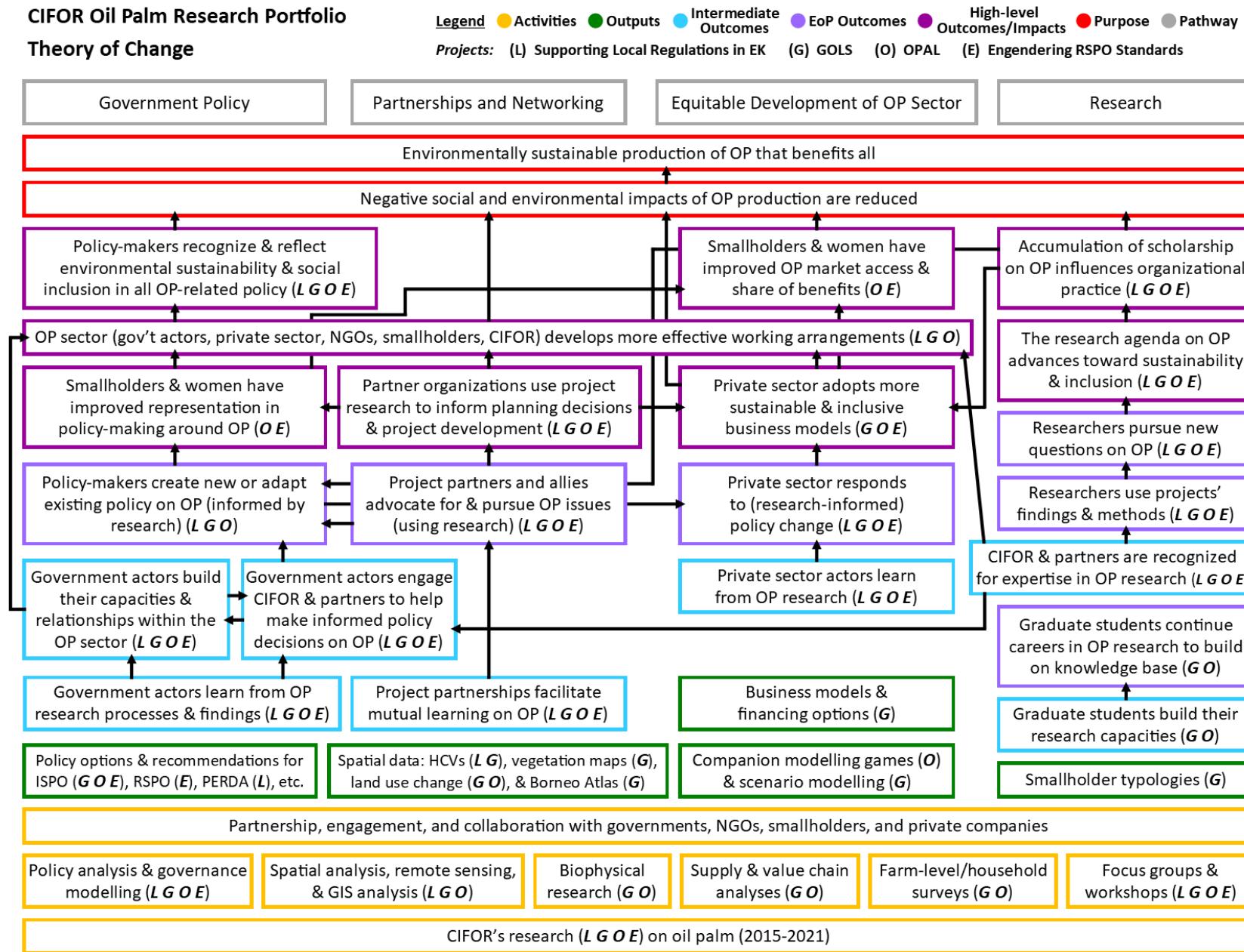
Government Policy

Three of the four projects (i.e., EK, GOLS, and OPAL) aimed to influence government policy mechanisms in Indonesia, specifically ISPO and a PERDA in East Kalimantan, by engaging government policy-makers across ministries to ultimately influence private sector practice. These projects collectively aimed to influence policy by in some cases participating in policy development processes, and by engaging with multiple levels of government, such that government actors particularly in the Ministry of Agriculture (Kementan) and Ministry of Environment and

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[6] An academic script is a white paper that provides scientific basis for Indonesian policy.
[7] A PERDA is a provincial level regulation passed by local governments and carry the force of law in the region.

Figure 2. Composite Portfolio Theory of Change

Forestry (KHLK) would learn from research processes and findings. The projects also aimed to support capacity development among participants and build relationships through facilitated processes. This was expected to build an appreciation for the research service CIFOR can provide to governments and hence lead to further opportunities for CIFOR and its partners to support evidence-based decision-making within the Indonesian government.

Portfolio research was intended to inform and support policymakers at all levels to revise current policies and/or create new policies for sustainable oil palm production and land use planning and management. For example, at the international level, ERS brought field experience from West Kalimantan to RSPO debates in an effort to influence the shape of RSPO P&C to better reflect the challenges women face in oil palm communities. It was intended that better-informed policy would support environmental sustainability and social inclusion goals, that the interests of smallholders and women would be better represented, and that improved working arrangements in the sector would continue coordinated efforts to promote sustainability. Outcomes in the government policy pathway are also supported by intermediate changes in the partnership pathway.

Partnerships and Networking

All projects worked in partnership to promote use of portfolio research and leverage opportunities to realize outcomes in other pathways. Projects partnered and collaborated with universities, donors, NGOs, and multi-stakeholder platforms. Collectively, partnerships and networks developed and strengthened through the projects were expected to facilitate mutual learning. Project partners were expected to advocate and pursue oil palm issues using research-based knowledge to inform planning and project development decisions. Partnerships were expected to support more effective working arrangements within the oil palm sector, as stakeholders become more coordinated and relationships are strengthened through project interactions. These stronger and more coordinated efforts were expected to support higher-level outcomes toward improved social inclusion and environmental sustainability in the sector. For example, GOLS engaged a group of scholars from the KHLK's Center for Research and Development on Social, Economics, Policy and Climate Change (P3SEPKI) as members of the research team to enable key research findings and messages are disseminated to those involved in decision-making processes in the ministry. P3SEPKI is a research group from within the ministry's Forestry and Environmental Research and Innovation Agency (FOERDIA).

Equitable Development of the Oil Palm Sector

This pathway is characterized by shifts in private sector (i.e., private companies, smallholders) practice toward more environmental sustainability and social inclusion. It was assumed that changes in the equitable development pathway could result from government policy changes, or as collective action emerges as a result of outcomes in the partnership and networking pathway (e.g., advocacy campaigns). All projects engaged with oil palm companies, primarily through multi-stakeholder platforms, private sector convenors, or intermediaries.

For example, the ERS Project intended to influence RSPO P&C to address the effects of oil palm labour standards and working conditions for women. The commissioning partner chairs the RSPO Working Group on Human Rights, enabling access for influence through the partnership pathway. Collectively, private sector engagement in the projects was expected to encourage private companies to gain knowledge and awareness about oil palm issues identified in portfolio research. This was expected to encourage improved private sector policies and practices, more sustainable and inclusive business models, and better coordination with stakeholders across the sector to support more equitable market access and corresponding benefits for smallholders and women.

Research

The portfolio aimed to influence the progression of oil palm research through the research pathway by generating new and building on previous knowledge pertaining to the regulatory, economic, social, and environmental dimensions of oil palm development in Indonesia. Research outputs were published and shared through normal scientific media (peer-

reviewed journals, open access databases, occasional papers), conferences, and research partnerships with local Indonesian universities and government research institutes, and through a range of products (e.g., policy briefs, infobriefs, blogs, etc.) tailored for particular audiences.

The projects were expected to increase research capacity and expand expertise on oil palm issues. Graduate students in the GOLS and OPAL projects, were expected to gain career opportunities in the sector, enabling students to build careers in oil palm research and contribute to the expanding knowledge base. It is expected that research partnerships and targeted research dissemination would lead to increased recognition of CIFOR and partners for their expertise.

This would lead to other researchers using and referencing project findings and methods to pursue new research questions and advance the oil palm research agenda toward greater environmental sustainability and social inclusion. At a higher level, the accumulation of scholarship on the topic is expected to influence organizational practice, which connects back to changes in the equitable development pathway.

Assumptions

Assumptions were identified from discussions held during the evaluation's inception meetings, researcher interviews, and midterm presentation of preliminary results in April 2020. Distinctions are made between theoretical and contextual assumptions. Theoretical assumptions are hypotheses about factors and mechanisms internal to the project that explain why a change is expected, while contextual assumptions are suppositions about the prevailing context within which a change is expected (Belcher et al., 2018; Belcher, Davel, & Claus, 2020). The ToC rests on the following assumptions:

1. Knowledge gaps in the evidence base are constraining good policy and practice;
2. The research effectively identified a gap and made an original contribution to help fill knowledge gaps;
3. Facilitating mutual learning processes and knowledge co-generation would contribute to better informed discourse and improved practices;
4. Engagement efforts were sufficient to build relationships with allies and target audiences to ensure uptake of findings and continuity of action;
5. Being flexible and adaptable to accommodate opportunities would expand the projects' influence;
6. The research findings draw public scrutiny to a topic that adds pressure for policy and practice change;
7. Partners are receptive to and develop an interest in applying the results;
8. The research findings align with existing political commitments to support uptake and/or coordination with allies;
9. The research findings are sufficiently aligned with private sector interests (e.g., profitability, sustainability/inclusion commitments, value chain efficiency/productivity) to lead to uptake and use;
10. Researchers already have an interest in the topic and seek out new and available evidence; and
11. CIFOR researchers and partners are well-positioned to influence change.

Results

Outcome Evaluation

Table 4. Summary of CIFOR's oil palm research portfolio outcome assessment, supporting evidence, and consideration of contextual factors and causal mechanisms affecting outcome realization (see Table 13 in Appendix 8 for a more detailed assessment)

Results	Illustrative Evidence	
Outcome Assessment	**Summary of supporting evidence for the assessment**	**Contextual factors and causal mechanisms affecting how the outcome was realized**
Government actors learn from oil palm research processes and findings [intermediate outcome] **Realized, clear portfolio contribution**	• Government officials demonstrated learning from research process and findings (e.g., KHLK, P3SEPKI, district plantation offices in East Kalimantan and Papua, Regional Development Planning Agency (BAPPEDA) Kotawaringin Barat) Learning included: • Greater understanding of challenges in the oil palm sector (e.g., gender blindness of oil palm labour policy and RSPO certification standards; barriers for smallholders' ISPO compliance) • Greater understanding of current conditions and potential impacts (e.g., maps locating HCV areas, an increased number of vegetation classes, extent and locations of oil palm expansion over time) • Broadening concepts (e.g., smallholder heterogeneity/typologies) • Recommendations for policy (e.g., CPO Fund allocation, policy options for tenure) Learning happened by: • Increased access to relevant data and information (e.g., maps, spatial analyses, smallholder typologies, scenario models) • Opportunities to share ideas and discuss in multi-stakeholder fora (e.g., Companion Modelling games, gender dialogue) • Provision of inputs to policy processes (e.g., academic draft for PERDA, policy recommendations for CPO Fund allocation, policy options for tenure, etc.)	Facilitating factors: • Strategic portfolio engagement and networking with government officials • There is some interest and existing government mandates to realize sustainable oil palm production • Intentions to foster collaborative action supported uptake of some findings, in some cases actively contributing to policy development processes • Supplementing governmental data and knowledge pertaining to oil palm issues (particularly at provincial and district levels) Barriers: • Competing interests within the political agenda (e.g., economic development) Alternative explanations: • Other organizations actively supplement the knowledge base, with similar data, research findings, and/or messages (e.g., raising attention to gender disparities in oil palm labour, smallholder heterogeneity, mapping oil palm expansion, and HCV areas)
Government actors build their capacities and relationships within the oil palm sector [intermediate outcome] **Realized, clear portfolio contribution**	• Government officials gained new or built upon existing skills and relationships through the portfolio (e.g., KHLK, P3SEPKI, district plantation offices East Kalimantan and Papua, BAPPEDA Kotawaringin Barat) • Some government respondents welcomed future and follow up partnerships with CIFOR on sustainable oil palm issues Capacities gained: • Data capacity (in terms of volume and accuracy) • Technical capacity (e.g., mapping and spatial analyses)	Facilitating factors: • Portfolio facilitated engagement activities (e.g., workshops, meetings, game sessions, etc.) to convene government, NGO, private sector, and researcher stakeholders across the oil palm sector • Some projects had a more explicit capacity- and relationship-building components than others Barriers: • Time and resources to provide training to government partners

	• Decision-making capacity (i.e., via awareness and understanding of oil palm issues from different perspectives) Relationships developed by: • Official MoUs and partnerships (e.g., KHLK, National Space Agency (LAPAN), BAPPEDA Kotawaringin Barat) • GOLS partnership supported P3SEPKI researchers' learning and built new competencies on oil palm issues • GOLS partnership fostered and strengthened individual and institutional relationships between CIFOR and P3SEPKI researchers • Continued engagement in processes in East Kalimantan following the EK Project supported training activities and companion modeling games through OPAL Scope for improvement: • Co-development of project proposals, research questions, and objectives • More intensive coordination and communication • More opportunities for training	• Governmental and portfolio turnover posed a challenge for institutional capacity-building and relationship development
Government actors engage CIFOR & partners to help make informed decisions on oil palm [intermediate outcome] **Realized, clear portfolio contribution**	• Portfolio researchers and partners have been engaged by government to support decision-making processes (e.g., KHLK, Kementan, Coordinating Ministry of Economic Affairs (Kemenko), East Kalimantan district plantation office, BAPPEDA Kotawaringin Barat) • Government respondents noted they hope that CIFOR continues to generate knowledge and resources that can be used to inform policy decisions Decision-making processes where CIFOR and partners were invited: • East Kalimantan Governor regulation (pergub) (follow-up to PERDA process) • Sustainable Plantation Communication Forum (FKPB) in East Kalimantan • National Action Plan for Sustainable Oil Palm Plantations (RANKSB) working group • ISPO working group • P3SEPKI (partner) consulted by colleagues within the KHLK on oil palm policy issues • Kementan's taskforce on revising a national policy on company's obligation to set aside concession areas for community farms	Facilitating factors: • Research engagement and dissemination strategies brought attention to and raised the profile of the portfolio's activities and outputs among government actors • Portfolio engagements strengthened relationships and positioned CIFOR and its partners as relevant actors within the oil palm sector (leading to follow-up engagements, invitations to multi-stakeholder processes, invitations as consultants) • Exposing stakeholders to diverse perspectives in a negotiated process fostered awareness-building and open-mindedness among government participants • CIFOR's expertise in diverse topics and international status brings a perceived level of experience and credibility • Some portfolio researchers and partners have established relationships with government (individual and institutional) • OPAL's support of the local government's mapping of HCV areas in East Kalimantan follow interactions initiated in the EK Project Barriers: • Perception of CIFOR as a "forest defender" with an agenda Alternative explanations: • Many actors are invited to support multi-stakeholder processes

| Policy-makers create new or adapt existing policy on oil palm (informed by research) [EoP outcome] **Realized, clear portfolio contribution** | • The portfolio provided inputs to policies at the subnational, national, and international level
• There is scope for further policy contributions from OPAL (n.b., the project will conclude in 2021)
Portfolio contributions to subnational policies:
• East Kalimantan PERDA – academic script on HCV
• East Kalimantan pergub – HCV maps
• Spatial plan of West Kotawaringin 2023 – smallholder plantation data
Portfolio contributions to national policies (n.b., extent of portfolio influence remains unclear):
• RANKSB – smallholder heterogeneity and compliance gaps
• ISPO – smallholder readiness for ISPO
Portfolio contributions to international policies:
• RSPO – strengthening gender gaps in P&C to improve working conditions for women | Facilitating factors:
• CIFOR's experience, neutrality, and evidence-based approach was believed to diffuse polarity in discussions among actors with conflicting interests, support collective action on common issues, and shift focus toward solutions
Barriers:
• It is difficult for governments to use external data or research without official endorsement from the national level (e.g., KHLK); most portfolio outputs do not have official endorsement
• The PERDA negotiation process involved some actors with conflicting interests, including GAPKI, which resulted in a less ambitious article pertaining to HCV
• Time-lags likely affect the reflection of learning from portfolio activities and outputs in policy
Alternative explanations:
• Policy processes involve multiple stakeholders, and other researchers and organizations are working to provide technical support and research on similar issues
• CIFOR is one of many information sources that policymakers consult when developing or revising policy
• The RSPO Human Rights Working Group drew on a dossier of research on gender and oil palm to inform revisions to the P&C (i.e., ERS findings were one of many inputs to the dossier)
• The development of the RANKSB was initiated by Kementan and United Nations Development Programme (UNDP), soliciting input from many stakeholders across the sector including CIFOR
• Indonesian Biodiversity Foundation (KEHATI), Bogor Agricultural Institute (IPB), and the University of Indonesia (UI) have also contributed research on smallholder typologies to ISPO strengthening process, serving as another input that would contribute to better reflection of smallholder realities in the policy |
| Project partnerships facilitate mutual learning[8] on oil palm [intermediate outcome] | • Project partners across the portfolio (e.g., graduate students, local university collaborators, subnational government agencies, NGOs, and donors) claimed to benefit from their involvement
• Most respondents were satisfied with the partnerships and conveyed interest to partner again in the future; one respondent | Facilitating factors:
• Some but not all partnerships in the portfolio were designed with some form of reciprocity to attract buy-in and foster relationships (e.g., proposal co-development, project co-design, frequent engagements and |

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[8] Mutual learning is both a process and outcome of engagements between two or more actors, whereby either knowledge is learned by both (or more) actors (e.g., both learn X), knowledge is exchanged (bilateral or multi-lateral exchange) (e.g., one shares X and the other shares Y, resulting in both knowing XY), or knowledge is co-generated (e.g., together in the process, knowledge Z is produced).

Realized, clear portfolio contribution	explained their reasoning to not re-engage CIFOR again (i.e., while the quality of the research was thought to be high, the quality of the final output was disappointing) • However, general satisfaction with the partnerships does not mean that there is no scope for improvement on how partnerships are approached and fostered Mutual benefits included: • In-depth knowledge of the oil palm sector in Indonesia and the specific topics under investigation • Enhanced research capacities and skill-building (e.g., methodologies, project management, presentation skills, etc.) • Expanded research and professional networks Mutual benefits resulted from: • Portfolio engagements (e.g., scoping, meetings, FGDs, events, etc.) and connections introduced through collaborators' networks Scope for improvement: • To increase mutual benefits, partnerships could reconsider CIFOR-USAID Fellowship (CUF) selection, CUF partner universities, CUF supervisor-CIFOR interaction, proposal co-development and co-design, equitable allocation of responsibility and funding between GOLS partners	communication, seeking input and feedback to research process and outputs, knowledge sharing and exchange) • Projects with strong internal team dynamics had external partnerships that were likewise strong (e.g., OPAL) • Projects identified opportunities to align with, support, and invest in allies' activities (mutually beneficial in the long-run if allies reciprocated by promoting or using research outputs in their advocacy on oil palm issues) Barriers: • Projects with siloed teams had low internal cohesion and external partnerships were strong in some components but weak in others (e.g., GOLS) • Challenge to engage and partner with private sector actors in Indonesia, owing to tensions and changing dynamics in the sector (e.g., the collapse of the Indonesian Palm Oil Pledge (IPOP)) • CIFOR and portfolio researchers lack contacts or access to private sector • Data-sharing challenges (i.e., governmental regulatory restrictions, lack of private sector transparency, etc.) Alternative explanations: • Some respondents may have chosen to not divulge their actual opinions regarding partnerships depending on who conducted the interview, who else was present during the interview, or who they believed would have access to the interview information
Project partners & allies[9] advocate for & pursue oil palm issues (using research) [EoP outcome] **Realized, clear portfolio contribution**	• P3SEPKI has been an important proponent for portfolio research in the KHLK on sustainable oil palm topics, as well as between ministries when called to oil palm diplomacy meetings (particularly with Ministry of Foreign Affairs and the Ministry of Trade) • Other proponents include Greenpeace, Oxfam Novib, and Forum for the Future in various campaigns and RSPO spaces Use of portfolio research: • NGO, IGO, government, researcher, and media allies in their work relating to deforestation, biodiversity conservation, fire, tenure, smallholder livelihoods, and gender equality • Out of all the portfolio outputs, the Atlas and the ERS findings have been leveraged the most to support partners' and allies' advocacy work	Facilitating factors: • Portfolio engagement in various spaces has exposed project researchers to potential partners and allies on oil palm issues • Strategic partnerships facilitated uptake and promotion of research outputs in advocacy work or gave portfolio researchers access to specific debates or networks (e.g., ISPO, RANKSB, European Union (EU)-Indonesia negotiations, public-private sector networks on zero deforestation commitments) • It is common practice for portfolio partners and allies to draw on research in their projects or advocacy; research provides a credible and grounded framing that enables them to engage in polarized debates with scientific authority Alternative explanations: • While scientific knowledge is considered key, respondents thought the role of research organizations or universities should remain neutral,

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[9] Allies are actors that work in similar contexts who are not partners but have similar/aligned goals as the portfolio.
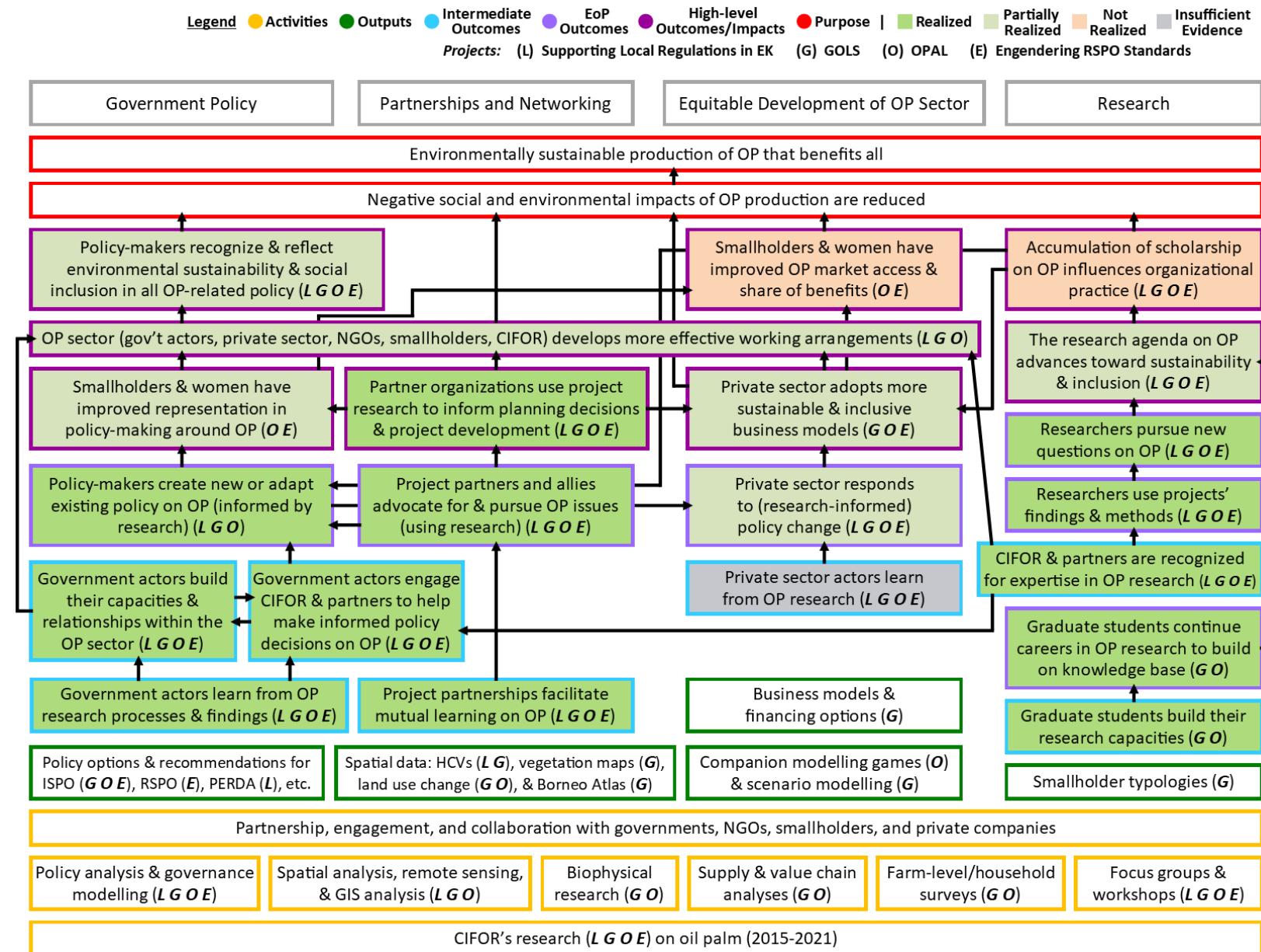
		leaving political engagement and advocacy to actors whose mandates fit that role • Some partners reduced their presence in the oil palm debate because of the high political sensitivity in the sector
Private sector actors learn from oil palm research [intermediate outcome] **Insufficient evidence, preliminary results indicate partial realization with clear portfolio contribution**	• Evidence indicates smallholders, farmer associations, and private sector convenors (e.g., RSPO, Forum for the Future, etc.) learned from the portfolio Learning included: • The extent of oil palm plantation-related deforestation and associated emissions • Understanding of oil palm sector challenges and opportunities • Plantation boundaries and locations • GIS mapping and analysis skills • Smallholder heterogeneity • Women's working conditions in the oil palm sector Learning occurred by: • Portfolio activities (e.g., data collection, workshops, game sessions) • Sharing of portfolio outputs in meetings, events hosted by CIFOR, and RSPO dialogues • Sharing of portfolio outputs by private sector convenors in RSPO fora	Facilitating factors: • As a result of political, market, and advocacy pressure for sustainability, the private sector is more responsive and open to research-based solutions for sustainable practices Barriers: • Research that identifies and qualifies problems may be dismissed because it uses imperfect (though the best available) data, hindering progress toward solutions • Lack of traceability in the supply chain and resistance (facilitated by legislative loopholes) to release private sector information poses a challenge for effective private sector learning • Some companies lack the resources to adhere to and implement NDPE commitments • Interviews with private companies were not possible, so this assessment relies on interviews with private sector intermediaries to evidence the outcome Alternative explanations: • Respondents perceived that private sector attention to research on oil palm is perpetuated by market signals and influenced by campaigns that amplify messaging around the negative consequences of oil palm expansion • Respondents perceived that the private sector requires financial incentivization to resolve negative environmental and social externalities if they wish to remain competitive

Private sector responds to (research-informed) policy change [EoP outcome] **Partially realized, clear portfolio contribution**	Company responses include:
	• Wilmar requested a meeting with CIFOR to compare the Atlas' data on concession boundaries (found incongruencies, but did not share their data to correct)
	• Bumitama responded to Greenpeace's complaint made to RSPO (which used data from the Borneo Atlas)
	• RSPO member companies made changes based on the modified P&C, through the:
	  • Establishment of gender committees to improve women's representation in decision-making
	  • Establishment of a Women's Charter (e.g., Wilmar)
	  • Introduction of contract innovation pilots
		Facilitating factors:
		• Strategic alignment of portfolio research with NDPE commitments
		• Making data publicly available (e.g., Borneo Atlas, Papua Atlas) in a user-friendly visual tool enabled NGOs to leverage information to hold companies accountable to their NDPE commitments
		• The private sector was perceivedto be open to solutions for improved sustainability practices, and most companies genuinely want to realize their zero deforestation commitments, indicating that many companies (particularly the large ones under public scrutiny) can be expected to respond to policy changes and advocacy influenced by the portfolio and other research efforts
		Barriers:
		• Companies and other interest groups have access to regulatory processes

	Potential for future responses: • Companies will be required to set aside and manage HCV areas in order to abide by the PERDA, effectively preventing companies from deforesting these areas	where they can lobby and exert pressure for a business-as-usual scenario • Private sector actors may submit complaints in response to PERDA regulations Alternative explanations: • Calls for increased accountability to NDPE commitments are believed to have also influenced private sector behaviour • Many stakeholders contributed to the knowledge based that informed the revisions to RSPO's P&C; companies' responses to the P&C are difficult to link back to the portfolio's contributions • Private sector adherence to requirements outlined in the PERDA and pergub in East Kalimantan are contingent on enforcement and monitoring of these regulations
Graduate students build their research capacities [intermediate outcome] **Realized, clear portfolio contribution**	• Graduate students from the CUF program, local Indonesian universities, and OPAL gained new knowledge, skills, and relationships • 24 of 26 CUF students completed the program and graduated; five of the six Indonesian OPAL students graduated, and one is working to complete their dissertation Research capacities included: • In-depth knowledge of the oil palm sector, dynamics of the Indonesian system, and theoretical and methodological knowledge • New research skills (e.g., surveying, spatial analysis, interviews, Companion Modelling, etc.), such as research design, fieldwork, and communication • Expanded academic, professional, and personal networks during their research experience Capacity-building happened by: • Opportunities for graduate student to organize workshops, present findings to governmental and academic audiences, and publish in peer-reviewed journals	Facilitating factors: • A dedicated graduate student research capacity component was built into the design of some projects (e.g., CUF in GOLS, OPAL) • GOLS received sufficient funding from United States Agency for International Development (USAID), built partnerships with American universities, and leveraged CIFOR resources to support the CUF program • GOLS and OPAL provided methodological and research training for students • Genuine and active involvement of OPAL students facilitated capacity-building (e.g., inception meetings, site visits, workshops, game facilitation, presentations, co-authoring, etc.) • Strong relationships (both personal and professional) between OPAL partners supported students in their research experience • OPAL students engaged directly with governmental actors through meetings, games, and presentations to build professional relationships • OPAL took advantage of unexpected opportunities for further student capacity-building (e.g., collaboration with external graduate students, invitations as resource people in governmental processes) • Partnership with local universities for data collection support supported local researcher capacity development (e.g., Mulawarman University (UNMUL), Antakusuma University (UNTAMA), Panca Bhakti University (UPB), Kutai Kartenegara University (UNIKARTA)) Barriers: • While overall successful, several areas of CUF could have been improved to augment student research capacity-building (e.g., student selection, CIFOR-university supervisor connections, linkages between CUF and GOLS research, etc.)

Graduate students continue careers in oil palm research to build on knowledge base [EoP outcome] **Realized, clear portfolio contribution**	• Ten students from the first CUF cohort work in organizations related to research or natural resource management in Indonesia (e.g., Wildlife Conservation Society (WCS), World Resources Institute (WRI), CIFOR, Indonesian Institute of Sciences (LIPI), Komodo National Park, Sinarmas) • Some OPAL students now work at IPB full-time, working with Kementan to formulate policies on plasma and smallholders; one works for the Indonesian Embassy in Bern, responsible for answering questions on the palm oil ban; and one is planning to work as a social planner in Indonesia following graduation • During the project, some OPAL students were invited by government actors to support local regulation development processes as resource people (e.g., Sustainable District Gathering Circle (LTKL), Sustainable Palm Oil Initiative (SPOI))	Facilitating factors: • Greater likelihood that students who pursue a graduate degree will seek a career in a related topic area • Projects with a dedicated graduate student research capacity component were designed to prepare and equip the future generation to work in research or natural resource management • The research experience facilitated student capacity-building, as they gained and developed knowledge, skills, and networks that could be applied in future work • Projects facilitated student exposure to relevant system actors, networks, and platforms to build their professional networks • Students' active role in all OPAL activities provided opportunities to build on and demonstrate their expertise during interactions with system actors, which likely played a role in the invitations to be a resource person • Most students graduated from their respective programs Barriers: • CUF's student selection chose not to admit researchers or practitioners already established in their careers • Students who did not complete their studies had personal reasons
CIFOR & partners are recognized for expertise in oil palm research [intermediate outcome] **Realized, clear portfolio contribution**	Perceptions of reputation included: • Most government, IGO, NGO, researcher, and private sector respondents attested to CIFOR's expertise in oil palm research • CIFOR is widely viewed as a credible knowledge producer that has influence in both academic and policy circles in Indonesia • However, some respondents critiqued the extent of CIFOR's influence • Despite the sector's sensitivity, CIFOR's research was described as objective, based in science, and data-driven • Most partners are interested to collaborate with CIFOR again on oil palm or other research • One respondent perceived CIFOR to be an irrelevant actor in the Indonesian context (instead believing CIFOR to only have influence at the global level) Reputation gained by: • Partners gained recognition for their expertise on oil palm as a result of their collaboration in the portfolio (e.g., P3SEKPI, LAPAN, BAPPEDA Kotawaringin Barat, IPB, Swiss Institute of Technology Zurich (ETHZ), graduate students, UNMUL) • Common indicators of academic recognition include: acquisition of a graduate degree (i.e., an internationally recognized	Facilitating factors: • CIFOR's pre-existing reputation as an international research organization and longstanding research in Indonesia contributed to system actors' perceptions of CIFOR's general research expertise • CIFOR's reputation in other forest-related debates (e.g., fire and haze, FLEGT, and REDD+) has extended the organization's reputation in the oil palm debate • Part of CIFOR's reputation is attached to the reputation of its scientists, many of whom have built their standing over the course of their career, including prior to joining CIFOR • Partners have established reputations, skillsets, and networks that positioned them as relevant collaborators in oil palm topics Alternative explanations: • It is unclear the extent to which CIFOR's and partners' expertise was already recognized; likely reputations preceded the portfolio as many respondents were familiar with research related to topics outside the portfolio • CIFOR and its partners are not the only actors working on oil palm in Indonesia; there are many active research organizations producing similar messages and findings

	credential); successful submissions of articles to peer-reviewed journals; and interest or invitations to join future research projects • Common indicators of governmental recognition include: endorsement of the project; invitations to join dialogues or conferences; and invitations to provide inputs to policy processes as resource people	
Researchers use projects' findings and methods [EoP outcome] **Realized, clear portfolio contribution**	Evidence of use: • Bibliometric, altmetric, and interview analyses provide clear evidence that external researchers, project researchers, and research partners are using outputs produced by the portfolio • Citation counts from a sample of portfolio outputs: Pacheco et al. (2018) is cited 22 times; Luttrell et al. (2018a) is cited 6 times; Gaveau et al. (2016) is cited 205 times; Jelsma et al. (2017) is cited 40 times; Sharma et al. (2018a) is cited once; Yulian et al. (2017) is cited twice; and Sijapati Basnett et al. (2016) is cited twice How used: • Citing researchers mostly refer to contextual observations (e.g., complexity of the sector, the political landscape of oil palm governance, system actors' roles in sustainability commitments, drivers of deforestation, oil palm-related landscape changes, smallholder heterogeneity, smallholder compliance barriers, the status of gender in the oil palm debate), and do not tend to use portfolio methods or analyses extensively • Two outputs (Jelsma et al., 2017; Gaveau et al., 2016) are the best examples where citing articles engaged with and used portfolio data (e.g., statistics on number of and area of oil palm plantations, forest loss over time, average size of smallholder plantations, share of oil palm cultivation by group, etc.), methods (e.g., satellite imagery interpretation approach, land cover classifications, sampling tools, proxy indicators, etc.), maps (e.g., estate boundary maps, oil palm-driven land conversion maps, industrial oil palm expansion maps, etc.), and tools (e.g., smallholder typologies) • Project researchers and partners applied methods and findings in other research projects (e.g., HCV maps, smallholder typologies, Companion Modelling games, scenarios, etc.)	Facilitating factors: • Many projects were designed to build on previous portfolio work for continuity (e.g., EK Project builds on a CGIAR Climate Change, Agriculture and Food Security (CCAFS) project; GOLS builds on LIFFE Options and Corporate Commitments; OPAL builds on Sentinel Landscapes, EK, GOLS) • CIFOR researchers and project partners frequently cite each others' research – both within and across projects • Portfolio outputs are disseminated widely through academic (i.e., peer-reviewed publications, academic conferences, etc.) and non-academic channels (i.e., CIFOR and OPAL websites, CIFOR Forests News, Twitter, meetings and events attended by researchers, etc.) Barriers: • Some projects did not publish in peer-reviewed journals (e.g., EK Project, ERS Project), which may explain low academic engagement of these projects' outputs • A few of the portfolio outputs are published in Bahasa, which can increase access to Indonesian researchers, but limits wider researcher uptake as English is the dominant language in academia Alternative explanations: • There is extensive research published on oil palm in Indonesia, meaning that portfolio outputs compete with a plethora of knowledge for uptake
Researchers pursue new questions on oil palm [EoP outcome] **Realized, clear portfolio contribution**	• Many respondents had the impression that portfolio research has drawn attention to oil palm issues in Indonesia • Portfolio researchers and partners noted they had new research interests and/or studies as a result of their respective projects (i.e., EK, GOLS, OPAL)	Facilitating factors: • By contributing to the overall knowledge base on oil palm, new research questions may emerge as a result • Most portfolio outputs have either been published in peer-reviewed journals or made available online, enabling more researchers to engage with this knowledge and reflect on questions not addressed
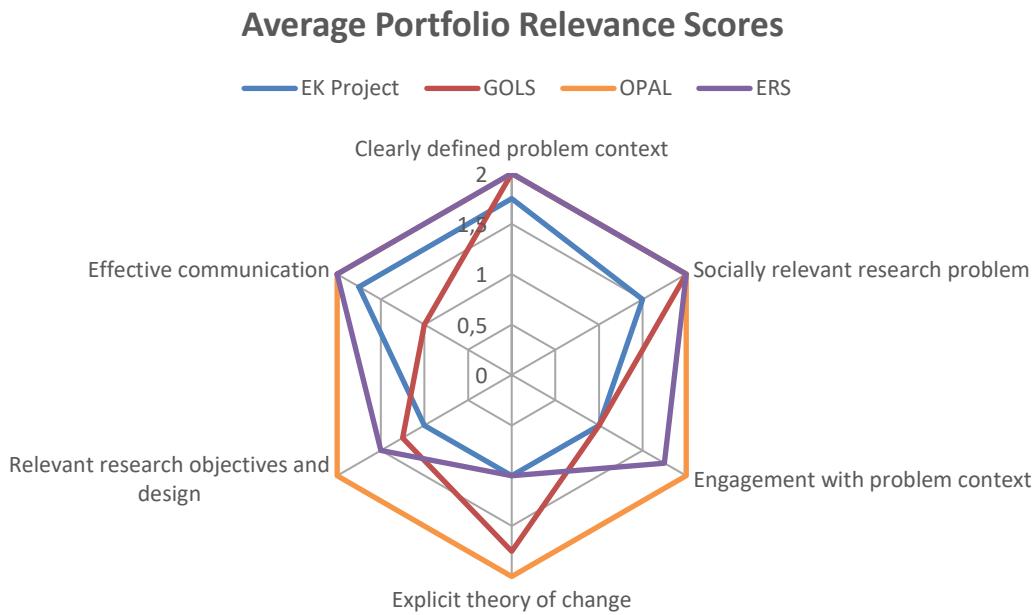
• New areas for possible inquiry were identified by respondents who were aware of the portfolio (e.g., PERDA implementation, economic impact of PERDA implementation on development, impact of peat restoration on oil palm emissions, scaling up of oil palm concession restoration model, restoration impact on smallholders)
  • There is evidence that researchers (e.g., CIFOR, World Agroforestry (ICRAF)) are pursing some of these new questions in future studies
  • Future opportunities for project collaborations between P3SEPKI and CIFOR are currently being explored (e.g., oil palm trade)
Citing articles used portfolio research (e.g., Gaveau et al., 2016; Jelsma et al., 2017; Sijapati Basnett et al., 2016) to identify entry points for their research, such as:
• A comparison of environmental impacts of oil palm between Colombia and Asia (Ocampo-Peñuela et al., 2018)
• Drivers of deforestation across Indonesia (Austin et al., 2019)
• An expansion of the geographic scope of the study to include West and Central Kalimantan (Schoneveld et al., 2019b)
• Estimations of carbon stocks on previously deforested or regrowing forests in Borneo (Asner et al., 2018)
• The contextual role of local and domestic knowledge and systems on oil palm production (Khatun et al., 2020)
• The implementation of GAP on oil palm for smallholders (Woittiez, 2019)
• Women's perspectives on current oil palm debates and policies that omit gender (de Vos, 2019)
	• Portfolio findings were shared at conferences and events attended by researchers to stimulate interest in oil palm issues
	• The portfolio exposed researchers and partners to new knowledge and gave them contextual experiences that may influence their research interests in the future
	• For portfolio outputs that have not yet received much academic engagement, there is potential for future uptake to inform new questions
	Barriers:
	• In order to pursue new research questions, researchers need funding and donor support which can be driven by many competing interests
	Alternative explanations:
	• In science, new areas of inquiry are developed based on interest, knowledge, and experience
	• Attribution to the portfolio is difficult as there is copious research conducted on oil palm in Indonesia

Figure 3. Portfolio Theory of Change, with outcomes colour-coded to reflect extent of outcome realization (green: realized; light green: realized; orange: not realized; grey: insufficient evidence)

QAF Analysis

Relevance

Average Portfolio Relevance Scores

Figure 4. Portfolio QAF scores for Relevance principle (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; and 2 = the criterion was fully satisfied). Criteria definitions can be found in Appendix 5.

All projects clearly defined the socio-ecological context of oil palm, particularly with respect to distinct social (women and smallholders) and ecological challenges faced in the industry (deforestation of high conservation areas, limited spatial information on biodiversity, plantations, smallholders on which to base decisions), and identify a relevant problem within the context to address with research (Doc1, Doc4, Doc9a, Doc26). The ERS Project's primary rationale was that women are frequently on the periphery of oil palm issues, and in order to ensure their inclusion in the sector, it is necessary to better understand their experiences and develop mechanisms to ensure inclusion. OPAL defined the oil palm context as polarized, and that decision-making dynamics need to be rethought, and better understood from multiple perspectives, in order to envision a sustainable future for the industry that benefits society and the environment. The EK Project was designed when the PERDA was under review and noted the need to facilitate a collaborative multi-stakeholder process to ensure the scientific case for HCV areas was reflected in policy such that companies may not establish plantations and maintain these areas. GOLS clearly defines the negative social and environmental impacts and drivers affecting the oil palm sector, deriving entry points from previous projects (e.g., LIFFE Options, Corporate Commitments on Sustainability), and was timely in alignment with other interventions (e.g., IPOP, New York Declaration on Forests, ISPO, SPOI). GOLS conducted research along environmental and social specific components to address problems including the lack of available spatial data on biodiversity, plantations, and smallholders. The relevance of the research problems addressed in the portfolio, and consideration for private sector commitments to sustainability, and ongoing policy processes (i.e., RSPO, PERDA, RANKSB) supported individuals within policy, research, NGO, and private sector target audiences to learn, advocate, and make decisions on timely social and environmental issues (i.e., smallholders, women, HCV, scenarios, and spatial information) within the oil palm sector.

All project researchers had at least an implicit idea of how the research would contribute to change processes. The ERS and EK Projects did not document a ToC, but the demand-driven nature of the work encouraged project researchers to employ an opportunistic approach that succeeded in influencing the shape of RSPO and PERDA
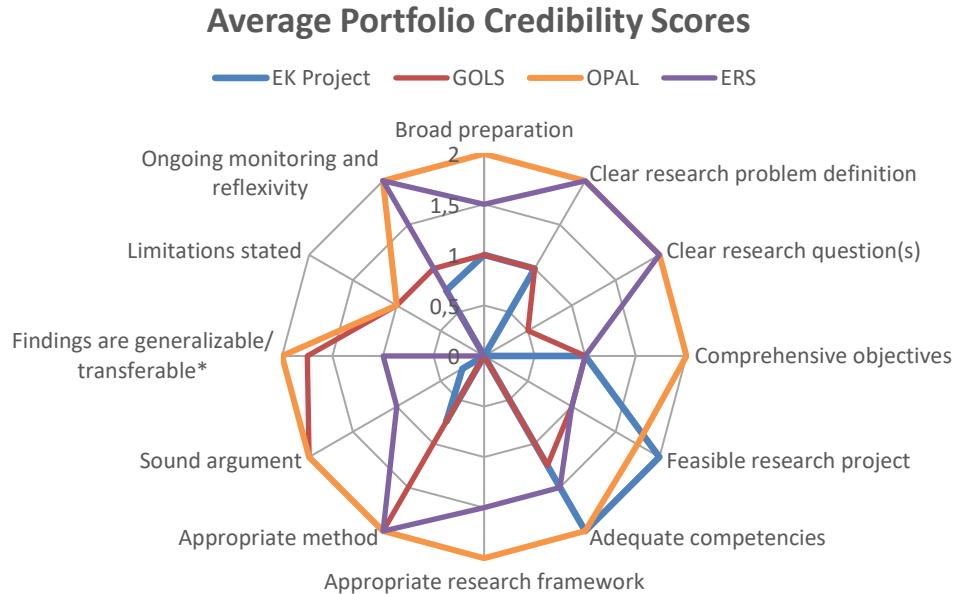
policies, respectively. GOLS and OPAL used more formal processes to document their ToC's. In use, the OPAL ToC functioned as a living document, with continual review and revisions, whereas the GOLS ToC remained static and was not utilized to its full potential. GOLS researchers reported to have not found the ToC useful as it was difficult to operationalize; hence, it was not used as a framework to re-assess opportunities for private sector engagement when IPOP disbanded (Res1, Res5, Res12, Res18, Res22, Res33, Res34). OPAL fully adopted a ToC that was theoretically grounded in psychological and behavioural science theory into its strategic planning, and attempted to synergize aspects developed in the GOLS ToC to continue progress (Doc9a, Doc9b, Doc9c, Doc22, Res10, Res16, Res18). As OPAL is ongoing, the team continues to use the ToC to monitor progress toward outcomes, test assumptions pertaining to changes, and guide adaptive project management, which has been perceived useful by portfolio researchers for responsive and relevant project design and implementation to support intended outcome realization (Res6, Res10, Res16, Res18, Res24).

The projects in the portfolio varied the most in meeting the criterion of relevant research objectives and design. EK had explicit objectives that were linked to the project's purpose, though not framed in terms of a knowledge gap, and the design of engagement activities was relevant to achieve objectives (Doc1). The GOLS proposal explains and identifies the derivation of objectives by gaps in the problem context to which each component would contribute knowledge (Doc4). However, there was limited strategic geographic overlap between the components, and some of the CUF program students did not conduct research that was relevant to the project or to the topic of oil palm. There was no clear mechanism by which the students' work would have fed formally into the project as the design was separate; this led to key missed opportunities to make further progress toward outcome realization in terms of new partnerships, networking, and policy engagement (Res1, Res5). OPAL's flexible design enabled scoping activities to co-design project objectives and pursue activities of mutual interest for researchers and intended users (Doc22, Res10, Res16). The ERS Project had an explicit objective which was well connected with the problem context to support the RSPO standards; however, the connection between the objectives and project design was vague (Res3, Doc26).

The projects also managed communication variably. When communication of results was perceived relevant to target audiences, use of research and subsequent contributions to outcomes was more likely. For example, the unique dataset and visualization in the Borneo Atlas was perceived relevant to target audiences to hold private sector companies accountable to their zero deforestation commitments (NGO3), and provide a better understanding of the status, location, and ownership of plantation driven deforestation (Gov12, IGO2, Res2, Res19, Res26, Res33). Communication with national government agencies (particularly with Kementan and Kemenko) was noted to be critical to support research uptake; it was suggested that researchers in the future try to be more proactive by sharing relevant information in the appropriate form to support government activities (i.e., knowledge translation) (Gov6, Gov11, Gov13, Gov20). Communication of ERS results received mixed reviews. One respondent perceived the writing style of the preliminary report to be the main weakness of the project (Doc29), and cited that despite the fact that weaknesses in the reporting were rectified, it was the main reason for why CIFOR was not engaged for a follow-up commission (NGO4). According to another respondent, the research communications brought objectivity and an evidence base to steer typically polemical discussions between NGO and private company stakeholders toward recognition that scope for collective action to improve conditions for women is possible (PS2). Communication of ERS results supported outcome realizations in the equitable development pathway to improve practice through changes to RSPO P&C and through the Decent Rural Living Initiative (DRLI) (PS2, Res3). GOLS planned targeted engagement and communication of results (Doc5), produced a variety of tailored products containing research findings, and was perceived to have communicated well with the donor (IGO4). However, there were impressions that not all outputs were accessible to target audiences, owing to both language (IGO2, NGO6) and medium (IGO2, NGO6).Some respondents could not identify any research outputs or contributions (Gov2, Gov11, Gov15, Gov18, Gov21, IGO5, PS6), indicating an important gap between what information researchers think they convey and what

target audiences understand and absorb. One respondent suggested that CIFOR must expand delivery of results to the Regent and other relevant agencies beyond the plantation office (Gov10). OPAL results are still in progress; however, the importance of open communication with research participants was noted by some respondents in order to manage expectations, keep them apprised of progress and results (to limit the extractive nature of research), and ensure participants benefit (Gov2, Gov6).

Credibility

Average Portfolio Credibility Scores

EK Project   GOLS   OPAL   ERS

Broad preparation
Ongoing monitoring and reflexivity
Clear research problem definition
Clear research question(s)
Limitations stated
Comprehensive objectives
Findings are generalizable/ transferable*
Feasible research project
Sound argument
Adequate competencies
Appropriate method
Appropriate research framework

Figure 5. Portfolio QAF scores for Credibility principle (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; and 2 = the criterion was fully satisfied). Criteria definitions can be found in Appendix 5.
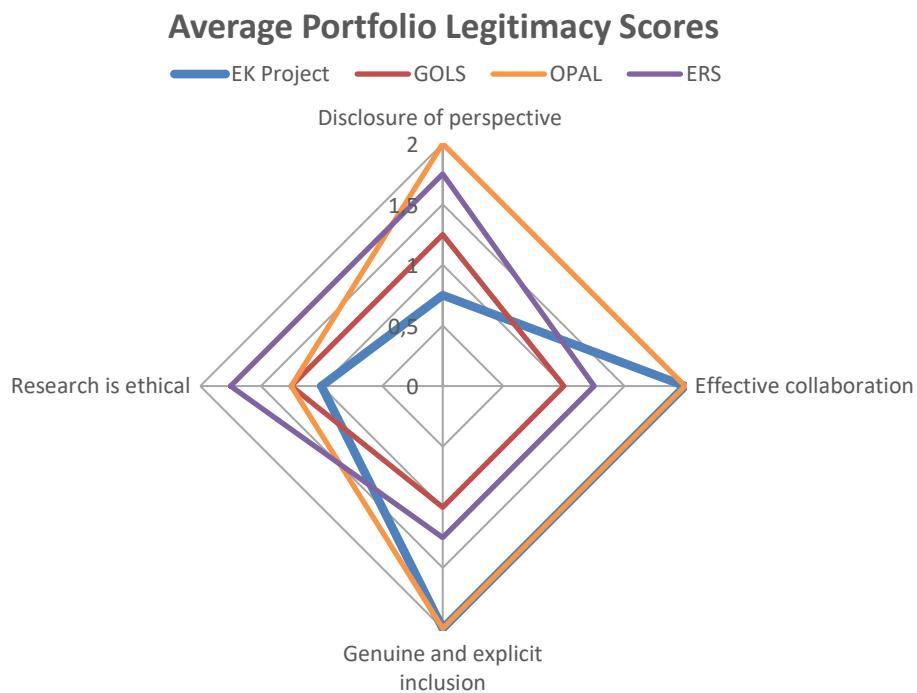
Projects varied considerably in with respect to meeting credibility criteria, despite many respondents citing CIFOR's scientific credibility, rigour, and independence as key strengths. Different conceptions of credibility exist, which may explain this disconnect. The QAF conceptualizes credibility to be the appropriateness and rigour of the method and analyses to derive conclusions, whereas respondents frequently equated credibility with scientific reputation, which refers to legitimacy. All projects demonstrated adequate competencies. The portfolio leveraged extensive experience working in Indonesia, research experience on oil palm and related natural resource management topics, facilitation and policy engagement (Gov14, NGO4, IGO2, PS1, PS2, PS5, Res10, Res12, Res15, Res16, Res25, Res34). Project management skills and the ability to bring concepts and research initiatives together in order to effectively execute GOLS were perceived by some project researchers to be lacking (Res1, Res12, Res18). EK, OPAL, and ERS documented and sought out a balance of competencies necessary to effectively realize project objectives, and included new partners and/or researchers as needed (Doc1, Doc5, Doc26, NGO4). Leveraging the portfolio's expertise and reputation was a key mechanism for outcome realization across all pathways, but was also questioned by some respondents. Some believed that the portfolio missed the mark on having the 'right' relationships with the 'right' stakeholders in the 'right' configurations, appropriate levels of in-house expertise within the industry, and institutional knowledge of the sector's political realities (NGO6, PS6).

All projects except for EK applied appropriate research methods. Engagement activities to solicit stakeholder input to the PERDA were described in documentation. The activities were well suited to the objectives and purpose of the project, and well-received by target audiences (Gov2, Res25, Res31), but there was scope to incorporate discussion of the use of participatory research methods to the project and generate corresponding research outputs to expand influence (Doc1). The methods are briefly discussed in the academic script to which the project contributed (e.g.,

observation interviews, focus groups), but were not well connected to the objectives (Doc60). Methodological development of Companion Modelling games has been a key component of the OPAL Project. The project adapted games to suit different decision-making scenarios and dynamics (Res16, Res24). Certain Kementan staff expressed interest in using Companion Modelling to facilitate multi-stakeholder discussions to better understand consequences of decisions, prioritize problems to address (particularly for smallholders), and stimulate more solutions-oriented discussions (e.g., strategies to make cooperatives more competitive) (Gov2, Gov6, Gov19). The application of appropriate methods in OPAL supported learning among participating government officials, stimulated consideration of research-facilitated processes in decision-making, contributed to progress for better policies to govern the oil palm sector, and improve working arrangements. GOLS and ERS likewise applied appropriate methods, which contributed to the perception of high scientific rigour on which their results were based (Gov15, Gov17, PS1, PS2, PS5, NGO1, NGO3, NGO4).

The projects inconsistently documented research questions and frameworks. ERS and OPAL had clear questions and analytical frameworks to guide the research (Doc9a, Doc26). The EK Project did not document research questions or a research framework (Doc1). GOLS had explicit questions to guide the research in each component, but the project lacked an overarching question and an appropriate research framework to support the integration of components and the CUF program (Doc4, Res1). Clear statements of limitations of the results and discussion of their generalizability and transferability were also variable. OPAL's methodology has the capacity to be transferred across many oil palm contexts (Res10, Res16). Study limitations and their implications on results were not discussed at all for the EK and ERS projects (Doc1, Doc9a, Doc60, Sijapati Basnett et al., 2016). GOLS' smallholder research and OPAL's games were criticized for their insufficient sampling to reach credible conclusions (Gov6, Res15). More explicit consideration for, documentation, and communication of research questions, frameworks, limitations of results, and assessments of generalizability and transferability are expected to rectify some of the issues that arose with internal project management and external research uptake.

Legitimacy

Figure 6. Portfolio QAF scores for Legitimacy principle (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; and 2 = the criterion was fully satisfied). Criteria definitions can be found in Appendix 5.

The projects variably satisfied legitimacy criteria. Respondents highlighted the importance of stakeholder inclusion in early stages of project inception, planning, and design, which they thought werekey to expand research influence, ensure research activities are not extractive, and provide clear benefits to participants (Gov1, Gov2, Gov6, Gov15, Gov18, PS6). EK and OPAL were designed as participatory projects, received positive comments from respondents on their inclusion, and were perceived by target audiences and research participants to have performed relatively well on outcomes particularly in the government and partnership pathways (Doc1, Gov2, Gov6, Res10, Res25, Res31). One government respondent said that GOLS treated research participants as sources of information, rather than beneficiaries, as outputs were not shared back to them for feedback; this further highlights the need for relevant communication with research participants, and when possible, inclusion in project design (Gov1, Gov18). However, Component 3 included smallholders in its design, and was perceived by a participant to be a beneficial experience to build technical capacity in GIS (PS3). In the ERS Project, an intersectional approach was taken to ensure that diverse perspectives (from women and men) and marginalized community voices were represented; however, the design of this research was not participatory, given the purpose to inform international-level policy (RSPO) with local-level knowledge; more inclusion in the research process was hindered by project financing and scope (Doc26, PS2, Res3).
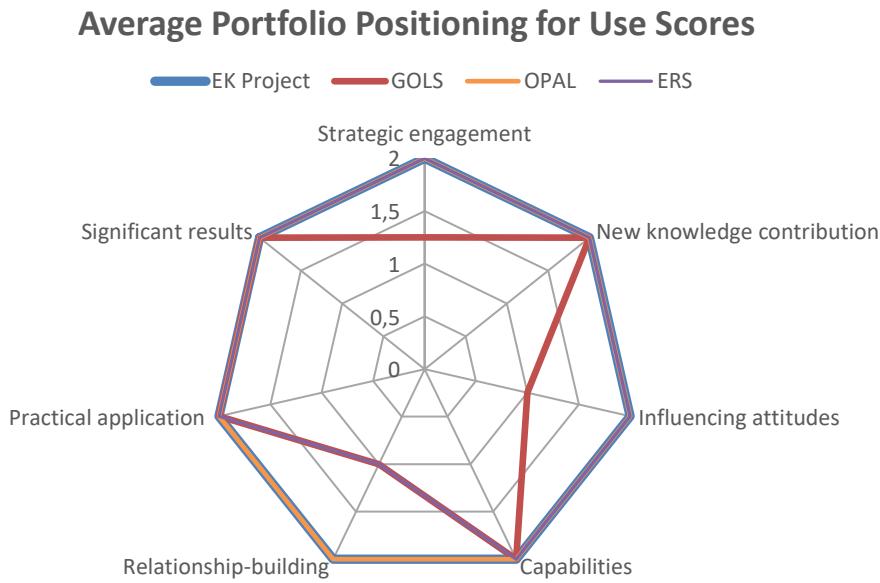
External (with participants) and internal (within project teams) collaboration were also noted to be of high importance (Gov1, Gov2, Gov9, Gov14, Gov15, IGO7, NGO3, PS3, Res1, Res5). When external collaboration was perceived to be positive, it correlated with contributions to capacity-building (i.e., P3SEPKI team gained expertise in oil palm topics), relationship-building (i.e., OPAL students were invited and funded to support research communities), and learning outcomes (i.e., ERS contributed to the discussions at RSPO and DRLI on women's experiences in oil palm communities and identified points of action), and contributed to policy (i.e., PERDA includes HCV); these relationships were encouraged to continue (Gov2, Gov3, Gov4, Gov7, Gov12, Gov13 IGO2, IGO3, IGO7, NGO3, NGO7, PS1, PS2, PS6, Res25, Res31). For example, OPAL participants perceived the collaboration with CIFOR supported improved decision-making approaches and exposure to innovative ways of stimulating multi-stakeholder discussion (Gov14, Gov19). Similarly, the collaboration in the EK Project between UNMUL, The Nature Conservancy (TNC), and the Plantation Office in East Kalimantan was perceived to have productively supported PERDA development, and CIFOR brought important input and experience to the discussions to contribute to the article on HCV areas (Gov2, Res25, Res31). GOLS was perceived to have low internal collaboration, as there was limited coordination and communication between the components, which limited the integrative capacity of the project; this had implications for the project's ability to meet the full potential of the CUF to develop research capacity (Res1, Res8), and for the project to effectively engage the private sector (PS5). Constructive feedback from respondents regarding collaboration re-iterated the importance of relevant communication (i.e., keeping respondents apprised of research progress, tailored dissemination, knowledge translation) and genuine inclusion (i.e., co-design). It was suggested that formal collaborations with governments be sought and pursued by project managers in the future to follow a clear protocol (e.g., a formal work order from local government (SPK)) (Gov2).

None of the projects underwent ethical reviews, though each included some documentation of protocols taken to maintain research ethics (Doc1, Doc4, Doc9a, Doc26). The projects varied in how each considered and disclosed potential bias. When this characteristic was present, it contributed to the perceived objectiveness of the research and positively influenced chances for research uptake (Gov13, Gov17, NGO3, IGO4, PS1, PS2, Res7). ERS documented how bias would be accounted for in the methodological protocol, and the findings were perceived to be objective (NGO4, PS1, PS2). OPAL researchers were similarly cognisant of bias, and made active efforts to validate findings with communities (Res24). GOLS did not document or discuss the implications of bias on the research results. A forestry perspective was perceived to bring a certain bias toward forest conservation; some respondents perceived it odd for forestry researchers to be involved in research focused on an agricultural commodity (Gov18, NGO6). The

EK Project did not document or discuss bias or the implications of bias on the project, but it was clear the project had an agenda to influence the PERDA in a certain direction (Doc1).

Positioning for Use

Criteria for positioning the research for use were well satisfied across the portfolio. Developing stakeholder capabilities by providing technical support (to governments) and research experience (to graduate students and partners) was key to outcome contributions.

Average Portfolio Positioning for Use Scores


Figure 7. Portfolio QAF scores for Positioning for Use principle (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; and 2 = the criterion was fully satisfied). Criteria definitions can be found in Appendix 5.

Research activities in the portfolio generated knowledge with practical application. The EK Project produced findings that were sufficiently applicable to be reflected in the PERDA, and likewise ERS findings were included in the RSPO P&C, supporting outcome realization in the policy pathway (Gov2, Gov4, Gov8, NGO4, PS1, PS2, Res3). GOLS' vegetation maps were applicable for spatial units of the government to increase the availability of high resolution spatial data that is typically limited by resources availability (Gov3); the Borneo Atlas was applicable to regional governments in conducting permit reviews and NGO campaigns to put pressure on the sector to adopt more sustainable practices (Gov12, IGO2, NGO3); findings on smallholders and smallholder plantation maps were perceived applicable for reducing instances of overlapping land claims, and were considered for inclusion in the guiding document for spatial planning (Gov10); and the scenarios were applicable for optimal land that should be controlled in licensed areas of the province that have not yet planted oil palm (Gov22). OPAL's findings are still in development, but the experience derived from the Companion Modelling games have demonstrated application in thinking through the effects and dynamics of decisions in the sector (i.e., challenges smallholders face in complying with ISPO and where there are leverage points for better supports), and facilitating multi-stakeholder discussions (Gov2, Gov6, Gov19, IGO1). It was suggested that more investment be directed in training governments, so they can develop the capacity required to ensure institutional retention of findings, processes, and relationships developed through the portfolio and future projects (Gov6, Gov10).

Relationship development was variable in the portfolio, in line with the variability in relevant communication, effective collaboration, and strategic engagement. Respondents identified relationships to be critical for research influence in the oil palm sector (Gov11, Gov13, Gov14, IGO3, IGO6, NGO6, PS5, Res3, Res12, Res31). While OPAL continued developing relationships built during the EK Project, limited geographic coordination, collaboration, and

communication within teams and with key target audiences in the GOLS and ERS projects made sustaining relationships challenging, and led to some missed opportunities (i.e., with the private sector and with academics participating in the CUF program).

Discussion

Outcome Assessment

To what extent and how were portfolio outcomes realized?

Extent of Outcome Realization

The portfolio clearly contributed to the partial or full realization of 12 of the 13 intermediate and end-of-project outcomes (Figure 3). Outcomes relating to changes in knowledge (i.e., learning), skills (i.e., capacities), and relationships were mostly realized. Changes in attitudes are clearly connected to some projects in the portfolio while others are not. Some changes in policy have occurred (e.g., PERDA, RSPO P&C), though the exact changes resulting from portfolio contributions is unclear in most other governmental policy processes (e.g., ISPO, RANKSB). The extent of outcome realization is summarized in Table 4. Detailed results and supporting evidence of outcomes are provided in Table 13 in Appendix 8.

How Outcomes Were Realized

Mechanisms Leveraged by the Portfolio

Table 5 presents the mechanisms leveraged in each of the portfolio's intended impact pathways. Overall, the most significant mechanisms leveraged by the portfolio relate to the production of new knowledge and the reputation of CIFOR and its partners. Increasing scientific knowledge is an important mechanism for any research project, and evidence indicates portfolio knowledge was used to influence changes in government learning and policy development, partners' and allies' advocacy, sector practice, and the advancement of research. Numerous interview respondents appreciated the neutral, credible, and experience-based information that CIFOR can offer to advance a controversial sector toward more constructive dialogues and action (Gov12, Gov15, Gov17, NGO4, PS1, PS2, Res2, Res31). Reputation was also important across each pathway, as trust in the knowledge and who produced it affects whether stakeholders will use that knowledge. CIFOR's reputation as an international research organization expanded the portfolio's standing and influence. How outcomes were realized by the portfolio are discussed by pathway below.

Table 5. Mechanisms of change leveraged by the portfolio, using Belcher et al.'s (2019) classification and organized by pathway

Mechanism	Pathways			
	Government Policy	*Partnerships and Networking*	*Equitable Development of the Oil Palm Sector*	*Research*
Scientific knowledge increased/knowledge gap filled	✓	✓	✓	✓
Methods developed and/or refined	✓			
Knowledge co-produced	✓	✓		
Research agenda influenced				✓
Alignment of research with parallel issues/initiatives	✓	✓	✓	
Capacity of actors in system improved	✓	✓		✓
Coalitions strengthened or created	✓	✓	✓	
Policy window opportunity realized	✓		✓	
Reputation leveraged or enhanced	✓	✓	✓	✓

Government Policy Pathway

While policy processes at multiple levels were considered by all projects in the portfolio, not all succeeded in seizing opportunities to influence policy development. The EK Project effectively leveraged a policy window, as the East Kalimantan plantation office initiated a PERDA process and was open to multi-stakeholder inputs. While GOLS and OPAL were cognisant of ongoing policy processes, such as strengthening ISPO, and attempting to influence them, there is no evidence that the portfolio directly influenced ISPO. While there is evidence of portfolio involvement in ISPO processes (namely the revamping process and the Communication Forum for Indonesian Sustainable Palm Oil (FoKSBI) platform), some respondents felt that CIFOR was not influential in the ISPO debates at the national level (IGO5, NGO1, NGO5, NGO6, NGO8).

Capacity-building (particularly learning and relationship-building) of government actors through research engagements was a distinct outcome for the portfolio. OPAL fostered capacity-building by running Companion Modelling games with multiple stakeholders to increase awareness and understanding of challenges different actors experience under ISPO. Government actors had positive impressions of their involvement in OPAL, and found the process beneficial as they could transfer their learning of different stakeholder perspectives into decision-making situations and better facilitate multi-stakeholder processes with that knowledge. GOLS also provided capacity-building opportunities for government actors through their partnerships with P3SEKPI, LAPAN, and BAPPEDA Kotawaringin Barat. For example, the open cooperation offered LAPAN researchers a "*deep research*" (SWD) experience and learn how to collect data, synthesize, and communicate data from the field and remote-sensing. Subsequently, LAPAN has applied these methods for spatial analysis to other contexts (e.g., West Kalimantan, Sumatra) (SWD). The EK Project brought important academic experience to guide the development of the academic script and facilitate discussions around the inclusion and representation of HCV in East Kalimantan's PERDA regulation, as well as offering *ad hoc* mapping support for government officials in the plantation office.

Some respondents felt that the portfolio's policy influence was limited (NGO5, Res21, Res34). One researcher felt the portfolio was more of an intellectual exercise than policy-relevant research that can be applied by target audiences (Res34). There are few specific examples of contributions to changing policy (e.g., PERDA, RSPO). Despite efforts to influence ISPO, there is no evidence to suggest changes to ISPO were influenced by portfolio contributions. However, national policies have more complex influence pathways than RSPO. While some of the findings have not yet been reflected in policy, it would be worthwhile to consider how the outputs could better support policy development in the future when opportunities (i.e., policy windows) arise, while also recognizing the possibility to generate opportunities to influence policy development processes through other mechanisms. For example, the ERS Project was perceived to provide a credible, objective source of information to fill relevant gaps for the RSPO P&C at the time when the standards were under review (i.e., a policy window) (PS1, PS2, NGO4, Res3).

Partnerships and Networking Pathway

The "*continuous flow of reciprocal information*" (Res26) between partners is considered highly strategic and mutually beneficial, but partners and allies also learn by being part of the research process (Res5). Private sector actors, academics, portfolio partners, and NGO allies also have gaps in their knowledge on oil palm dynamics, issues, and solutions that affect their work; hence, they are also important target audiences of the research. Disseminating portfolio knowledge or co-producing that knowledge together with partners resulted in mutual learning on topics such as deforestation, biodiversity conservation, fire, tenure, smallholder livelihoods, and gender, among others. NGO, IGO, government, researcher, and media partners and allies were able to use the knowledge and tools produced by the portfolio to pursue pressing issues on oil palm production in Indonesia. Some partnerships in the portfolio built in aspects of reciprocity to attract partner buy-in and foster relationships. For example, the partnership with LAPAN and BAPPEDA Kotawaringin Barat in GOLS identified the smallholder plantation mapping as a relevant exercise and

output that could inform spatial planning decisions in Kotawaringin Barat; subsequently, the mapping was incorporated into the MoU (TR36, TR76). Likewise, P3SEPKI has actively drawn upon GOLS findings for tasks in the KHLK related to oil palm because they co-produced the research. OPAL is a strong example where co-production mechanisms fostered mutual learning and cooperation that strengthened project activities and results.

Co-production mechanisms were also closely tied with capacity-building mechanisms. Project partners across the portfolio (e.g., graduate students, local university collaborators, government agencies, and NGOs) gained skills and built upon their research capacities. In combination with greater knowledge and in-depth understanding of the oil palm sector in Indonesia, partners and allies are now more equipped to continue working or advocating on topical oil palm issues (e.g., UNMUL, P3SEPKI, LAPAN, BAPPEDA Kotawaringin Barat, UNTAMA, OPAL students, etc.). Enhanced capacities of these partners also occurred in the *government policy* and *research* pathways, demonstrating the connectivity between pathways as well as the interconnecting role of the *partnerships and networking* pathway and its mechanisms.

The portfolio also sought to strengthen existing or create new coalitions in support of sustainable oil palm production through the *partnerships and networking* pathway. While building a "*landscape of champions* […] [is] *not a luxury that a lot of projects have*" (Res5), strategic partnerships facilitated uptake and promotion of portfolio outputs by partners and allies, access to specific debates or networks (e.g., ISPO, RANKSB, EU-Indonesia delegations, public-private engagements on zero deforestation commitments, etc.), and increased demand for policy and practice change. The EK Project assisted the multi-stakeholder engagement process to help foster a coalition of actors to support the development and direction of the PERDA, which also resulted in follow-up activities in anticipation of next steps in the process (e.g., pergub development). In another example, P3SEPKI partners who are key proponents for GOLS research in the KHLK, have continued to champion sustainable and inclusive oil palm in intra- and inter-ministry debates.

Projects identified opportunities to align with, support, and invest in allies' activities, which could prove beneficial for the portfolio if allies reciprocated by promoting or using research outputs in their advocacy on oil palm issues. For example, during the fieldwork stage, OPAL engaged with KEHATI, TNC, German development agency (GIZ), and Tropical Forest Conservation Act (TFCA) who also had projects underway on sustainable oil palm in East Kalimantan (Res20, Res24). It was hoped that these allies would take an interest in and adopt Companion Modelling in their work with local communities and governments to scale up the influence of the project (Res24). In another example, Greenpeace was a strong ally of GOLS on the Atlas work. Greenpeace provided some data inputs used in the development of the Borneo Atlas, and in the end used Atlas data in several of their investigation reports of oil palm company-driven deforestation and fire (e.g., Doc56, Doc65). Similarly, Oxfam Novib, an ERS funder and client, drew upon project findings and other research on gender and oil palm to address the omission of gender in RSPO as part of their initiatives in the RSPO Working Group on Human Rights.

Reputation is a key factor considered when entering into research partnerships that can help draw attention to a topic and support the perceived legitimacy of outputs. Respondents indicated that the reputations of CIFOR and its partners affected their trust in the research process and the results generated (Gov3, Gov14, Gov20; IGO2, IGO4, IGO6, PS1, PS2, Res3, Res5, Res25, Res28, Res32). The reputations of partners and allies also play a role in uptake of the findings as they share and promote the research through their work and networks.

Equitable Development of the Oil Palm Sector Pathway

There is limited evidence to assess outcomes and mechanisms in this pathway. However, it is plausible that outcomes pertaining to private sector practice are *indirectly* affected by mechanisms leveraged to realize outcomes in the aforementioned pathways (i.e., via policy changes and partnerships). For example, it is reasonable to expect that NGOs' advocacy resulting from use of the Borneo Atlas to hold companies accountable to zero-deforestation

commitments will increase pressure on the private sector to demonstrate that companies are not engaging in deforestation. Policy changes to which the portfolio contributed (e.g., PERDA) mandate a shift in private sector practice to reduce ecologically destructive activities (i.e., establishing plantations in HCV areas). The realization of environmental benefits is however contingent on the implementation and enforcement of policy, a complex process in and of itself. Challenges and barriers to effective policy implementation and enforcement should be considered when designing research for policy.

Efforts to align the research with parallel policy and multi-stakeholder initiatives helped facilitate private sector outcomes. Notably, in the ERS Project, alignment with existing initiatives to support private sector sustainability commitments, particularly the review of the RSPO P&C in 2018 (i.e., policy window) and follow-up processes led by the DRLI to further mobilize the research helped to shift attention to gender issues as a priority for private sector collective action (e.g., establishing gender committees, contract innovation) (NGO4, PS1, PS2, Res3). This highlights the benefit of working with engaged intermediaries whose objectives align with the intended influence of the research intervention, and can help feed the research into relevant processes.

Research Pathway

All projects in the portfolio produced new knowledge and filled existing knowledge gaps, such as on oil palm governance arrangements, corporate plantation-driven deforestation, consequences on biodiversity, identification of HCV areas, land tenure, smallholder heterogeneity and characteristics, implications of policy scenarios, system actor perspectives on sustainable oil palm production, and gendered aspects of oil palm, among others. The projects used conventional scientific channels to share new knowledge with research audiences (e.g., peer-reviewed journal articles, occasional papers, conference presentations) and communication through partners' research networks, as well as a range of products targeted to non-academic audiences (e.g., policy briefs and infobriefs made available online), in-person meetings and workshops, and promoted via social media. Evidence indicates these strategies have spread awareness of portfolio findings among academic audiences, and researchers are using knowledge produced by the portfolio. However, some projects did not publish in peer-reviewed journals (e.g., EK Project, ERS Project), which may explain the low academic engagement of these projects' outputs.

Each project aimed to contribute to either academic discussions on sustainability (e.g., EK Project), inclusion (e.g., ERS Project), or both (e.g., GOLS, OPAL). Portfolio researchers and partners are actively involved in organizing and participating in studies, conferences, and dialogues to promote sustainable and inclusive oil palm in academic circles and influence the academic agenda.

Two projects had a capacity-building component built into the design, targeting the research skills development of graduate student researchers (e.g., 26 CUF in GOLS, 6 OPAL). Graduate students became key proponents of the research in both academic and practitioner spaces, and have developed the expertise necessary to continue to contribute to the momentum of oil palm or natural resource research in Indonesia in the future. In addition, the portfolio partnered with several local Indonesian universities to support data collection (e.g., UNMUL, UNTAMA, UPB, UNIKARTA). These types of partnerships can also build local researcher capacities by introducing new topics, methods, approaches, and skills to their research profile. Training is often provided to ensure graduate students and research partners have the skills necessary to conduct the research.

Reputation is another mechanism leveraged in the *research* pathway. As an international research organization with longstanding research experience in Indonesia and on oil palm, CIFOR has developed a reputation as a relevant and objective knowledge producer. Moreover, CIFOR's reputation in other forest-related debates (e.g., fire and haze, FLEGT, and REDD+) has carried over into the oil palm debate (Gov20, Res7, Res15, Res32, Res33). Reputation can also be fostered during a project. Using GOLS as an example, P3SEPKI partners developed a reputation as oil palm experts in their Ministry and expanded their research capacity and workload. Likewise, OPAL students gained valuable

research experience and insights, which other actors recognize; individual graduate students and the OPAL team have been invited to various events, conferences, and system processes as academic experts and resource people where they can share findings and encourage use of the research.

Are the higher-level changes likely to be realized?

Most high-level changes identified in the portfolio ToC demonstrate progress toward or potential realization in the future (see Table 13 in Appendix 8 for more detailed results). Much of this potential will be determined by the development, implementation, and enforcement of effective policies, ongoing partnerships, private sector commitments, the direction of the research agenda, as well as sufficient momentum to overcome challenges present in Indonesia's oil palm sector.

Government Policy Pathway

Progress toward higher level outcomes in the government policy pathway is contingent on effective implementation, enforcement of research-informed policies, and political will to continue progress toward inclusive and sustainable oil palm production. For example, it is suggested that the preparation of an omnibus bill (a multisectoral law) focused on job creation will have significant bearing on the oil palm sector if enacted (Gov5, NGO4, Res7). The debate regarding this bill is divided (Doc73). Supporters believe the omnibus bill will boost economic growth and ease the administrative red tape for foreign investors to open a business in Indonesia (Doc71, Doc72, Doc73), such as streamlining various license and permit processes, addressing overlapping land use issues, and labour reform (Doc73). Opponents, like environmental NGOs and labour groups, worry that the omnibus bill only accommodates corporate interests. The bill neglects environmental and social injustice issues prevalent in the oil palm sector and other industries, such as deforestation, land grabbing, and poor labour conditions (Doc73, NGO4, Res7; Semibiring et al., 2020), and will likely perpetuate these issues with the relaxation of environmental standards (e.g., requirements for environmental impact assessments) and labour reform (e.g., a reduction in employers' obligations to their employees) (Doc73; Semibiring et al., 2020). In addition to deregulation, amendments in the omnibus bill will weaken regional governmental power (Doc73) and the "silent" (Semibiring et al., 2020, p.99) way in which the bill was drafted threatens transparent and inclusive law-making (Res32). Presently, this bill remains under review in the House of Representatives (Doc71). While no direct portfolio influence on the omnibus law was intended, some portfolio researchers and partners have been invited to meet with representatives of Kemenko to discuss oil palm policy articles, which may open an opportunity to share portfolio findings of relevance to the omnibus bill (e.g., smallholder typologies) that could provide critical evidence to the legislative debate (SWD).

Evidence suggests smallholders and women have improved representation in policy content (e.g., RSPO companies mandated to establish gender committees, PERDA mandating a communication forum that includes smallholders, consideration for diversity of smallholders in ISPO and in government extension services), but no evidence that their representation in policymaking has improved in as a result of the portfolio's research contributions. The PERDA mandates the development of the FKPB to improve stakeholder representation in decision-making, such as smallholders. It was perceived that the smallholder typologies developed by GOLS contributed to raising awareness about the need to focus policy to give the right assistance to the right kind of smallholder. While this is not explicitly reflected in policy to date, government respondents indicated that the typologies have been considered in planning for interventions targeted to smallholders. The complexities faced by smallholders in registering for ISPO are indicated in the presidential regulation (PerPres No.44/2020), and smallholders have been included as representatives of the working groups aiming to improve the conditions of oil palm plantations. While is unclear the extent to which these changes in policy have directly resulted from projects within the portfolio because other actors (e.g., KEHATI, WRI, UI, IPB) are engaged in similar work to characterize smallholders, it is plausible to expect some contributions to the ideas and content contained within the policy given researchers' active participation in working groups, and

engagements with policymakers to support their development. The ERS Project successfully contributed to the RSPO P&C to reflect and respond to challenges women face working in the sector, which has had a trickle-down effect to member companies to establish gender committees to better include women in decision-making. RSPO changes to ensure the rights of women are protected have led to the development of new standards and indicators to certify member companies, that better reflect the need for adequate consultation of women, and mechanisms to ensure fair working conditions for women working in the sector. It was noted, however, that for these changes to be truly realized on-the-ground, RSPO's auditing capacity and mechanisms need to be improved.

Despite growing awareness on the importance of inclusive governmental policy-making in Indonesian society, the government remains largely dominant in the process (Gov13, IGO1, Res31). The state's role in Indonesian policy processes has thus been debated. Prominent arguments relate to the potential for corruption or inefficient policy outcomes resulting from high state intervention (Gillis, 1988). Although decentralization enables greater authority for subnational governments, national-level policy-making remains complex. At the national level, many ministries and governmental agencies are involved in oil palm issues, each with their own agendas and directives. Yet, the oil palm sector experiences low inter-ministerial coordination, and the commodity is assumed to predominantly fall under the jurisdiction of Kementan (Doc7, Gov11, Gov17, Gov18, Gov20, IGO7, Res20, Res31, Res32). Enhancing state coordination on oil palm issues is one of the foci of RANKSB (Doc32, Doc61). However, governmental coordination continues to be challenged by contradicting policies and limited resources (e.g., human capital, budget, time, knowledge, skillsets, etc.) (Blog9, Gov1, Gov13, Gov20, IGO1, IGO7, NGO1, NGO7, TR33, TR73; Datta et al., 2011). Moreover, some governmental bodies are limited by their respective level of authority (i.e., main tasks and functions (TUPOKSI)) (Gov4).

In addition, groups of non-state actors have differentiated capacity to influence policy-making towards their interests (Gov5). Some argue that business interests have greater influence on policy processes (IGO6; Li, 2017; McCarthy, 2011). For example, GAPKI, a palm oil business association with extensive networks and capital, is believed to have power to shape domestic policies in the palm oil sector (Sahide et al., 2015). Businesses in Indonesia have long maintained relationships with national and subnational political elites (Chua, 2007; Fukuoka, 2012; Hadiz & Robison, 2011). Together, these state-business relations may challenge the role of multi-stakeholder processes and research to inform effective policy development in the Indonesian palm oil sector.

The portfolio has contributed to increased consideration of environmental sustainability (recognition for HCV areas) and social inclusion (smallholder realities, better working conditions for women) in various policies governing the oil palm sector (RSPO, RANKSB, ISPO, subnational regulations) by bringing knowledge and facilitating activities to support changes. CIFOR's independence, objectivity, experience, collaborative approach, and focus on advancing sustainability in the oil palm were key factors to contribute to better reflection of environmental sustainability and social inclusion in policy. However, the Indonesian government "*see*[s] *palm oil as a strategic commodity*" (Gov5) for the economy, and appears to prioritize the economic development of the sector over social or environmental concerns (Doc34, IGO1, IGO4, IGO5, IGO6, IGO7, Res14, Res31, Res32, TR33). Critics discuss how certain parties, including government and companies, romanticize or overestimate the sector's contribution to socio-economic development such as Indonesian foreign exchange and rural job creation (Doc40; McCarthy & Cramb, 2009; Obidzinski et al., 2012; Tyson et al., 2018). While a policy focus on economic development can foster public-private collaboration to promote and improve the image of Indonesia's palm oil in the global market, social and environmental externalities remain under-addressed in policy. A rigorous policy assessment required to make definitive conclusions is beyond the scope of this evaluation.

Partnerships and Networking Pathway

In order for Indonesia's oil palm sector to reduce the social and environmental consequences of current production practices, collective efforts are imperative – though this comes with trade-offs and compromise. As partners and allies continue to develop new projects and advocate for sustainable and inclusive oil palm practices, the potential for change grows. The portfolio has made clear contributions to partners' decision-making and project development, such as PERDA collaborators' ongoing activities in support of the pergub development (PS6), USAID's LESTARI Project (IGO4), P3SEPKI's proposals and KHLK's internal document development (Doc7, Gov1, Gov15, Res6), BAPPEDA's spatial planning in Kotawaringin Barat, the Tropical Forest Alliance's (TFA) project development (PS5), proposals to expand the Atlas for Papua and Sumatra (IGO2, Res2, Res34), OPAL partners' new projects (Doc20, Res14, Res20), and Oxfam Novib's gender advocacy work in other commodities (NGO4), among others.

More effective working arrangements between governments, private sector, NGOs, and researchers will enhance coordination and cooperation, which are presently low in Indonesia (Pacheco et al., 2017). Amongst growing efforts for collaboration, territoriality and competitive dynamics between these actor groups remain a challenge (SWD). By working together, these actor groups can identify gaps, challenges, opportunities, and solutions to realize shared goals for sustainable and inclusive oil palm. Encouragingly, there are some multi-stakeholder processes emerging and government policies supporting collective action, capacity-building, and knowledge sharing, such as ISPO, FoKSBI (Doc51), and RSPO, among others. Portfolio researchers and partners have taken advantage of opportunities to engage in these spaces, share knowledge from portfolio research, and foster collaborative working relationships and engagements. Partnerships and collaborations were appreciated by government, NGO, and private sector respondents and follow-up was encouraged (Gov2, Gov3, Gov4, Gov7, Gov12, Gov13 IGO2, IGO3, IGO7, NGO3, NGO7, PS1, PS2, PS6). While some system processes have ultimately failed (e.g., IPOP) and organizational competition and territoriality persist (SWD), informants discussed that some progress toward more effective working is happening. There is scope for continued engagement, participation, and research contributions to foster alliances and more effective working arrangements in Indonesia by CIFOR and its partners. It is through these spaces where prevailing challenges can be collectively strategized and overcome.

Equitable Development of the Oil Palm Sector Pathway

As the portfolio intended to influence changes in policy, knowledge contributions from the research on smallholders (GOLS), game simulations (OPAL), and challenges faced by women (ERS) reflect an intention to improve market access and share of benefits for smallholders and women. The changes to RSPO P&C imply improvements to increase women's share of benefits from the oil palm industry, at least for RSPO certified companies. Gender-responsive policy direction includes: equal pay for equal work, equal access to resources, child care and maternity. CIFOR's smallholder data has been used to plan different types of targeted smallholder interventions as per the provisions of ISPO, a smallholder plantation registration certificate (STDB), and land legality at the district-level. This awareness and recognition in conjunction with a better understanding of smallholder realities among government actors through role playing games may lead to policy changes that reduce the risk of smallholder disenfranchisement and improve market access and benefits. Policy changes will require effective enforcement and implementation, and policy design must provide sufficient incentives for companies and smallholders to adopt sustainable practice.

In response to the collective action toward improving working conditions for women, to which ERS research contributed, Wilmar released a Women's Charter, which outlines commitments to respecting women's rights and ensuring their welfare. The charter also outlines new governance arrangements within the company to ensure key issues (i.e., protection and care of female health, care of family life and welfare, protection from sexual harassment and violence, non-discriminatory, fair, and equal opportunities at work and in workers' representation, and continuous education) are addressed. In the face of high pressures in the market arising from environmental NGO campaigns, increased consumer awareness of the negative consequences of oil palm, and public demand for palm oil bans (e.g.,

in Europe), some companies are demonstrating willingness and openness to embrace sustainability in practice through their commitments (Doc35). For example, some companies have taken the initiative to make their supply chains more sustainable and equitable, such as Wilmar International (Doc63, Web6), Golden Agri Resources (Blog14, Doc74, Web7), Musim Mas (Web8), Cargill (Doc75, Web9), and Asian Agri (Web10). Other companies continue business-as-usual in the absence of sufficiently robust incentives, low traceability in supply chains, and conflicting policies, all of which hinder a large-scale shift away from destructive agricultural practice. Respondents perceived the Atlas as likely to contribute to increased exposure of and private sector accountability to environmentally destructive practices (e.g., deforestation) and discourage private sector business-as-usual (NGO3, Res27). Evidence-based solutions and guidance to improve private sector practice toward sustainability and inclusion were perceived to be welcome in the future, as this gap in implementation (i.e., how to realize sustainability and inclusion in oil palm business practices) remains a key challenge.

While new private sector commitments and supporting mechanisms that address working conditions for women mark important steps in the direction toward more sustainable and inclusive practice in the private sector, challenges in both implementation and enforcement of policies governing private sector practice remain. RSPO's monitoring and enforcement to hold its members accountable to their compliance with the P&C has been demonstrated to be weak. Increased attention to this issue has led to RSPO setting aside budget for impact evaluation studies and research to improve the functioning of the mechanism, which may influence true adoption of sustainable and inclusive business models of its members and their suppliers in the future.

Research Pathway

At present, there is momentum toward sustainability and inclusion within the current research agenda on oil palm. Compared to inclusion, sustainability is a much more advanced topic within oil palm research in Indonesia, though topics related to inclusion of minority groups (i.e., smallholders, women) have gained attention over the last ten years. The Scopus analysis indicates CIFOR and portfolio partners are among the active research institutions contributing to these topics and guiding the direction of the oil palm research agenda. However, it should be recognized that factors of politics and funders' interests also affect the research agenda. Growing politicization and divergent interpretations of sustainability with regards to the oil palm sector do present challenges for researchers.

Some researchers recognize that research influence on practice is not a linear process, and often faces time-lags (Res1). While it is too early to assess whether the accumulation of scholarship has influenced practices within the oil palm sector to date, interviews with private sector intermediaries and NGOs confirmed their use of scientific research to keep abreast of new knowledge, innovations, and recommendations for best practices to inform decision-making (NGO1, NGO2, NGO4, NGO5, NGO7, PS1, PS2, PS6). One government respondent felt it was possible for research to influence government and private sector practice in Indonesia, asserting that it is knowledge – scientific or otherwise – that shifts the paradigm of practice (Gov5). While the private sector, smallholders, and general practitioners have either participated in or are target audiences of the research, the portfolio places greater emphasis on influencing governmental policy change. For example, the portfolio applies theory, provides estimations and projections of scenarios, and develops evidence-informed recommendations for policy development or revisions at the subnational, national, and international levels (Doc1, Doc4, Doc7, Doc9a, Doc26, Doc23, Gov1, Gov3, IGO7, Res3, Res5, Res6, Res23, Res29, TR20, TR73). Therefore, the portfolio may indirectly contribute to practice change via its influence on government policy in Indonesia.

If the research agenda on oil palm maintains its focus on sustainability and inclusion, there will be a stronger foundation of knowledge and argumentation promoting and guiding sustainable and inclusive oil palm development. As more research is generated, there is a greater likelihood for some of this knowledge to be picked up and applied to policy and practice in Indonesia and beyond. In theory, sustainable and inclusive oil palm production will be more cost-

effective, raise yields, increase profits, and reduce negative social environmental externalities over time; as awareness of these benefits spread, it is expected that sustainable and inclusive practices become mainstream and demand for research-informed best practices grows. In turn, this bottom-up demand could attract future resources and funding, eventually creating a positive feedback cycle that reinforces the research agenda's sustainability and inclusion foci. Yet, getting evidence-based research into policy remains a challenge, and will require a new kind of partnership between researchers and policy-makers.

Summary

There is promising progress toward sustainable and inclusive oil palm production in Indonesia's future, but critical barriers remain. There is evidence of both full and partial realization of some of the portfolio's higher-level outcomes, as well as areas that have not yet advanced. Many of these higher-level changes represent a best-case scenario and remain dependent upon factors and processes outside the portfolio's influence, but there is evidence of portfolio contributions.

Through the portfolio, CIFOR and its partners positioned themselves as relevant knowledge producers, active conveners, and engaged partners in ongoing processes focused on sustainable and inclusive oil palm in Indonesia. Many other actors with similar objectives continue to make progress toward sustainability and inclusivity in the sector. Progress toward a sustainable and inclusive oil palm sector relies on collective action and increasingly cohesive working arrangements between governments, private sector actors, NGOs, and researchers toward that objective. However, "*sectoral ego*" (Gov11, Gov16, Gov20) and conflicting policy agendas resulting from competing interests remain critical barriers. In an ideal world, the guidance of governmental regulation, private sector commitments, and research to inform sustainable and inclusive practices, oil palm production – by large companies and smallholders alike – has the potential to increase development opportunities for Indonesia and exert fewer pressures on its ecosystems. However, realizing this will rely on sufficiently strong incentives, policy implementation, and enforcement to shift business-as-usual practice. These pathways are complex, context-specific, and require political will, changes in attitudes, cooperation and coordination across the sector, and time. Constructive changes in policy, working arrangements, private sector practice, and research must continue to manifest in order to reach the ideal where oil palm becomes a commodity that benefits all.

Could the outcomes have been realized in the absence of the portfolio?

The portfolio representes one set of interventions among many processes that influence government policy, partnerships, and practice in the oil palm sector, as well as the research agenda. To account for complexity within the Indonesian context and wider international systems, other interventions and contextual variables influencing the extent of outcome realization and how outcomes were realized are reviewed below.

Government Policy Pathway

The government policy pathway is characterized by changes in government knowledge, and capabilities to improve policy governing the oil palm sector in Indonesia to which the portfolio aimed to influence, namely PERDA, ISPO, and RANKSB.

While some evidence indicated a shift toward growing use of research and public consultations (Doc51, NGO7), the extent to which scientific studies actively inform in Indonesia's policy-making is varied. There is also a dilemma between the production of knowledge and the politicization of knowledge (Res32). Datta et al. (2011) describe how "formal knowledge in the shape of academic scripts and consultations with state and nonstate actors is, generally speaking, supposed to play a prominent role in policy formulation processes. However, our research suggests that, although varying considerably across sectors, formal rules are not always followed" (p.65). For example, a national policy such as ISPO does not appear to be informed by robust academic studies (personal observation) while the

PERDA in East Kalimantan was developed on the basis of an academic script. Yet, another factor to consider is the quality of the research used to inform policy. Datta et al. (2011) also provide helpful insights into the spectrum of factors affecting policy-makers' investment in, demand for, and use of knowledge – academic or otherwise – to inform policy development (e.g., response to a presidential mandate; to establish or improve one's credibility and objectivity; adherence to one's ethics; cultivating favourable public perceptions; to exercise authority or exert pressure; to deflect criticism; financial incentives; to advance one's career; etc.) as well as deterrents (e.g., opposition from other actors; lack of power; lack of analytical capacity; pressure to perform or deliver; competing interests and agendas; etc.).

There are many actors that contribute to and influence specific national and subnational policy changes for Indonesia's oil palm sector, either by participating in policy processes or producing policy-relevant research, such as national and international NGOs, national and international development organizations, private companies, farmers associations and civil society organizations (CSO), and local and international researchers, among others. While portfolio researchers and partners participated in both ISPO and RANKSB processes (e.g., via public consultations, meetings, etc.), there are myriad actors involved which make portfolio-specific contributions difficult to identify or trace (Doc51). Yet, formal channels for non-state policy input remain limited because public consultations are "*encourage*[d] rather than *require*[d] […] and there is a lack of budgetary support for civil society inputs" (Ledergerber & Susanti, 2007, p.96, italics original).

The portfolio clearly influenced the shape of the PERDA, where ISPO and RANKSB contributions are less clear. This is a result of greater complexity in the process, variable portfolio engagement, and a lack in clarity of the particular value or gap being filled that the research brought to ISPO and RANKSB. Other actors (e.g., KEHATI, WRI, UI, IPB) brought similar characterizations of smallholders to ISPO debates. Moreover, there are indications that participant learning in the OPAL games may scale up to increase decision-making capabilities.

Partnerships and Networking Pathway

The partnerships and networking pathway is characterized by changes in relationships between CIFOR, research partners, and NGO allies, as well as supporting partners' learning and activities through the provision of evidence-based knowledge.

While the portfolio made efforts to create coalitions of support and align with partners' and allies' initiatives, differing and evolving agendas between these actor groups can present challenges, especially within a politically sensitive sector like oil palm (Res6, Res16). Funders, who are vital project partners, are partly driven by internal policy directives, political pressures, and public opinion, among other factors, and seek to fund projects that are feasible, practical, and innovative (IGO4, Res6, Res8, Res29). Depending on external circumstances, funders can appear to change their minds in terms of the types of projects they support (PS6, Res1, Res32, Res33), or may be driven by the "*latest flavour of the day*" (PS6). Funders may also lack capacities to distinguish which projects can contribute to the outcomes they intend to support (NGO1, Res33), which makes funders an important target audience of project learning. In the case of GOLS, the funder has made some moves to step back from the oil palm debate owing to increasing politicization of the sector and to maintain their presence in Indonesia for other projects they work on and fund (Res18, Res29).

We conclude that the portfolio had substantial influence on its partners and allies, despite the political turbulence that has made engagement and research on oil palm issues challenging. However, many actors, projects, and fora outside the portfolio's network have emerged that also make contributions to relevant oil palm debates, policy processes, and advocacy circles. Some portfolio partnerships require more strategic engagement, genuine inclusion, and repair, as well as reflection on existing partnerships (i.e., does CIFOR partner with the right actors) and future connections and relationships that need to be fostered.

Equitable Development of the Oil Palm Sector Pathway

The equitable development in the sector pathway is characterized by changes in the capacity and incentives for companies and smallholders to adopt GAP and reduce negative social and environmental impacts as a result of oil palm expansion.

Many NGOs, researchers, government, and private companies work to support better practices in the oil palm sector. Environmental NGOs like Greenpeace, World Wildlife Fund (WWF), and Indonesian Forum for the Environment (WALHI) launch campaigns to raise awareness of the negative consequences of oil palm expansion as well as promote ecological conservation. Other NGOs like Sawit Watch, Indigenous Peoples Alliance of the Archipelago (AMAN), and the Oil Palm Farmers Union (SPKS) focus on human rights and/or developing smallholder capacities. Sustainability, GAP, smallholder farmers, and equitable development are important topics to NGOS, and therefore remain important foci of research on oil palm in Indonesia.

While some NGOs' criticisms have strained relationships with the government, NGO activities are considered to have successfully pushed governments and companies to change practice (Khor, 2011). With growing criticism of Indonesian palm oil over the last two decades, the government has made some attempts to solve issues facing the sector by raising concerns on balancing economic development and conservation through finance schemes (Pramudya et al., 2017). However, the sustainability agenda promoted by the government is largely challenged by overlapping land use allocation (Gov5, Res31). For instance, company- or smallholder-owned plantations are often illegally located in areas designated as forests, and conflicts over land ownership between companies and local communities frequently occur (Beckert et al., 2014; Levang et al., 2016; McCarthy, 2012; Obidzinski, 2012; Pramudya et al., 2017). Moreover, a 2019 audit by the Audit Board of Indonesia (BPK) revealed that over 80 percent of oil palm plantations do not comply with existing regulations (Doc76). While smallholders cultivate a considerable share of oil palm in Indonesia (estimated to be around 40 percent), smallholder issues remain prevalent and largely invisible (Jelsma & Schoneveld, 2016). For example, smallholders commonly do not have a formal certificate showing their right to plant oil palm (Jelsma et al., 2017). Some individuals are difficult to categorize as smallholders, as they manage hundreds of hectares of plantations (Res5, Res22; Jelsma et al., 2017). Furthermore, some smallholders lack knowledge, skills, and resources to conduct GAP (IGO1, IGO7, Res20, Res22, Res24; Jelsma et al., 2019; Schoneveld et al., 2019b; Woittiez, 2019). Several important policies were issued by the government to solve these issues, such as the palm oil moratorium (Doc69), Kementan's replanting program (Doc70), and ISPO (Doc62). In the palm oil moratorium, the president instructed all ministries and subnational governments to postpone any permit issuance and evaluate existing permits (Doc69). Meanwhile, the replanting program targets 750,000 ha of smallholder oil palm plantations for replantation, aiming to improve productivity (Doc70). Supporting smallholder practices was one target of ISPO (Doc62). However, the lack of reliable plantation data remains a challenge for the implementation of these policies (Gov13, Gov20). This means that land illegality issues remain at an impasse, and eligible beneficiaries of these policies are unable to access governmental support (e.g., extension services, credit access, etc.) and are excluded from formal supply chains. In 2019, the government announced they had identified the total national oil palm plantation areas gathered from various institutions (Gov13, Gov20, NGO2); however, these data are incomplete (Gov1).

While 'sustainability' is a growing focus in the governmental agenda, some argue it is a rhetoric used to improve the image of Indonesia's oil palm sector (Anderson et al., 2016). Moreover, few stakeholders share the same or even a holistic definition of sustainability. For example, some NGOs understand sustainability to refer to environmental conservation while the government and private sector predominantly speak in terms of economic sustainability, which creates polarization around the concept in research, policy, and practice (Doc34, IGO2, Res16, Res18).

We conclude that competing concepts of sustainability, a lack of incentives to comply with regulations, and complications with land legality resulting in access to government support remain critical challenges to realize outcomes in this pathway, such as the widespread adoption of GAP. There is insufficient evidence to conclusively

assess the significance of the portfolio's contributions to private sector practice, but there is evidence that the progression toward more gender-sensitive practices among RSPO companies marks an example of promising progress in principle. Monitoring and enforcement of RSPO companies to adhere to the P&C remains a critical challenge that will determine success. The Borneo Atlas has been a major contribution to provide an evidence base to NGO campaigns and provide additional monitoring and transparency of private sector adherence to NDPE commitments.

Research Pathway

The research pathway is characterized by changes in knowledge and research capacities that influence academic debates on oil palm issues, generation and use of policy-relevant research, and the advancement of the research agenda on oil palm.

In science, new areas of inquiry are developed based on interest, knowledge, and experience. By contributing to the overall knowledge base on oil palm, new research questions may emerge as a result. While the portfolio has made numerous original knowledge and literature contributions, other scholars' work likewise contributes to these academic discussions. Hence, portfolio outputs compete with a plethora of knowledge produced by local Indonesian universities, as well as international academics from Asian, European, and North American universities, government research agencies or *litbangs*, NGOs, and other international research organizations. How these discussions evolve affects the research agenda. There is evidence that many researchers and institutions, in addition to CIFOR, are working toward integrating and reinforcing sustainability and inclusion in the current research agenda on oil palm (Res12). Numerous studies, conferences, and dialogues have been dedicated to reconciling the environmental, social, and economic dimensions of sustainable oil palm development. However, it was thought that some disciplinary siloing remains within academia that may stall or divide the research agenda (Res26). How sustainability and inclusion are positioned within the research agenda also depend on donors, who are faced with competing interests, pressures, and politics in terms of research funding decisions (Res12, Res32, Res33). These decisions ultimately guide which research questions are pursued, which topics advance, and which knowledge lacunae remain unanswered. In addition, the ever-changing dynamics within academia, practitioner, and government debates also present challenges for researchers (Res18). Moreover, the reactive nature of the oil palm sector and policy making process in Indonesia have made it challenging for the portfolio and other researchers to work on topics related to sustainable oil palm.

We conclude that portfolio contributions to scientific knowledge on oil palm in Indonesia are substantial, though CIFOR and its partners do not operate alone in these topics. The portfolio has also equipped a group of young Indonesian researchers to continue working in either research or natural resource management.

Expert Judgement

Respondents were asked for their expert opinion on what would have happened in the absence of the portfolio. Most respondents identified knowledge and/or social process contributions made by the portfolio (Gov1, Gov5, Gov6, Gov7, Gov8, Gov9, Gov10, Gov13, Gov14, Gov17, Gov19, Gov20, IGO1, IGO5, IGO6, IGO7, NGO1, NGO7, PS1, PS2, PS5, PS6, Res21, Res25, Res26, Res28, Res31), others were unsure (Gov18) or said they could not prove their impression (IGO5, PS6), and some conveyed that no significant changes resulted from the portfolio's research (Gov2, Gov11, Gov21, Res21). The majority of respondents indicated that outcomes related to changes in governments' and partners' knowledge, the research pathway, as well as progress made in decision-making or policy development would not have been realized to the same extent.

In general, respondents concluded that research on forests and oil palm in Indonesia would not have advanced as much without the portfolio, particularly with respect to the generation of reliable high-quality data (Gov13, Gov20, IGO6, IGO7, PS1, PS5, Res21, Res26, Res28). One respondent noted that they would not have the ability to compare country data on oil palm without the portfolio, as CIFOR has conducted many multi-country comparative studies on this

commodity (IGO6). Yet, several respondents thought that other actors would have filled the niche of the portfolio (Gov4, Gov8, Gov12, Gov15, Res7, Res25, NGO3, NGO4). Many acknowledged that other individuals and institutions also contribute to the scientific knowledge base on oil palm in Indonesia (Gov13, Gov17, IGO4, IGO5, IGO7, NGO1, NGO2, PS1, PS5, Res6, Res7, Res12, Res15); though many also draw on CIFOR's research (NGO1) and some research is often not as high quality as CIFOR (IGO7). Another respondent did not think the sector would have made the same extent of progress to date without portfolio contributions (NGO1). For some respondents, qualifying what would have happened without the portfolio was difficult, but they were convinced that change happened in some form as a result of the portfolio's activities and outputs (Gov5, Gov7, Gov17, PS5). Other respondents could draw clear connections to specific projects.

For example, some respondents believed the EK Project contributed to the knowledge base on HCV in East Kalimantan (IGO1, NGO7) and enriched the PERDA process (Res31). One partner felt that important aspects currently reflected in the PERDA would be missing without the project's involvement (NGO7), though they did not specify or elaborate which aspects. Respondents noted that progress on the PERDA would have been much slower in the absence of the EK Project (NGO7, Res25, Res31) as the project provided support and assistance to both the academic script and the policy engagement process (Res25). While multi-stakeholder discussions would have occurred regardless, respondents felt the PERDA discussions would not have been as well-informed (NGO7, Res25, Res31) and been a "[b]*usiness as usual* [situation where] *nothing would change*" (NGO6). Yet, without the project or CIFOR's involvement, some respondents felt other partners or allies would have filled this niche (NGO6, Res25).

According to respondents familiar with GOLS, there would be a dearth in the scientific knowledge base without the project (Gov8, Gov10, Gov12, Gov15, IGO5, Res26). One research partner claimed that "[t]*here would be a huge gap of knowledge about deforestation* […] *for land use change*" (Res26). Most respondents specifically mentioned the loss of key spatial data, such as the smallholder plantations maps (Gov8, Gov10) and the Borneo Atlas (Gov12, Res26). Prior to GOLS, subnational governments like the Plantation Agency in Kotawaringin Barat lacked spatial data, which GOLS provided them (Gov8); without the project, they likely would still face this data barrier. The Borneo Atlas was described as a major knowledge contribution of the project and a key reference for governmental decision-making (Gov12). However, if CIFOR had not produced a tool like the Atlas, it was felt that other organizations would fill this niche as there are other similar mapping tools available (Gov12, NGO3), though perhaps not to the same depth or quality as the Borneo Atlas (NGO3). Other researchers are developing similar typologies of smallholders, such as WRI and UI (Res32). Furthermore, there are many organizations working on oil palm issues in the same regions as GOLS, and likely the project's niche would be filled by others if GOLS did not exist (Gov4, Gov8, Gov15). Similarly, a LAPAN partner noted that other organizations would have been viable candidates for partnership had they not partnered with GOLS (Gov3). Other government partners from the project felt they would not have developed their research capacities on oil palm in the absence of the opportunity provided by GOLS (Gov1). Only one respondent was unsure whether change had happened and chose not to answer the question as they were unfamiliar with GOLS outputs (i.e., because the outputs had not been shared with the individual, despite participating in the project) (Gov18).

Respondents said OPAL contributed to the knowledge base (Gov6, Gov7, Gov9, Gov19, IGO1). In the absence of the Companion Modelling games, participants conveyed they would neither have gained personal awareness of diverse stakeholder perspectives nor internalized understanding of the implications that their decisions or policy have on different groups (Gov6, Gov19). Without the critical thinking stimulated in the games setting, one government participant did not think they would consider their work differently as they do now (Gov19). While acknowledging that OPAL contributed to individual learning, one explained that these changes are difficult to pinpoint and slow to manifest at a higher level (Gov7). Without the project, one government respondent did not think they would have formed a relationship with the OPAL team (Gov14).

Without the ERS Project, some respondents felt the gap in the knowledge base on gender and oil palm would remain (PS1, PS2); in contrast, one respondent noted that another organization would have filled this knowledge gap as it was commissioned work (NGO4). While polarization persists within the sector, one private sector intermediary believed the project helped depoliticize discussions on oil palm, particularly with respect to gender, and progress would not have been made to the same degree otherwise (PS2).

Only a few respondents indicated that there would be no difference without the portfolio (Gov2, Gov11, Gov21, Res21). Several government respondents shared similar reasonings for why they believed no significant change resulted from the portfolio, in that real changes emerge when target audiences of the research are supported to implement the findings in decision-making, policy, practice, or their day-to-day work (Gov2, Gov11, Gov21). For some, it is not enough to produce knowledge and deliver it (Gov2, Gov11); while for others, ineffective dissemination means that portfolio outputs are not used or applied as intended, and therefore expected changes have not materialized (Gov21). Moreover, one respondent noted that while the portfolio has provided governments with maps and information, ultimately, the changes put into action are undertaken by actors with power and influence in the sector, like the Kementan (Gov11). One researcher had the impression that the portfolio has not yet triggered any direct changes on policy or practice in the sector, only making knowledge contributions thus far (Res21).

Were there any positive or negative unexpected outcomes?

When prompted, respondents did not report any negative outcomes resulting from the research (Gov3, Gov9, Gov10, Gov12, Gov15, Gov17, Gov19, IGO7, PS1). Several unexpected outcomes have demonstrated further progress toward the realization of higher-level outcomes (e.g., the establishment of new projects/initatives) or hindered progress toward intended outcomes (e.g., created tensious relationships). Unintended negative consequences can be mitigated with effective collaboration, inclusion, and communication (Gov1, Gov15, Gov17, Gov18, Gov20).

The ways in which some changes in relationships manifested in the portfolio was unexpected, particularly with the private sector. GOLS was designed to largely rely on private sector engagement through IPOP. While the disbandment of IPOP was beyond the control of the project, it affected the intentions of the project to effectively engage with the private sector (IGO4, NGO6, Res5, Res8, Res19, Res34). Private sector actors were invited to some outreach meetings, but researchers acknowledge that these were insufficient to generate meaningful connections and partnerships (Res5, Res6, Res18). However, learning derived from the lack of private sector integration in the project, and lessons on how to engage the private sector in research (i.e., recognizing where joint outcomes and mutual interest could be developed) has been taken up in new projects; one example reported a collaboration funded by Wal-Mart to invest in smallholder oil palm in Indonesia, which may continue to pave the way for more effective outcomes for the private sector and smallholders (Res5). GOLS additionally faced challenges in effectively integrating research across the components, and some CUF student projects lacked topical relevance for oil palm and there was ineffective coordination between CIFOR and the universities, indicating missed opportunities for progress toward relationship and network building that would have further supported the realization of research and partnership pathway outcomes (Doc8, Res1, Res8).

The ERS Project worked closely with private sector convenors with the objective to realize inclusion in the oil palm sector – both for women and smallholders, who continue to use the research to further pursue women's empowerment. Private sector convenors and NGOs working in partnership with the private sector have taken up the research and applied it when doing advocacy in commodity sectors that face similar social issues (e.g., seafood) (PS2, NGO4). However, turnover posed a challenge in sustaining the relationships developed in the ERS Project (Res3). OPAL actively sought networking opportunities, which resulted in some unexpected research collaborations among graduate students (Doc20, Res20).

Were the assumptions pertaining to why these changes were expected sustained?

Assumptions are hypotheses that explain why a change is expected to happen. As the projects representing the portfolio had underdeveloped or undocumented ToCs, the evaluators proposed the following assumptions based on discussions with portfolio researchers and identified assumptions inherent within the composite ToC. The evaluators also included assumptions that are frequently encountered in and applicable to other R4D case studies. Assumptions are often missing or underdeveloped, so this shortcoming is not unique to the portfolio. OPAL was an exception, as the project had the most explicit set of documented assumptions. A subset of portfolio researchers provided feedback and validation to the framing of these assumptions during one of the sense-making workshops in November 2020. This process also provided additional supporting and opposing evidence for the assessment. This assessment aims to present the results in such a way so as to account for project differences and nuance.

Five of the eleven assumptions were partially sustained, five were fully sustained, and one was not sustained according to available evidence (Table 6). The results demonstrate that knowledge contributions do play a role in contributing to or influencing change, but social process contributions (e.g., knowledge co-generation, mutual learning, capacity-building, etc.) are possibly as or more important and influential in realizing diverse outcomes across multiple impact pathways. The assessment of uptake-related assumptions indicates that demand-driven research, problem and/or solution alignment with target audiences' objectives and interests, continuous engagements, consistent messaging and coherent narratives, as well as output tailoring and knowledge translation are crucial aspects that expand influence for uptake. Relationship-building is a key process underpinning several assumptions; the portfolio succeeded in establishing connections at the individual level, but these linkages have yet to fully materialize and exert influence at the institutional level. Formal partnerships (particularly with governments, but also with research partners) were more influential. Some projects recognized that certain system actors have little to no motivation or incentives to change (or change would be costly for them) and there was limited scope and ability to engage and influence these actors; for example, large-scale corporations are often better positioned compared to small-scale companies and producers to make changes. The assumption that was not sustained reflects that portfolio engagement of public audiences was overall insufficient to arouse widespread public scrutiny and not strategically built into project design.

Some portfolio researchers recognized that commonly held assumptions do not apply to all of the projects or were not sustained across the portfolio (SWD). For example, the first assumption which considers knowledge to be a primary constraint to good policy and practice was common to three of the projects, but not OPAL as the team's assumptions were more sensitive to factors of political will and interest to use available knowledge to inform policy and practice change. OPAL's approach therefore put an emphasis on fostering understanding of different stakeholder perspectives among government participants and other system actors to build empathy and political willingness for more meaningful and informed decision-making. Several assumptions were assessed to be partially sustained based on strengths of one or two projects and not the full set of projects. The results support conclusions that the theoretical bases for why the portfolio would lead to intended changes were overall weak, because the projects were not originally conceptualized or carried out as a strategic and cohesive portfolio of activity.

Table 6. Assesment of portfolio assumptions

Assumption	Results
Knowledge gaps in the evidence base are constraining good policy and practice *Applicable Projects:* • EK Project • GOLS • ERS	**Partially sustained**. Prior to the portfolio, there was little to no georeferenced data (e.g., HCV areas, oil palm-driven deforestation, etc.) or evidence-based information on certain oil palm issues (e.g., smallholder characteristics, gendered experiences of oil palm, etc.) that – left unknown – had implications for policy and practice. There has been subsequent uptake of some portfolio findings for better informed policy at the sub-national and international levels (e.g., HCV concepts in EK PERDA, HCV maps in EK Pergub, ERS findings in RSPO P&C) and potential for future integration in national-level policy (e.g., smallholder typologies in ISPO and RANKSB). Some knowledge gaps remain barriers to sustainable oil palm practices (e.g., supply chain traceability). *Counter-evidence:* Knowledge gaps or limited access to existing information are not always constraining factors, as there is a plethora of information already available. Political willingness to use evidence-based information was noted as a major barrier to informed decision-making. How available information is used may have greater bearing on policy and practice decision-making than access.
The research effectively identified a gap and made an original contribution to help fill knowledge gaps *Applicable Projects:* • EK Project • GOLS • OPAL • ERS	**Sustained**. Addressing knowledge gaps was a key mechanism leveraged by the portfolio to support outcome realization across each impact pathway. Each project identified the research entry points of existing knowledge gaps and justified the need and value of filling those gaps. Some knowledge gaps were pre-identified by the commissioning partner (e.g., ERS) and were therefore demand-driven. Each project made original knowledge contributions to fill research, policy, and/or general knowledge gaps about Indonesia's oil palm sector (see the QAF assessments for the 'New knowledge contribution' criterion in Tables 8-11 in Appendix 6). In addition to the original knowledge contributions generated from graduate students' fieldwork, OPAL actively facilitated a process to fill gaps in understanding of different system actors' perspectives and decision-making on oil palm through the Companion Modelling approach. *Counter-evidence:* Some projects' knowledge gaps were not demand-driven, co-identified, or validated by target audiences (e.g., EK Project, GOLS), which affected perceptions of relevance.
Facilitating mutual learning processes and knowledge co-generation would contribute to better informed discourse and improved practices *Applicable Projects:* • EK Project • GOLS • OPAL	**Sustained**. Most of the portfolio's partnerships with government agencies (e.g., P3SEPKI, LAPAN, BAPPEDA Kotawaringin Barat) and local universities (e.g., UNMUL, IPB, UNTAMA, UNIKARTA, UPB) co-produced knowledge and resulted in mutually beneficial learning. These social process contributions have supported partners' knowledge, capacities, research activities, and discourse. Outside of formal partnerships, portfolio engagement in multi-stakeholder fora (e.g., EK PERDA process) and OPAL's Companion Modelling approach enabled knowledge co-generation and mutual learning with diverse system actors and research participants. *Counter-evidence:* Without political interest or will to be involved or collaborate in a research project, it is difficult to foster opportunities for mutual learning. Often a formal partnership, LoA, or MoU is needed. Successful engagement of governmental decision-makers in the research process on sustainable oil palm has been challenging, particularly when there is not a shared vision for sustainability.
Engagement efforts were sufficient to build relationships with allies and target audiences to ensure uptake of findings and continuity of action *Applicable Projects:* • EK Project • GOLS	**Partially sustained**. The EK Project's participation in and support to the PERDA's multi-stakeholder process contributed to the follow-up and continuation of policy development (e.g., Pergub) and the FKPB. One GOLS researcher's engagements and data sharing (both internal and external to CIFOR's activities) with Greenpeace and Borneo Futures resulted in uptake and continuity of action on deforestation issues. OPAL's participatory research process fostered the necessary relationships with and gained recognition from target audiences that led OPAL researchers and graduate students to be invited to support ongoing governmental policy processes (e.g., ISPO, LTKL, SPOI). *Counter-evidence:* Despite extensive dissemination workshops and meetings with governments, NGOs, and the private sector, portfolio investments to share findings have not resulted in equivalent or substantial uptake and use. ERS engagements built the
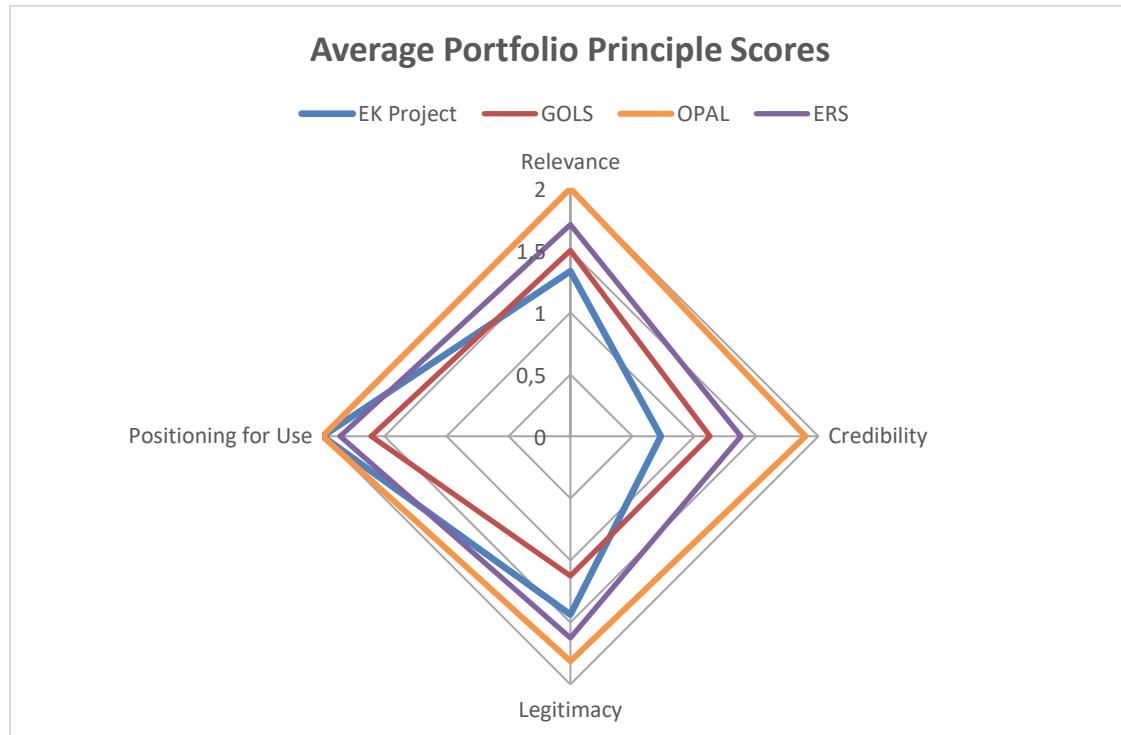
• OPAL • ERS	necessary connections with allies like Forum for the Future and RSPO; however, staff turnover resulted in a loss of the institutional connection as these relationships were mostly built at the individual level. While continuity of action is taking place in RSPO, this momentum comes from outside the portfolio's sphere of influence and is informed by external research.
Being flexible and adaptable to accommodate opportunities would expand the projects' influence *Applicable Projects:* • EK Project • OPAL • ERS	**Sustained**. Portfolio researchers' role in the EK PERDA process provided flexibility to support emergent needs and contribute inputs to the multi-stakeholder process. Flexibility built into OPAL's proposal and ToC enabled the project to accommodate external requests (e.g., providing inputs to two district policies) and integrate unexpected opportunities (e.g., international research collaborations with external graduate students) which expanded portfolio influence; while OPAL did not always have sufficient capacity to respond to all opportunities, the team took advantage where possible. Despite limited budget, ERS was able to take advantage of opportunistic integration of unplanned activities and outreach (e.g., video development, policy dialogues, CIFOR call for action, requests for interviews by journalists). *Counter-evidence:* None.
The research findings draw public scrutiny to a topic that adds pressure for policy and practice change *Applicable Projects:* • GOLS • OPAL • ERS	**Not sustained**. The portfolio contributed to issues already under international public scrutiny (e.g., unsustainably sourced oil palm, oil palm-driven deforestation), but does not appear to have drawn extensive attention to new or lesser-known issues. There is potential that the Borneo Atlas captured some public attention via online new outlets and social media, but the reach and resulting public scrutiny could not be assessed. While Greenpeace's use of Borneo Atlas data in an RSPO complaint did pressure a company to respond, there was insufficient evidence to indicate any substantial public scrutiny or practice changes resulted. *Counter-evidence:* While some portfolio engagements and dissemination media (e.g., blog posts, videos, press releases) intended to increase public awareness of various oil palm issues, the public was not a focal target audience of the portfolio. GOLS did capture some public recognition, receiving requests to feature on Indonesian and international news broadcasts to discuss oil palm and related forestry topics, but there is insufficient evidence to indicate that this resulted in increased pressures for policy or practice change. Increased awareness of the Borneo Atlas findings and smallholder heterogeneity concepts have yet to receive the requisite public pressure to stimulate policy change.
Partners are receptive to and develop an interest in applying the results *Applicable Projects:* • EK Project • GOLS • OPAL • ERS	**Partially sustained**. Some partners have clearly demonstrated their receptivity to the findings and have applied them (e.g., UNMUL, P3SEPKI, LAPAN, Oxfam Novib, RSPO). There are indications for future application of portfolio findings by partners from the EK Project (e.g., Pergub). *Counter-evidence:* There are instances where partners have sufficient interest and intentions to apply the findings, but lack capacities and resources (i.e., time, funding, human resources, software/hardware) or are ill-equipped to use them. While training was intended to be given to help some partners overcome this barrier, this has yet to take place.
The research findings align with existing political commitments to support uptake and/or coordination with allies *Applicable Projects:* • EK Project • GOLS • OPAL • ERS	**Sustained**. Overall, the portfolio designed the activities and aligned the outputs to feed into and inform governmental policy processes underway (e.g., EK PERDA, ISPO, RANKSB, EU-Indonesia negotiations) that were already driven by Indonesia's national mandates and international commitments. Evidence also indicates portfolio engagements also contributed to some partners' and allies' coordination and advocacy. ERS was clearly aligned with partners' and allies' interests to support coordination around the revisions to RSPO's P&C. *Counter-evidence:* There was scope for the portfolio to produce findings that aligned with priorities important to the government (e.g., economic development and growth) to support further uptake. Governmental support for transition to sustainability remains unclear, as state interests and agendas are complex and at times contradictory.

The research findings are sufficiently aligned with private sector interests to lead to uptake and use *Applicable Projects:* • GOLS • OPAL • ERS	**Partially sustained**. ERS is the only project that successfully aligned the findings with RSPO interests to revise the P&C to reflect gender considerations, which subsequently led to uptake of findings as one source of evidence-based information. *Counter-evidence:* This assumption was present within the GOLS and OPAL ToCs, but portfolio researchers reflected that this was a naïve assumption as thinking was underdeveloped in terms of what could be done with the research and how the private sector could be influenced. Successful uptake of the findings by private sector actors required more intensive engagements and translation than were done. Moreover, the private sector is a heterogeneous group (i.e., large-scale corporations, small-scale companies, farmers associations, smallholders), so findings would need to be aligned and tailored to diverse private sector interests. The portfolio did not appear to identify or map different private sector actors' commitments, signaled interests, or needs/knowledge gaps, which could have been a useful process to inform research activities and engagements.
Researchers already have an interest in the topic and seek out new and available evidence *Applicable Projects:* • GOLS • OPAL • ERS	**Sustained**. Emergent research inquiries build on previous research and use existing data or findings to substantiate claims. Portfolio researchers and partners are amongst the most prevalent and recent contributors to the scientific knowledge base on oil palm in Indonesia. Bibliometric and altmetric evidence demonstrate that all projects which produced outputs for academic audiences (i.e., peer-reviewed publications) have been interacted with or used by researchers in some way (e.g., reads, downloads, citations, sharing on various social media platforms, etc.). Portfolio data have also been used (e.g., mills database). *Counter-evidence:* None.
CIFOR researchers and partners are well-positioned to influence change *Applicable Projects:* • EK Project • GOLS • OPAL • ERS	**Partially sustained**. Influence across most pathways stemmed from CIFOR's reputation as an international research organization. This was a crucial assumption for policy influence, as government respondents recognized both portfolio researchers and partners for their research expertise, long-term experience working in Indonesia, and pre-existing relationships (i.e., positive interactions, trust) with specific government agencies and individuals. Some partnerships were particularly strategic in this regard (e.g., P3SEPKI, IPB). One's level of influence changes over time; as one learns and engages more in the sector and various system processes, influence tends to increase. The portfolio had access to and was engaged in the appropriate policy spheres at different levels to cultivate relationships and a reputation to position themselves for influence. *Counter-evidence:* In contrast, the portfolio was not as well-positioned to exert influence within and across the private sector, despite efforts to bring partners on board who had access to private sector actors and networks (e.g., GOLS). Some researchers are better positioned than others depending on the target audience, multiplicity of roles an individual holds, positionality (i.e., Indonesian versus international researcher), and individual reputation and connections they bring (i.e., not necessarily associated with CIFOR). Distrust in the data and who produced it (e.g., target audiences' perceptions of CIFOR as a forest defender) can affect one's position of influence. Indonesia's policy arena is a crowded space, and CIFOR's and partners' relative influence is difficult to discern and should be questioned.

Project Assessment

What elements of the research design and implementation supported outcome realization, and how?

Overall, the collective portfolio's design and implementation aligns with TDR principles and criteria of relevant, credible, and legitimate research, that was well positioned for use to contribute to outcomes. Collectively, the portfolio produced knowledge that is useful and used (see Tables 8-11 in **Errore. L'origine riferimento non è stata trovata.** for QAF results and justifications). However, each project variably satisfied transdisciplinary criteria across the four principles (Figure 8; see QAF Analysis in Results for more detail by project (Figures 4-7)), highlighting that satisfaction of different TDR qualities can lead to different kinds of changes. The results highlight lessons for future research design and implementation, as well as opportunities to improve cohesion among research projects focused on a particular topic, sector, or geography (i.e., oil palm) in terms of how they are designed and implemented.

Figure 8. Portfolio QAF scores for Relevance, Credibility, Legitimacy, and Positioning for Use principles (0 = the criterion was not satisfied; 1 = the criterion was partially satisfied; and 2 = the criterion was fully satisfied). Criteria definitions can be found in Appendix 5.

The portfolio QAF assessment highlights key elements of design and implementation that supported outcome realization, and where efforts in future design and implementation can be directed to better support contributions to outcomes. As a portfolio, the research was well positioned for use, with variable satisfaction of relevance, legitimacy, and credibility criteria. The portfolio was able to realize outcomes, particularly in the policy pathway, owing to the timeliness of the research, strategic engagement, and consideration for ongoing policy processes (i.e., PERDA, RSPO). Collaboration with and inclusion of participants in the research processes was appreciated when done well. However, some respondents felt the research was extractive, were unclear on the utility research findings for them, and indicated a perception that communication was inadequate. Scientific credibility was perceived to be a key facilitating factor for researchers and research results to be taken seriously in relevant policy debates (i.e., PERDA, RSPO), and underpinned perceptions of good reputation, independence, and objectivity. The projects demonstrated both adequate competencies and employed appropriate research methods. However, research questions, objectives, and frameworks were variably applied. For example, GOLS would have benefited from developing an appropriate research framework, a clear

overarching research question at a project level, and effectively applying the ToC to rectify some of the issues that arose with integration, project management, and missed engagement opportunities.

Variable project reliance on principles and criteria to realize outcomes indicates that different elements of project design and implementation lead to different changes, and scope remains for researchers to consider this more strategically. The ERS Project relied on relevant communication and strategic engagement to influence the RSPO P&C. The EK Project relied on effective collaboration with TNC, UNMUL, and the plantation office, and practical application of the research to effectively influence the shape of the PERDA. OPAL has primarily relied upon employing appropriate methods, and genuine and explicit inclusion of target audiences in the research process. GOLS relied on addressing socially relevant problems within the oil palm sector.

The assessment also highlights a lack of cohesion among projects and their respective designs and implementations, likely resulting from disparity among donor requirements for research proposal development, and internal factors including limited incentives and leadership for effective project conceptual integration and collaboration. For example, the EK Project was difficult to score along credibility criteria that focus primarily on scientific rigour, as the project focused more on directly supporting policy development and government agencies than on research, essentially functioning more as an engagement project. As a result, this project did not fully satisfy most criteria that explicitly pertain to research, particularly those under the principle of credibility. Careful consideration for the integration of TDR criteria in connection with intended outcomes is key to strategic research project design and implementation for impact. The following criteria strongly influenced what projects achieved and respondents' perceptions; when projects performed well, these aspects corresponded with positive feedback, and when not done well, these aspects were criticized: relevant communication (relevance); clarity in the research framework, questions, considerations for limitations and generalizability of results (credibility); effective collaboration and genuine and explicit inclusion (legitimacy); and practical application (positioning for use). These criteria should therefore be the focus of developing new projects that aim to change policy and practice in the oil palm sector.

To what extent and how did the projects engage effectively with relevant stakeholders?

The portfolio convened actors from smallholder communities, multiple levels of governments, IGO partners, NGOs, private sector, and researchers for pre-project scoping, partnership, training, data collection, as well as dissemination and knowledge sharing. Some projects used engagement to disseminate findings (e.g., GOLS, ERS), some used engagement as part of the research process (e.g., OPAL), and others facilitated engagement processes as part of the main project activities (e.g., EK Project). Some projects in the portfolio had explicit engagement strategies (e.g., Doc5) to reach and engage diverse stakeholder groups, while others did not. Tables 8-11 in Appendix 6 provide project-specific assessments of engagement characteristics, such as relevant communication, effective collaboration, genuine and explicit inclusion, and strategic engagement.

Communities

As the end-use beneficiaries of the research and the intended changes, smallholders and their communities were important stakeholders to engage. As part of initial engagement, the portfolio met with communities of interest in West, Central, and East Kalimantan to socialize the projects and conduct site visits (Blog20, Doc12, Doc27, Res5, Res9, Web1). District governments and smallholder associations supported portfolio access for community engagement (Doc7, Gov10, Res5, Res9, Res11). Village leadership, smallholders, and women were engaged during fieldwork activities to collect data, such as household surveys, farm-level surveys, and interviews (Blog8, Doc10, Doc12, Doc15, Doc17, Doc27, Gov10, Res3, Res5, Res6, Res9, Res10, Res11, Res12, Res24, Web1). In OPAL, communities (as well as government, NGOs, and private sector) supported testing of the Companion Modelling games to provide feedback on the representation of smallholder experiences and oil palm landscapes presented in the games (Blog21, Doc15, Res6, Res10). Once the games were finalized, community members were engaged as players (Blog8,

Blog21, Doc16, Doc17, Doc23, Doc31, Doc48, Gov6, Res6, Res10, Res20, Res24, Vid2, Web1), which acted as a secondary form of data collection for the OPAL graduate students (Blog21, Doc15, Res6, Res10). This appeared to be an effective and multi-purpose engagement approach. One project document noted the challenge of maintaining active participation of communities in the PERDA process, for example, though smallholders had representation by farmer associations (Doc3). There is little evidence to suggest participating communities were actively engaged for dissemination of portfolio findings, except through OPAL (Res24); this appears to be a missed opportunity for validation and knowledge exchange, and illustrates how some portfolio engagements were extractive.

Government

With high policy focus in the portfolio, national, provincial, and district governments were crucial stakeholders to engage and influence. Pre-project engagement of multiple levels of government stakeholders was crucial to receive support and garner interest for governmental participation in data collection activities (Res9). The portfolio invited government officials to preparatory meetings and inception workshops to socialize project objectives and approaches (e.g., Companion Modelling), acquire permission, and obtain feedback (Blog16, Doc7, Doc10, Doc11, Doc12, Doc23, Gov1, Gov6, Res6, Res9, Res10, Res11, Res16). As part of pre-project engagement, the EK Project engaged three sets of provincial governments who had prior experience of a PERDA to gain insights and lessons (Doc3, Res6); GOLS met with KHLK, Kementan, and provincial and district-level government agencies in West, Central, and East Kalimantan, such as the plantation and forestry service offices (Doc7, Gov1, Res6, Res9, Res11); and OPAL interacted with national, provincial, and district-level stakeholders in East Kalimantan from the plantation and forestry service offices, National Land Agency (ATR BPN), Regional Planning and Development Agency, and District Licensing Agency (Blog16, Doc10, Doc12, Res6, Res10). Government actors, as well as other stakeholders, participated in the development of OPAL's ToC (Doc10, Doc12, Res10). While pre-project socialization undertaken by the portfolio did receive governmental support, one respondent thought this type of engagement would be more valuable if the process focused on collective problem-framing to determine stakeholder needs, gaps, and entry points for a project (Gov2). This could help identify priorities of the government that could be supported by the portfolio's research, rather than pushing forward the issues that researchers think are important (Gov10, Res29, Res32, Res34).

Governments were also engaged for partnership. Through the EK Project, CIFOR engaged closely with the plantation office in East Kalimantan who was responsible to lead the PERDA development (Doc3, Gov2, Gov14, NGO7, Res6, Res25). Regarding the EK Project's HCV mapping, some governmental actors questioned why their division was not engaged despite having a pre-existing relationship with CIFOR and relevant expertise (Gov6). Through GOLS, CIFOR had MoUs to partner with P3SEPKI on Component 1 research on the CPO Fund and tenure (Gov1, Gov15, Res6, Res11, Res18) as well as with LAPAN and BAPPEDA Kotawaringin Barat on Component 3 for spatial mapping (Gov3, Gov10, Res11). P3SEKPI found the engagement mutually beneficial (Gov1, Gov15) as did LAPAN (SWD), but representatives from BAPPEDA did not feel they were actively involved (Gov10, Res11). Despite an official relationship with KHLK, some researchers felt the portfolio did not strongly engage or fully leverage its connections with the ministry (Res27). One researcher suggested CIFOR consider diversifying its governmental relationships beyond the KHLK (Res33). Following engagements on the Atlas work, an MoU was also signed with government officials in Papua (Gov12). Government respondents encouraged CIFOR to continue engagement and partnerships with government institutions to gain "*legitimization*" (Gov1), and recommended CIFOR pursue official cooperation processes (e.g., through a SPK) in future projects to facilitate collaborative engagement and support research uptake as official data (Gov2, Gov7, Gov11).

Some engagement activities focused on governmental capacity development. For example, governments in West Papua were given training on how to use the Papua Atlas (Gov12, IGO2, IGO6, Res2, Res19). LAPAN built upon their spatial analytical skills and have since applied the methods they learned through GOLS to other contexts (e.g.,

West Kalimantan, Sumatra) (SWD). In general, most government respondents wished there were more training opportunities provided by the portfolio (Gov1, Gov7, Gov10, Gov15). Portfolio researchers recognized the importance of training provision and technical support, particularly at the district-level, but they have not had the time or resources to follow-through (Res1, Res11, Res19). Engagements focused on governmental capacity-building would be ideal to encourage use of portfolio outputs and interest to collaborate and support future research.

Governments were engaged for data collection to assist activities, share data, and as participants. GOLS received ground-truthing support from the plantation agency in East Kalimantan (PS3, Res5, Res6, Res11). LAPAN and provincial plantation agencies provided portfolio researchers with access to spatial data (Doc7, Gov2, Gov3, Vo8, Res6, Res11). National government representatives from Kementan, KHLK, Kemenko, CPO Fund Management Agency (BPDPKS), and BPS as well as provincial and district government representatives from the plantation and forestry service offices were interviewed (Gov1, Gov4, Gov13, Gov18, Res6). Government representatives from Kementan and the Plantation Agency in East Kalimantan participated in the Companion Modelling games (Blog13, Blog21, Doc16, Doc17, Doc19, Doc20, Doc25, Doc31, Doc48, Gov2, Gov6, Gov19, Res6, Res10, Res18, Res24, Vid2, Web1). The Indonesian Ambassador to Switzerland also joined as a player (Blog12, Doc17, Doc18). Some government players played more than once, giving them an opportunity to assume different roles and learn multiple perspectives (Gov6, Gov19). Players found the Companion Modelling approach useful for learning and personal reflection (Gov2, Gov6, Gov19), but not as a means to socialize the results (Gov6). The scale of the games supported individual engagement, but not necessarily engagement at the institutional level. Players recommended that OPAL continue to engage more government actors at both the district, provincial, and national level (Gov6, Gov19). Some also suggested that government staff be trained to replicate the games as an ideal way to disseminate OPAL findings more widely (Gov2, Gov6). Overall, the Companion Modelling games were an effective way to engage governments.

Dissemination of portfolio outputs to governmental target audiences was extensive. Various portfolio outputs were shared during meetings and workshops to seek clarification and feedback from governmental representatives at Kementan, KHLK, Kemenko, BPDPKS, Geospatial Information Agency (BIG), LAPAN, BAPPEDA Kalimantan Barat, BAPPEDA Kotawaringin Barat, and provincial plantation agencies (Doc3, Doc7, Doc20, Doc24, Gov1, Gov4, Gov5, Gov7, Gov8, Gov9, Gov10, Gov11, Gov12, Gov13, Gov14, Gov19, Res1, Res2, Res6, Res8, Res11, Res12, Res15, Res20, Res22, Res23, Res24, TR57, TR71). Findings were also shared in policy dialogues attended by governments (Blog5, Doc19, Doc21, Gov14, Gov16, Res2, Res10, Res13, TR31, TR50) and one-on-one meetings with portfolio researchers (Gov5, Gov12, Gov17, Gov19, Res2, Res6, Res19, TR19, TR31). For example, multiple meetings were held with the deputy chairman and staff from the Corruption Eradication Commission (KPK) on how the Borneo Atlas could support their work (Gov5, Res19). Some government officials from KHLK, Kemenko, the ISPO Commission, and the Ministry of Women have been invited to portfolio events as guest speakers and resource people (Blog5, Gov13, Gov15, Gov17, Gov20, Res3, Res6). Despite sending invitations for meetings, workshops, or events, not all governmental representatives are available to attend (Gov1, IGO7, PS6, Res3, Res11, Res29, Res32, Res34), which can lead to governments feeling they have not been sufficiently engaged by the portfolio. Portfolio researchers' and partners' participation in government-led multi-stakeholder processes also supported dissemination of portfolio findings to governments, such as the PERDA (Doc3, Gov14, Gov21, IGO1, NGO7, Res25), the FKPB forum in East Kalimantan (Doc23, Gov21, Res6), as well as ISPO and RANKSB (Doc7, Doc16, Doc23, Doc24, Gov13, Gov15, IGO7, Res2, Res5, Res6, Res10, Res14, Res15, Res17, Res18). One researcher was not convinced that CIFOR has access to Kementan in the ISPO process (Res27). Some government respondents found the portfolio's engagement to disseminate and share outputs was done generally well (Gov3, Gov8, Gov9, Gov13, Gov15, Gov19, Gov21). It was emphasized that coordination, sharing of information, and consultation with governments regarding research on oil palm are crucial (Gov9). Others thought portfolio engagement could be improved. Some noted how engagement varied; engagement would be intensive at the beginning or during the fieldwork phase, but then

communication would slow or stop altogether (Gov8, Gov11, Gov20, Gov21). Some did not find the engagement as mutually beneficial as expected; the portfolio collected data from governments, but the final outputs were not effectively disseminated back (Gov6, Gov10, Gov18). Several found dissemination by PowerPoints and meetings was not effective and insufficient (Gov6, Gov7, Gov10), and others rarely or had not received hard or soft copies of the research directly from CIFOR (Gov5, Gov7, Gov10, Gov18). One government respondent shared an instance where they were invited by CIFOR to help present portfolio data, but they felt that by doing so, it would appear that the government officially recognized the data when they were actually unfamiliar with the output (Gov11). One respondent felt there has been an over-emphasis of portfolio dissemination for policy-making purposes (Gov15), perhaps overlooking the value of simple knowledge-sharing engagement (e.g., FGDs, seminars) and capacity-building activities (Gov10, Gov15, Gov17, IGO2). An external researcher thought the portfolio's approach to policy-making in Indonesia does not work, and requires investment in continual engagement and discussions on a topic and policy process (Res32). Some respondents felt that dissemination alone is insufficient, and the portfolio should consider supporting governments and other target audiences to implement findings and recommendations (Gov2, Gov8). Others encouraged that policy engagement be more proactive and followed-through (Gov5, Gov8, Gov14, Gov20, IGO7).

Some portfolio engagements have led to tensions with the government. Some portfolio researchers are not always well prepared to present in public fora or are unsure of what can and cannot be said (Gov1, Res5, Res18). At times, the portfolio has lacked coherent oversight in terms of messaging (i.e., conflicting narratives), which actors have previously been engaged, and what social capital or networks exist already in-house (Res5).

When asked to identify relevant government stakeholders that did not appear to be engaged by the portfolio, respondents thought the Ministry of Trade (Gov13, Res15), ATR BPN (Gov19), the Ministry of Industry (Res15), National Development Planning Agency (BAPPENAS) (Res15), Bupati (Gov10), and KPK (Res15) were not sufficiently engaged. Others thought BIG (who is responsible for the One Map Initiative) (Res2, Res19), Forestry Planning Agency (BAPLAN), and KHLK (Res2) should have been engaged in connection with the Atlas, and that OPAL did not engage KHLK or the ATR BPN (Gov19).

IGOs

IGOs, particularly those connected to the portfolio as donors and boundary partners, are relevant stakeholders. OPAL involved their donors in inception workshops, site visits, and testing of the Companion Modelling games (Blog18, Blog20, Doc11, Doc13). Apart from regular meetings regarding project progress, IGOs were mostly engaged at workshops, dialogues, and international fora (e.g., the World Bank's Land and Poverty Conference) where portfolio knowledge was shared (Doc28, IGO1, IGO4, IGO5, IGO6, IGO7, Res8, Res12). One IGO respondent found the events and dialogues useful for networking, but not for dissemination or learning purposes (IGO5). Most IGO partners appear satisfied with the regular level of communication and inclusion in portfolio engagement activities, though they noted there is always scope to improve outreach (IGO4, IGO6, IGO7).

NGOs

Both local and international NGOs were identified as relevant stakeholders for engagement on oil palm, but one respondent had the impression that CIFOR is not well connected with NGOs (IGO2). When they are engaged by the portfolio, NGOs appear to mostly support activities or are invited to dissemination workshops. During the PERDA process, NGOs such as TNC, Stabil, WWF, and the Global Green Growth Initiative (GGGI) were engaged (Doc3, Gov2, Gov21, IGO1, NGO7, Res25, Res34, TR61), though this engagement is not solely attributable to the EK Project. Auriga, Greenpeace, WWF, TNC, and other CSOs supported data collection and were engaged for dissemination for GOLS and OPAL (Gov1, NGO2, NGO3, NGO7, Res1, Res19, TR57, TR71). Human rights organizations participated in a policy dialogue hosted by the ERS Project (Blog5, Res3). KEHATI appears to be a highly relevant NGO that has not been engaged officially by the portfolio (NGO5, NGO8).

Private Sector

Indonesia's private sector comprises both small- and large-scale stakeholders relevant for engagement on issues related to oil palm production (i.e., smallholders, farmers associations, small and medium enterprises (SMEs), companies, etc.). In some instances, the portfolio successfully engaged private sector stakeholders, while in others not. During the multi-stakeholder engagement process for the East Kalimantan PERDA, farmers associations like GAPKI and other private sector representatives from oil palm companies or intermediaries like Daemeter Consulting were involved (Doc3, IGO1, PS6, Res25), though again their involvement is not solely attributable to the EK Project. In the early stages of GOLS, IPOP was identified as a strategic platform in which to engage oil palm companies as boundary partners (Doc5, Doc7, Res3, Res5, Res34). Following IPOP's collapse, GOLS shifted its engagement focus to companies with zero deforestation commitments, GAPKI, and RSPO (Doc7, Res6). Outreach meetings to socialize research activities were held with companies directly or intermediaries, such as farmers associations (Res5, TR41). Some portfolio researchers acknowledge that private sector engagement in GOLS was weak overall and their engagement was not significant (Res5, Res6, Res18). Others noted the challenges to engage private sector actors, establish relationships and trust, as well as get appointments and participation (Gov1, PS6, Res6, Res18). ERS researchers wished they had engaged companies and other private sector representatives more from the outset of the project (Res3).

Private sector actors participated in portfolio fieldwork activities. Some companies allowed GOLS researchers to visit company plantations to observe sustainable management practices (Gov1); farmers associations like SPKS supported GOLS data collection (PS3, Res5); representatives from cooperatives, farmer associations, and oil palm companies participated in interviews and the Companion Modelling games as players (Blog21, Doc12, Doc23, Doc31, Doc48, Vid2, Web1); and RSPO-certified companies and auditing firms were consulted on gender (Res3, TR59).

As an important target audience for the portfolio's outputs, representatives from oil palm companies, farmers associations, and other intermediaries like TFA were invited to multi-stakeholder focus group discussions, dialogues, and events where findings were shared (Doc7, PS3, PS5, PS6, Res12, TR57). For example, companies like GAR attended an event on gender rights in the oil palm industry (Blog14, Res12). In some instances, portfolio findings were shared and discussed with company representatives in informal one-on-one meetings (e.g., Wilmar, Musim Mas) (PS1, Res2, Res6, Res33, TR19, TR31). Private sector actors were also reached via portfolio researchers' presentations at international panel discussions (e.g., Asia Pacific Forestry Week) on the Borneo Atlas and Companion Modelling games (Doc19, Doc25, NGO7, TR37). One private sector respondent felt more portfolio engagement and dissemination were needed at the local level (PS3).

RSPO is a key stakeholder on oil palm which addresses private sector issues. The portfolio engaged RSPO briefly regarding the Borneo Atlas (NGO3), smallholder research (Res12), and the Companion Modelling games (Doc16), though RSPO was a major target audience of the ERS Project. However, RSPO engagement does not appear to have been systematically or directly planned as part of the ERS Project. While one-on-one conversations were had (PS1), sharing of ERS findings occurred through the commissioning partner (NGO4) or by portfolio researcher participation in RSPO roundtable meetings which they attended by chance (Res3, Res12).

Researchers

Local and international researchers were core target audiences of the portfolio. Researchers were engaged for partnerships and dissemination. The portfolio collaborated with researchers from UNMUL, UNTAMA, IPB, and ETHZ. UNMUL research partners supported the development of the academic script (Doc3, Gov2, NGO7, Res6, Res25, Res31), and were involved in preparatory meetings to discuss project design, events, and planned engagements for the EK Project (Doc3, NGO7, Res6). Since passing of the PERDA, one research partner noted that engagement and communication have been lacking despite the initiation of the pergub process (Res25); while beyond the scope of

the EK Project, this could be a valuable space in which the portfolio can remain engaged. UNTAMA researchers supported spatial data collection for GOLS (Doc7, Gov8, Res9, TR13, TR34, TR57, TR67). Researchers and graduate students from IPB and ETHZ collaborated with CIFOR through OPAL (Doc19, Doc25, Res6, Res10, Res14, Res16, Res18, Res20, Res24, Web1). OPAL research partners had co-ownership of the design and implementation of the project (Res14, Res16, Res18), and each partner brought their strengths to the partnership (Doc25, Res10, Res14, Res18). Dissemination of portfolio outputs to academic audiences occurred through presentations, demonstration workshops, and events (Blog13, Doc17, Doc18, Doc23, Res30, Res32), graduate student defenses (Doc16, Doc19, Doc20, Res14, Res20, Web1), and participation in academic debates and international conferences (Blog4, Blog5, Doc15, Doc19, Doc24, Doc28, Gov1, Res4, Res12, Res14, Res15, Res16, Res20, Res29, TR19, TR24, TR69). One research partner felt that portfolio results were not routinely shared, so they had to search for outputs themselves (Res25). Overall, researchers that partnered with the portfolio found the engagement was done well.

To what extent were project findings sufficiently relevant to achieve stated objectives?

Table 12 in Appendix 7 summarizes respondents' perceptions of the relevance of the portfolio's outputs. Impressions of the research findings' relevance are inferred from respondent comments regarding the entry points of the projects and perceptions of possible utility. Oil palm is exemplary of sustainable development challenges. As a highly debated topic in Indonesia, given the high potential for economic gains, and corresponding high potential for ecological and social risk, oil palm was relevant topic to pursue. As such, respondents perceived many complex environmental and social issues facing the sector, including: poor supply chain traceability due to incomplete (mapped) information leading to overlapping land claims, conflict, and illegal establishment of plantations (Gov15, IGO2, Res2, Res25, Res26, Res31), a lack of capacity for certification and sustainable practice, particularly for smallholders (Gov10, Gov15, Gov17, IGO1, IGO2, Res26), a lack of political will and extension services (Gov15, Gov17, Gov18, IGO1, Res33), low land productivity (Gov9, Gov15), pricing (Blog12, Gov13, Gov16, Gov20, PS4, PS6, Res25, Res31), and variable problem-framing owing to competing interests, misinformation, and political economy (Gov10, Gov13, Gov18, PS1, Res14, Res9). With significant knowledge gaps in spatial data (Gov3, Gov10, NGO2, NGO3, PS4); characteristics and locations of smallholder landholdings (IGO2, PS4); women's experiences in oil palm communities (NGO4, PS1, PS2), and an overall lack of scientific bases for policy development, the aims of the portfolio were well aligned to produce relevant information. However, some respondents perceived the relevance of the research to be hindered by an overall lack of consideration for the realities of the political economy in the sector (NGO2, NGO6). Some respondents held perceptions that forestry researchers were pursuing an agenda that fell outside their jurisdiction (as oil palm is associated with agriculture), some scepticism (Gov10, Gov18).

The EK Project's input to the PERDA process was perceived to add valuable nuance and field experience to the discussions (Gov2, Res25, Res31).

To identify and promote improved synergies between public and private policies, regulations and practices of sustainable oil palm production, GOLS partnered with P3SEPKI to develop policy recommendations for allocation of CPO Funds and rectifying smallholder land legality. The project additionally took stock of existing initiatives, where there were possible complementarities and disconnects that needed to be rectified (Pacheco et al., 2018; Luttrell et al., 2018). These outputs provided a clear overview of the status of the sector (IGO1, IGO6, PS2, PS5, Res7, Res26), and built capacity in the P3SEPKI team to become the go-to experts for oil palm issues within the ministry (Gov1, Gov15).

To quantify the impacts of oil palm expansion on biodiversity and ecosystem services, GOLS undertook substantial mapping and data visualization. The large-scale vegetation map was perceived relevant to provide a more accurate and precise representation of the vegetation classes in the region (Gov3). The Borneo and Papua Atlas have relevance for monitoring licenses and instances of deforestation (location and who is responsible) to increase transparency and accountability in the sector (Gov12, NGO3).

To identify business models, mechanisms and incentives for improved inclusion of smallholders in the palm oil supply chain with reduced environmental impacts, the GOLS project developed smallholder maps and typologies in Kotawaringen Barat which were perceived to increase understanding of smallholder communities, challenges of regulation compliance, and help set the foundation for integration into sustainable supply chains (Gov10, IGO2).

To inform state agencies, corporate groups, and CSOs of the social and environmental trade-offs, GOLS generated a series of scenarios for oil palm expansion (i.e., business-as-usual, conservation, and sustainable intensification) that modelled expansion, land use, and ecosystem service values and outlined the trade-offs of each. The research concludes that a cautious expansion must be considered in the light of implications for food security given the implicated agricultural land use change (Sharma et al., 2019). The scenario models were perceived useful for planners to identify the optimal non-forest estate land (APL) areas that need to be monitored, and the scenario recommendations could support the execution of the environmental quality indicators for a regional mid-term development plan (RPJMD) in West Kalimantan (Gov22).

OPAL researchers perceived Companion Modeling to be useful to engage and bring knowledge from different actor groups together to get a realistic understanding of the complex system and move polemical discussions toward solutions (Res10, Res16, Res24). Government officials perceived the games useful for better consideration of consequences of decisions to improve decision-making practices, and acquire a better understanding of the challenges different groups face in the sector (Gov2, Gov6, Gov19, IGO1).

ERS findings were perceived useful to bring experience from the field to the revisions of the RSPO P&C to raise awareness and provide a starting point for what needed to be addressed to improve working conditions for women among member companies (NGO4, PS1, PS2).

Overall, the portfolio generated relevant science to realize its objectives. General perceptions of CIFOR's contribution to the sector was the provision of credible, reliable, objective research to provide a comprehensive overview of issues in the sector (IGO1, NGO1, PS1, PS2, Res26, Res27, Res32), some of which is reported in news outlets like Mongabay to increase public awareness on oil palm issues (Doc41, Doc42, Doc43, Doc44, Doc45, Doc46). The capacity of CIFOR to generate long data series on deforestation and land use change was perceived to be invaluable to give an accurate picture of the oil palm sector (Gov3, Gov12, PS1, Res26). Despite appreciation of the findings' relevance, some comments indicate contrasting views. One NGO respondent perceived the lack of consideration for the political economy to render spatial data irrelevant, save for producing PhDs (NGO2). Some respondents did not know what the findings were (Gov2, Gov11, Gov15, Gov18, Gov21, IGO5, PS6, Res31) or were not apprised of when they could be expected, indicating that in addition to providing relevant results, it is important to manage expectations of project participants/intended audiences and communicate the results in an accessible way to stakeholders (NGO5). The potential for research process related contributions should be considered as well as knowledge contributions generated by the research process to build relevance in the knowledge generated. The analysis also illustrates some lack of coherence in the objectives between projects in the portfolio, indicating scope for a more comprehensive strategy toward building research relevance for government, private sector, NGO, and CSO actors.

To what extent and how are target audiences aware of and using portfolio outputs?

See Table 12 in Appendix 7 for a more complete list of portfolio outputs. Key outputs include: the academic script developed to feed into the East Kalimantan PERDA (Doc60); HCV maps; analyses of governance arrangements (Pacheco et al., 2018) and private sector commitments (Luttrell et al, 2018a); policy recommendations for the CPO Fund (Nurfatriani et al., 2019) and land tenure (Wibowo et al., 2019); vegetation land cover maps; the Borneo Atlas and Papua Atlas; smallholder typologies and smallholder planation maps (Jelsma et al., 2018); scenarios (Sharma et al., 2018a); Companion Modelling games (e.g., ComMoDO, LUCOPE, ComMod ISPO); and policy recommendations for the reflection of gender in RSPO (Sijapati Basnett et al., 2016). Portfolio outputs were shared with target audiences

via peer-reviewed publications, graduate theses and dissertations, various media (e.g., CIFOR website, Twitter, CIFOR Forests News, videos, web-based tools and databases, etc.), e-mail correspondence, events, workshops, meetings, policy dialogues, international fora, conferences, multi-stakeholder processes, and informal discussions to spread awareness of the research. There is evidence that awareness spread through partners' institutions and networks not directly engaged by the portfolio (e.g., UNMUL researchers shared in their academic network (Res31); P3SEPKI partners shared GOLS knowledge with other ministries (Gov1, Res6); IPB partners brought OPAL knowledge to new collaborations (Res6, Res14, Res20); Oxfam Novib shared ERS findings through RSPO networks (NGO4)). There is also evidence that target audiences shared portfolio outputs or learning within their networks (e.g., Papua Atlas linked on a government website (Gov12, Web11); scenarios shared with the RSPO Secretariat working on deforestation (PS1); Companion Modelling participants shared their experience and learning with colleagues (Gov2, Gov19, Gov21, NGO7)). Researchers citing portfolio outputs increases the reach of that knowledge to other researchers and academics who might seek the original source. Moreover, online news outlets (e.g., Business Insider, Mongabay, The World) (e.g., Doc33, Doc43, Doc46, Doc49) and Indonesian newspapers (NGO1) that promoted or referenced portfolio outputs made them more visible to the public (Res27).

Awareness of Project Outputs

Most respondents were aware of at least one output produced by the portfolio, but this varied in degree of awareness; some could identify a general subset of the research while others could describe in detail key pieces of knowledge. Government respondents were most aware of the portfolio's work on HCV (Gov2, Gov7, Gov9, Gov14, IGO1). Partners from other projects were generally aware of portfolio research on oil palm supply and value chains (IGO1, PS2, Res7, Res28) and private sector commitments (PS5). Few respondents knew about P3SEPKI's research contributions on the CPO Fund and land tenure in Component 1 of GOLS, but those that did could identify specific recommendations from that work (Gov4, Gov15). Only representatives from BIG discussed the vegetation land cover maps (Gov11), but documents and researchers suggest wider governmental awareness among provincial and national governments at BAPPEDA Kalimantan Barat, Badan Planologi, and KHLK (Doc7, Res1, Res6, Res28, TR53), though this could not be verified. A document also indicated that researchers at the University of Tanjungpura (UNTAN) may be aware of the vegetation land cover maps (Doc7). Outputs related to the Atlas work were most widely known. Researchers from IPB, WRI, and universities or research institutes in Malaysia, Australia, Europe, and North America are aware of the mills database (Doc6, Res7, Res30). The Papua Atlas is less well known than the Borneo Atlas, but the former is known by government target audiences in West Papua (Gov12, IGO2). In addition to respondents who were personally aware of the Borneo Atlas (Gov5, Gov10, NGO1, NGO2, NGO3, PS1, Res26, Res28, Res30), documents and respondents gave indications of: governmental awareness (e.g., Peat Restoration Agency (BRG), KPK, KHLK, Plantation Agency, West Kalimantan Forest Service, BAPPEDA Kotawaringin Barat, BAPLAN, Directorate of Prevention of Impacts of Environment and Sector Policy (PDLKWS)) (Blog10, Doc7, Gov5, Gov10, Res2, Res6, Res9, Res15, Res19, TR19, TR28, TR51); IGO awareness (e.g., International Union for Conservation of Nature (IUCN), USAID, DFID's UK Climate Change Unit (UKCCU)) (Doc57, IGO2, TR2, TR19); NGO awareness (e.g., EcoNusa, Bruno Manser Fund) (Blog23, IGO2, TR19); company awareness (e.g., Wilmar, Musim Mas, Asia Pulp and Paper Group, ADM Capital) (Doc7, Res2, Res6, Res15, Res17, Res19, Res33, TR16, TR19); researcher awareness (e.g., WRI, University of Maryland, UI) (Blog4, Doc37, TR16, TR19); and potential public awareness via CIFOR Forests News (Blog3, Blog4, Blog6, Blog7, Blog10), Mongabay (Doc43, Doc46), Business Insider (Doc33), and The World (Doc49). Only one respondent discussed the decrease in deforestation in Indonesia since 2012, a key finding of the Atlas (PS1). The portfolio's research on smallholders from GOLS was also more widely known among other portfolio outputs. While some respondents indicated a general awareness of the topic (Gov2, IGO1, IGO5, IGO6, Res7), others could identify specific outputs such as the smallholder plantation maps (Gov3, Gov4, Gov7, Gov8, Gov10, Res28) and smallholder typologies (Gov1, Gov4, Gov10, Gov16, IGO2, IGO7, Res32). Yet, among

governmental respondents, some discussed the findings on smallholder heterogeneity and specific characteristics in-depth (Gov1, Gov4, Gov10), while others appeared to only have a superficial level of knowledge (Gov16). Documents and respondents also gave indications of governmental awareness of smallholder heterogeneity and typologies, via discussions (IGO5, Res22) and portfolio researchers' participation in the ISPO Working Group (Res5, Res15), and KHLK's awareness for policy decisions related to CPO Fund allocation and tenure issues (Blog1, Doc7, Doc68, Res5). The scenarios output was lesser known, only by representatives from BAPPEDA Kalimantan Barat (Gov22) and RSPO (PS1). The Companion Modelling games were well-known by both players (Gov2, Gov6, Gov19, Vid5) and non-players (Gov21, NGO7), the latter who gained awareness from players who shared their experience. As players, government participants became aware of oil palm plantation conditions and smallholder experiences (Gov6, Gov19), smallholder compliance capacities (Gov2, Gov19, Vid5), and smallholders' readiness for ISPO (Gov6, Gov19). Other respondents indicated their personal awareness of smallholders' readiness for ISPO (NGO7, NGO8, Res7). ERS outputs on gender and oil palm were known in great detail by target audiences from Oxfam Novib, RSPO, and Forum for the Future, such as gender gaps in RSPO (NGO4, PS1, PS2) and vulnerabilities, gendered exploitation, and women's land rights (NGO4). Two partners were aware of Li's (2016) research on the social impacts of oil palm plantations (IGO1, NGO4), which was a precursor to the ERS Project.

Use of Outputs

Table 12 in Appendix 7 summarizes the evidence of uptake and use of portfolio outputs, both formal and informal. Portfolio partners, participants, and target audiences are using outputs generated by the portfolio. Data, maps, typologies, scenarios, analyses, and recommendations have been used.

Governmental Use

Government actors have used outputs from across the portfolio, but the evidence is not always clear as to whether governmental use is formal (i.e., official) or informal. Many respondents noted the provincial government's inclusion of HCV from the academic script in a couple chapters of the East Kalimantan PERDA (Doc3, Gov2, Gov21, IGO1, NGO7, PS6, Res6, Res25, Res31). Others also noted intended use of the HCV maps in the upcoming pergub (Gov2, Gov14, Res6, Res25, TR11). According to a partner, the HCV maps are also referenced in BAPPEDA Kotawaringin Barat's geoportal website (Res25). One government respondent thought the East Kalimantan Plantation Agency has used the HCV data (Gov9), but this could not be verified. Through P3SEPKI partners, outputs from GOLS Component 1 and 3 have been used to inform the development of position papers for KHLK (Gov1, Gov15) and Kemenko (Gov1), as well as a handbook for palm oil diplomacy produced for the Ministry of Foreign Affairs (Gov1, Gov15). More specifically, outputs were used to inform KHLK inputs to the BPDPKS research commission (Gov1), Kementan's guidance on a decree for a replanting program (Gov1, Doc68), tenure issues for plantations located in forest-designated areas (Gov15), forest amnesty (Gov1), and indirect land use change (ILUC) (Gov1). One research partner had the impression that vegetation land cover maps have been used by governments at the district and provincial levels (Res28), but this could not be verified. A representative from BAPPEDA Kotawaringin Barat claimed use of the Atlas' spatial data as well as the smallholder plantation maps to compare and validate estate locations and size (Gov10), but it is unclear as to whether this use is official or informal. Governments in Papua have used the Papua Atlas to monitor concession permits (Gov12, IGO2), and the plantation agency's website links to the Papua Atlas (Gov12, IGO6, Res19, Web11). Representatives from LAPAN noted use of satellite data from GOLS, but they also acquire satellite imagery from the Japan Aerospace Exploration Agency (JAXA) (Gov3). One researcher had the impression that subnational governments have used the smallholder plantation maps and typologies to determine eligibility for governmental assistance (Res9), which was validated by representatives from the plantation agency in East Kalimantan (Gov4, Gov8). The maps have served to determine eligibility by identifying plantations located in forest-designated areas and distinguishing independent smallholders from elites (Gov4). The plantation agency's use appears to be informal as one

respondent explained that reach could be greater if portfolio outputs were endorsed at the national level (Gov4). While project documents claim and others indicate reflection of smallholder compliance gaps and heterogeneity in the presidential instructions on RANKSB (Doc7, Doc61) and ISPO (Doc7, Doc62), it is unclear as to whether governments drew upon outputs from the portfolio or elsewhere for this knowledge; however, one government respondent had the impression that Component 3 research was an input to the preparation of RANKSB (Gov4). Portfolio researchers had the impression that BAPPEDA Kalimantan Barat has used the scenarios outputs to develop a RPJMD (Doc7, Res23), but a government representative clarified that the scenarios were only used to inform land conservation, one task outlined in the RPJMD (Gov22). There is no evidence to suggest that governments have used the Companion Modelling games, but a government participant documented their experience of playing in an official report submitted to the director general of Plantations (Gov19). Likewise, governments do not appear to have used ERS outputs, but they are not a target audience of the project.

NGO Use

NGO use is less varied. Some respondents from Earth Innovation Research Institue (INOBU) and TNC noted general use of portfolio outputs for background reading on oil palm, but did not specify which topics or foci (NGO1, NGO7). Outputs related to the Atlas appear to draw most NGO attention. The mills database has been downloaded and likely used by WWF Indonesia and the EcoNusa Foundation (Doc6); a blog provides supporting evidence of EcoNusa's use (Blog23). According to a GOLS report, the Atlas has been used by NGOs such as PM Haze and Forest Trends to verify companies' zero deforestation commitments and identify illegal encroachments (Doc7), but this could not be triangulated. Greenpeace has used Atlas data in various ways, such as for comparison of oil palm concession maps from Greenpeace's mapping platform and in reports to hold companies accountable to their RSPO commitments (e.g., *Burning Down the House* report; *Dying for a Cookie* report) (Doc7, Doc36, Doc56, Doc65, NGO3, Res19). One portfolio researcher had the impression that ERS findings have been used in a Rights and Resources Initiative (RRI) campaign about large-scale land acquisition (Res3), but this could not be validated. Oxfam Novib has used and transfered ERS findings on gender to other international commodity certifications, such as seafood (NGO4).

IGO Use

Compared to other actor groups, IGOs appear to use portfolio outputs the least. A representative from UKCCU makes general use of the portfolio for background reading (IGO6), while USAID has used GOLS outputs to inform the design of the LESTARI Project and other project or program proposals on oil palm (IGO4). One respondent claimed aspects of the smallholder research from GOLS Component 3 have informed the GIZ policy briefs (IGO1), but these were not specified or corroborated with documentation.

Private Sector Use

Private sector intermediaries like TFA noted general use of portfolio outputs for background reading (PS5). Portfolio reports and researchers noted representatives from companies like Wilmar and Musim Mas have reviewed Atlas data on plantation boundaries to compare with their concession data (Doc7, Res2, Res6, Res19, Res33), but respondents from these companies were not responsive to requests for interviews to enable verification of usage. There is stronger evidence of use of ERS findings by private sector intermediaries. Aspects of the findings on gender and oil palm, such as gaps regarding child care and maternity leave, health and safety, women's land rights, and training, among others, were used to inform revisions to RSPO's P&C (Doc54, Doc55, PS1, PS2, Res3, Web3). ERS recommendations have been used by the RSPO Task Force (NGO4) and the RSPO Human Rights Working Group (NGO4, Res3).

Academic Use

Table 12 presents evidence of academic use in terms of citation counts and downloads. From the sample of selected portfolio outputs, one had high academic engagement (>200 citations; e.g., Gaveau et al., 2016); two had medium

academic engagement (16-50 citations; e.g., Jelsma et al., 2017; Pacheco et al., 2018), four had low academic engagement (1-15 citations; e.g., Luttrell et al., 2018a; Sharma et al., 2018a; Sijapati Basnett et al., 2016; Yulian et al., 2017), and three had no academic engagement to date (0 citations; e.g., Hasanah et al., 2019b; Nurfatriani et al., 2019; Wibowo et al., 2019). Download counts indicate that outputs with low engagement or not yet cited may be used in ways that cannot be traced, and likely have potential for future use by researchers or other actor groups. Citing articles tended to make only a couple references to knowledge generated by the portfolio, predominantly to provide background context and rationale. Few use methods, maps, or analyses extensively; Gaveau et al. (2016) and Jelsma et al. (2017) are the best examples where citing articles engaged with portfolio data, methods, maps, and tools (e.g., typology classification). Nearly all of the citing research focuses on Indonesian oil palm, but some studies were situated in other contexts, such as Tanzania (Balchin et al., 2018), Cameroon (Ordway et al., 2017), Ghana (Khatun et al., 2020), Peru (Bennett et al., 2019), Colombia (Ocampo-Peñuela et al., 2018), Mexico and Guatamala (Castellanos-Navarrete et al., 2019), Brazil (da Silva Medina, 2019), Malaysia (Tey et al., 2020; Davidson et al., 2019; Ibragimov et al., 2019; Pirker et al., 2017; Nesadurai, 2018) in Malaysia; Europe (da Silva Media, 2019; Ostfeld et al., 2019; Sabel et al., 2015), and global case studies (da Silva Medina, 2019; Khatiwada et al., 2018; Rulli et al., 2019). Some studies focused on other resource value chains (e.g., Sabel et al., 2015 on dairy; Nesti et al., 2018 on coconut).

Table 14 in Appendix 10 provides information on the types of researchers (i.e., CIFOR, partners, external researchers) using portfolio outputs. CIFOR appears to reference their work frequently. This demonstrates connectivity between projects (within and outside the portfolio), as they build upon research they have done. In addition, scholarly collaboration appears to be an important strategy to expand the reach of portfolio knowledge as CIFOR researchers and partners extend their knowledge-sharing to individuals and groups with whom they co-author. In some instances, co-authoring on the Borneo Atlas and smallholder research has led to co-authors citing these portfolio outputs in further articles not co-authored with portfolio researchers (e.g., Alamgir et al., 2019; McAlpine et al., 2018; Meijaard et al., 2017; 2018; Morgans et al., 2018; Santika et al., 2017a; 2017b; 2019a; 2019b; 2020; Schouten & Hospes, 2018; Sokoastri et al., 2019; Woittiez et al., 2018; Voigt et al., 2018; Wolff et al., 2018). External researchers do cite the portfolio, predominantly by researchers from the Global North but also with representation of researchers from the Global South, including Indonesian researchers (Table 14).

Research partners have used portfolio research for background reading (Res4, Res31), applied in other projects (e.g., Strengthening Sustainable Palm Oil Management Program in Indonesia (SPOS) Project, Anticipation Grant (ANGIN)-supported project) (Doc20, Doc24, Res6, Res20), and used to inform their teaching (Blog13, Res14, Res20). Tropenbos researchers have used the vegetation maps as part of their landcover analysis of Kalimantan Barat (Res28). WRI researchers have used portfolio outputs for background context as well as data and statistics, such as the mills data to compared with WRI's Global Forest Watch data (Res7, Res30). Many other researchers – ranging from graduate students to established researchers – have downloaded and likely used the mills database, representing uptake by universities or research institutes in Indonesia (e.g., IPB), Malaysia (e.g., Universiti Teknologi Malaysia, Universiti Putra Malaysia), Australia (e.g., University of Queensland), Europe (e.g., University of Geneva, Mercator Research Institute on Global Commons and Climate Change, University of Leeds), and North America (e.g., Massachusetts Institute of Technology (MIT), Harvard University, Pasadena City College) (Doc6).

Outputs Not Used

Most outputs have been used in some way. Despite general awareness of portfolio outputs, representatives from Kemenko, KEHATI, and Auriga said they have not used any outputs generated by the portfolio (Gov20, NGO2, NGO5, NGO8). One respondent explained that they found the information "*lacking*" (Gov20). Other respondents had the impression that key target audiences do not use portfolio knowledge, such as KHLK (NGO2, Res27), Kementan (Res27), Climate Policy Initiative (Res3), or Indonesian researchers (IGO2). Looking at specific outputs, some

expected or relevant target audiences have not used the outputs to date. For example, respondents noted that the Atlas has not yet been leveraged by KPK (Gov5, Res2, Res6), KHLK (Gov1), INOBU (NGO1), or Auriga (NGO2). There has been reported interest from KPK following one-on-one meetings with portfolio researchers to conduct follow-up investigations of illegal concessions in Kalimantan highlighted by compelling evidence from the Atlas, yet no action appears to have been taken to date (Res19). BAPPEDA Kotawaringin Barat has not used the smallholder plantation maps, but a representative expressed intentions to use the maps as a reference to complement government data for the development of a regional spatial plan (RTRW) and a RPJMD (Gov8). Private sector allies like GAPKI have not used or applied the Companion Modelling games, but a researcher noted discussions have been held to do so in the future (Res20).

Barriers

In the past, knowledge supply on oil palm topics has been a challenge, but this has significantly improved (IGO1). However, other barriers persist which affect uptake and use of portfolio outputs – some that lie within and others that lie outside the portfolio's control. While some respondents were aware of portfolio activities, they were not necessarily aware of or could remember specific findings because of ineffective dissemination or translation of research into knowledge or outputs that target audiences can understand and use (Gov16, Res18, Res31). For example, a government respondent noted that findings are commonly shared in presentations and meetings, but a soft or hard copy is not always shared (Gov16). Not all outputs have been published; in some cases, the publication of results has been delayed at the request of partners or because outputs require refinement (Doc3, Gov14, IGO1, Res31). For example, government partners requested the publication of EK findings be delayed until the PERDA was accepted by Parliament (Doc3, TR53). Sometimes it is the way in which target audiences are engaged that acts as a barrier to wider uptake. For example, the Companion Modelling games were played by individuals (and not necessarily by those with high-level decision-making authority), so uptake happens successfully at the individual level but not necessarily at the institutional level (Gov19). Some target audiences lack the time to read the research in-depth (IGO6, Res34). Some governmental bodies are limited by their respective level of authority to use and implement knowledge gained. For example, if the issue is beyond TUPOKSI (i.e., main task and function), it is not possible (Gov4). In order for governments to use external data, they require official endorsement at the national level (Gov4, Gov5, Gov11, Gov12, NGO2, Res2, Res6, TR53). This may be overcome if engagements are more collaborative from the outset, and governments co-own the knowledge produced. Governmental target audiences often lack personnel or expertise, in spatial analysis for example, so training is required for uptake and use to happen (Gov7, Gov12, PS6, Res19). Sometimes portfolio resources are available or allocated for training, but not always. For example, funding was given to support governmental training to use the Papua Atlas, whereas the Borneo Atlas did not (Res19). Capacity-building was thought to be a gap future projects could fill (PS6). Governmental uptake may also be restricted by the complicated political landscape surrounding oil palm issues (Gov1, Res15). Disagreement may exist among ministries, which is one of the reasons why ISPO has not been signed by the president (Res15).

What lessons can be learned from the portfolio to enhance research design, management, and assessment of research-for-development programs in the future?

Together, the analyses of outcomes and project design and implementation elicited several conclusions about research design, influence, and evaluation. The portfolio contributed to notable achievements in each pathway; yet, despite these achievements, realized changes were diffuse and there were missed opportunities that highlight scope for more intentional coordination, cohesion, and coherence across research efforts on oil palm issues in Indonesia in the future. The following lessons should be considered within the unique operating context of the CGIAR, CIFOR, and FTA, which relies entirely on project-based bilateral funding from various development agencies and in turn corresponds

with unique challenges. The assessment concludes with the following lessons and recommendations within the context of these challenges:

Lesson 1: Engagement and collaboration contribute to outcome realization.

Some research participants described that they felt more like research objects rather than partners, did not fully benefit from their involvement in the research process, and in some cases were not apprised of the results. It was suggested that co-designing and co-developing projects in partnership with the government could rectify this issue. Respondents' perceptions of extractive practices partly resulted from poor communication, inequitable collaboration structures, and inconsistent inclusion of participants. These factors affected relationship-building opportunities and progress toward outcomes. When these elements of project design and implementation were present and done well, respondents could more easily draw connections to the portfolio's influence. When communication, collaboration, and inclusion were perceived lacking in a project, these elements were criticized. Active engagement in advocacy circles, organizational association with actors in conflict with the Indonesian government, or being perceived to support campaigns critiquing the government all pose risks to reputation and ability to influence policy. While supporting or collaborating with coalitions of allies are ideal to realize collective goals, it may not be possible for CIFOR to do so openly. According to respondents, NGOs typically take a critical stance regarding Indonesia's oil palm sector (e.g., the government's hesitation to reconcile development objectives with environmental conservation), and are perceived to promote foreign interests and campaigns to attack the economy (Gov17, Gov20, Gov21, Res2). Sporadic and opportunistic engagement strategies with research participants and target audiences lack the ability for sustained partnerships and relationships to continue progress toward intended changes and respond to changing circumstances.

> *Recommendation 1: When possible, projects should be designed to engage target audiences, participants, and partners appropriately in project design, or early on in project implementation, to facilitate a spirit of collaboration, partnership, and ensure mutual benefits.* Recognizing the opportunity to benefit target audiences and participants in the research process will enhance the likelihood of corresponding social process contributions that facilitate knowledge uptake. This will also help strike an appropriate balance between research and development objectives, as synergies can be identified.

Lesson 2: Multiple channels of communication that are tailored for relevance and accessible to intended audiences help realize policy outcomes.

While awareness of project findings could be traced back to meetings, in many cases, respondents could not recall the specific information being presented. Publications were perceived relevant and useful for gaining a comprehensive overview or understanding of the sector, but did not contribute to tangible policy recommendations or outcomes. More efforts should be made to translate research for uptake. This lesson also further indicates the importance of strategic relationship development, inclusion, and collaboration in R4D to help build relevance: "*when you want to have a policy impact, it's not just writing the brief, it's undertaking a partnership*" (IGO2).

> *Recommendation 2: Researchers should tailor communications to purpose and intended utility.* Research communications should be timely and responsive to other system processes, and are more effective at sharing knowledge when outputs are tailored to and translated for the needs of the target audience.

Lesson 3: Capacity-building supports research uptake across pathways.

In some cases, target audiences lack the skills to use and apply research outputs (e.g., data, theory, analyses). Providing training to government, research participants, partners, and graduate students is a critical social process contribution that supports research uptake. These types of engagement can also demonstrate how research can provide knowledge that is useful to governments, participants, boundary partners, and other actors, and show these groups how they can utilize that knowledge to support their own activities and objectives. Offers to support capacity-building can strengthen

partner relationships (i.e., foster trust, reciprocity, collaborative interest) and help address some systemic barriers that currently prevent uptake and use of research outputs.

> ***Recommendation 3: Opportunities for capacity-building in research participants, partners, and target audiences should be considered and integrated in project design and implementation.*** Capacity-building activities should be strategic (i.e., with existing partners, fill existing capacity gaps, be demand-driven) and not one-off events. Appropriate time and resources should be allocated for these activities.

Lesson 4: Research planning should deliberately focus on solution development and implementation support.

Target audiences of the portfolio generally appreciated the value of research to identify and analyze problems in the sector. However, there is a demand for greater emphasis and support for research to play a role in the development and implementation of solutions. Often researchers and/or funders guide what research problems will be addressed, and there is scope for greater involvement of target audiences in problem identification in order for research to address the most pressing knowledge gaps or problems.

> ***Recommendation 4: Projects should prioritize opportunities to address knowledge gaps or problems deemed important by stakeholders.*** Problem identification can be done collaboratively with multiple stakeholders. Funders can support these processes by allowing flexibility in project proposals and allocating resources to undertake problem co-identification and co-design activities. ***Boundary partners should be identified based on their ability to use research solutions to support progress to intended outcomes.*** Researchers should be more strategic in partner selection, looking for partners who will support engagement processes, solution testing and pilots, implementation, and the socialization and sharing of outputs.

Lesson 5: Projects/programs use Theory of Change inconsistently, and connections between projects are not always coherent.

ToC is not always employed consistently across research projects on the same topic to reach its full potential as a tool for planning, monitoring, and evaluation. OPAL's ToC functioned as a living document, supporting the identification and integration of new engagement opportunities. While GOLS invested time to develop an explicit ToC model, it remained static and was not fully leveraged as a tool for adaptive project management to re-think strategy when IPOP collapsed. The underleveraging of ToC led to missed opportunities across the portfolio to adapt to dynamic circumstances that could bring opportunities for more influence and more coordinated research efforts, which could help rectify some of the shortcomings in communication, stakeholder inclusion, and collaboration. Improved documentation of intended project ToCs and leveraging data management tools to support a ToC's continuous utility would help facilitate the adaptive management necessary to enhance strategic alignment with broader objectives and intentions of CIFOR and FTA.

> ***Recommendation 5: Researchers and program managers should fully utilize ToC as a core element of project planning and adaptive management. Research activities should be planned around intended outcomes, and ToC should remain a living tool to monitor progress and support adaptive management.*** It may be worthwhile reviewing ToCs that correspond to the same research topic and/or in the same geographical regions to ensure coherence and integration when designing and implementing research efforts to levereage pre-existing relationships and support further progress on outcomes realized to date.

Lesson 6: Clarity in research focus and connection to a relevant social problem are paramount.

The value of independence, objectivity, and credibility that CIFOR and its partners bring to the oil palm debate was widely noted by respondents. As a research organization, CIFOR should ensure that projects clearly explain the purpose of the research, the problem to be addressed, the questions to answer, the objectives to be achieved, and methods. Research questions were not always developed, and should serve as a basis for preliminary engagements

with intended audiences to scope relevance and solicit input to refine questions that will benefit both science and society. Projects that offer collective problem-framing to determine stakeholder needs, gaps, and entry points can increase the relevance and applicability of outputs produced.

> ***Recommendation 6: Research problems, questions, objectives, and methods should be clear for all projects.*** It is critically important to articulate the connection between the research focus with specific problems experienced by specific actors in the problem context. Researchers should ensure that these aspects are well described and documented in project proposals to help focus and guide the research process.

Lesson 7: There is scope for improved coordination and synergy across related projects to increase the potential for impact.

While all projects in the portfolio engaged in topics related to the oil palm sector in Indonesia, they investigated diverse aspects of sustainability and inclusion, indicating an overall lack of coordination and linkages between projects. An exception to this is the connection between the EK and OPAL projects, which both conducted work in East Kalimantan, which built on existing relationships and followed up on previous engagements. The lack of coordination is part a result of differences in funding expectations. Different funding sources bring different research priorities and expectations, which pose challenges for cohesion among research projects working on similar topics, maintaining relevance locally, while also working internationally. There is scope to demonstrate to donors more promising avenues for return on investment. With improved documentation of project activities and influence, impact narratives would support a stronger evidence base for options and pathways through which research (i.e., their investment) can make the most difference.

> ***Recommendation 7: When possible, research should be coordinated and integrated by overlapping target audiences, geographies, and intended outcomes to maximize possible influence. Existing relationships should be considered and sustained to support effective implementation of new projects.*** More cohesive objectives and design for research conducted in the portfolio overall would have made synergies between projects more explicit, deliberate, and complementary for more targeted and comprehensive realization of outcomes. This will help identify opportunities to mobilize and collate existing knowledge to target audiences to support improvements in policy and practice, and support continuity in progress toward higher-level outcomes. The same data can be analyzed from diverse angles to elicit new lessons, and sometimes it may not be necessary to invest time and resources to collect primary data. Being mindful of the demands for information among target audiences, as well as existing availability of information and capacity in-house to identify gaps, will support targeted research efforts and more efficient project management.

Lesson 8: Reliance on individual champions (as opposed to institutional relationships/partnerships) leaves research uptake susceptible to turnover.

Debate and practice around sustainability in the Indonesian oil palm sector are characterized by many policy developments, institutional arrangements, and is a complex and crowded field to engage. There are many actors that contribute to and influence specific national and subnational policy changes for Indonesia's oil palm sector, either by participating in policy processes or producing policy-relevant research, such as national and international NGOs, national and international development organizations, private companies, farmers associations and CSOs, and local and international researchers, among others. Despite having clear implications for forestry, the oil palm sector is conceptualized under the jurisdiction of agriculture. Further complicating matters is that political authority over the oil palm sector does not lie with KHLK, but rather with Kementan and Kemenko, which means ability to influence policy change through partnership with KHLK is limited. The portfolio relied on engagements with individual champions within government institutions to influence policy, rendering the uptake of findings susceptible to personnel

turnover. The exception was the P3SEPKI partnership through GOLS, which contributed to P3SEPKI researchers' capacity-building for oil palm expertise within the KHLK.

> ***Recommendation 8: Organizations should consider developing institutional relationships and partnerships that support the institutional capacity and knowledge necessary to realize intended outcomes.*** CIFOR should look for opportunities to better leverage their existing relationship with the KHLK on oil palm and other issues, as well as look to develop formal institutional partnerships with other ministries.

Lesson 9: The lack of official endorsement hinders research uptake by governmental actors/agencies.

Use of portfolio data was hindered by the lack of official governmental endorsement, and was noted as a key barrier

for research uptake. Subnational governments' ability to implement policy needs support from national government, and vice versa. Indonesian oil palm sustainability initiatives are challenged by limited resources, competing interests, and power dynamics. Governments are selective in terms of the organizations with which they cooperate. Which ministries or divisions received funding in connection to CIFOR-governmental collaborations in the portfolio may explain the resentment of some government officials toward CIFOR, as they viewed their own department's work to be more relevant to oil palm issues in relation to others (Gov6, Gov18). Projects that pursue official cooperation processes at project inception (e.g., through an SPK) have a greater likelihood of facilitating collaborative engagements and supporting research uptake as official data. Co-development of projects with governments could ensure shared ownership over data.

> ***Recommendation 9: When the government is intended to benefit or use the research, it is important that researchers establish formal partnerships and foster processes to co-generate data to increase the likelihood of use.*** Co-developing projects and data with government agencies will help build the degree of ownership necessary to gain formal endorsement, as well as help optimize the possible utility of data and outputs generated by research.

Lesson 10: More research is needed on relevant topics to support solutions that help realize sustainability and equity in Indonesia's oil palm sector.

Respondents highlighted many areas for future research efforts that can support the sector's progress toward sustainability and equity. The following were identified as relevant entry points for future research initiatives: providing needs-based solutions for companies and independent smallholders to adopt sustainable practice (Gov15, Gov18, PS2, PS5), the impact on peat restoration on oil palm emissions and smallholders (NGO1), costs, benefits, and impacts of certification systems and other policies and how to implement them (IGO1, Gov2, Gov4, Gov15, Gov17, NGO3, NGO4), formalizing smallholders (PS3).

> ***Recommendation 10: Needs-based and demand-driven research should be considered when designing new research projects on the topic of oil palm in Indonesia.*** This can guide how CIFOR approaches its research in the future: either the research is demand-driven (i.e., co-identification of gaps), or gap identification is framed by system actors' existing needs, objectives, commitments, and priorities. While the list of topics suggested by respondents is by no means exhaustive, it signals some possible entry points for future research efforts to focus, building on and bringing in expertise and relationships from previous projects.

Appendix 1. Evidence Sources

Code	Class	Source	Reference	Date
Blog1	Blog post	CIFOR Forests News	Hubert, T. (2015, May 27). In Indonesia, corporate commitment to sustainable palm oil [Blog post]. Retrieved from https://forestsnews.cifor.org/28657/in-indonesia-corporate-commitment-to-sustainable-palm-oil?fnl=en	2015
Blog2	Blog post	CIFOR Forests News	Pacheco, P. (2016, January 7). Zero deforestation in Indonesia: Pledges, politics and palm oil [Blog post]. Retrieved from https://forestsnews.cifor.org/39085/zero-deforestation-in-indonesia-pledges-politics-and-palm-oil?fnl=en	2016
Blog3	Blog post	CIFOR Forests News	Ramsay, D. (2016, September 26). Delving into drivers of deforestation. Retrieved from https://forestsnews.cifor.org/43881/delving-into-drivers-of-deforestation?fnl=en	2016
Blog4	Blog post	CIFOR Forests News	Neslon, C., & Ramsay, D. (2017, February 15). For a better Borneo, new map reveals how much terrain has changed [Blog post]. Retrieved from https://forestsnews.cifor.org/48167/for-a-better-borneo-new-map-reveals-how-much-terrain-has-changed?fnl=en	2017
Blog5	Blog post	CIFOR Forests News	Croft-Cusworth, C. (2017, March 8). Event coverage: Voices of women in palm oil [Blog post]. Retrieved from https://forestsnews.cifor.org/48684/voices-of-women-in-palm-oil?fnl=en	2017
Blog6	Blog post	CIFOR Forests News	Gaveau, D., & Salim, M. A. (2017, November 23). New map helps track palm-oil supply chains in Borneo [Blog post]. Retrieved from https://forestsnews.cifor.org/52817/new-map-helps-track-palm-oil-supply-chains-in-borneo?fnl=	2017
Blog7	Blog post	CIFOR Forests News	Croft-Cusworth, C. (2017, November 30). Are 'No deforestation' commitments working? [Blog post]. Retrieved from https://forestsnews.cifor.org/52994/are-no-deforestation-commitments-working?fnl=	2017
Blog8	Blog post	CIFOR Forests News	Dayne, S. (2018, February 28). Oil palm landscapes: Playing for keeps [Blog post]. Retrieved from https://forestsnews.cifor.org/54802/oil-palm-landscapes-playing-keeps?fnl=en	2018
Blog9	Blog post	CIFOR Forests News	Wibowo, L. R., Hakim, I., Komarudin, H., & Ratna, D. (2018, November 20). Finding a recipe to reduce conflict in state forest areas [Blog post]. Retrieved from https://forestsnews.cifor.org/58715/finding-a-recipe-to-reduce-conflict-in-state-forest-areas?fnl=en	2018
Blog10	Blog post	CIFOR Forests News	Evans, M. (2019, September 2). New tool shows decline in oil-palm related deforestation in Borneo [Blog post]. Retrieved from https://forestsnews.cifor.org/61908/new-tool-shows-decline-in-oil-palm-related-deforestation-in-borneo?fnl=en	2019
Blog11	Blog post	ETHZ	Ghazoul, J. (2017, October 13). Banning palm oil blocks good practices [Blog post]. Retrieved from https://ethz.ch/en/news-and-events/eth-news/news/2017/10/banning-oil-palm-blocks-good-practices.html	2017
Blog12	Blog post	ETHZ	Hasanah, N., Chiribog-Arroyo, F., & Ponta, N. (2018, July 6). Wearing Borneo's Farmers Shoes Through Role-Playing Game [Blog post]. Retrieved from https://blogs.ethz.ch/ETHambassadors/2018/07/06/wearing-borneos-farmers-shoes-through-role-playing-game/	2018
Blog13	Blog post	Global Landscapes Forum	Susetyo, G. (2018, August 8). Q+A: CIFOR landscape games feature at Indonesia's Sustainable Districts Festival: Instructive role playing. Retrieved from https://news.globallandscapesforum.org/28704/qa-cifor-landscape-games-feature-at-indonesias-sustainable-districts-festival/	2018
Blog14	Blog post	Golden Agri Resources	Yeoh, M., & Teo, E. (2017, August 22). Gender equality in palm oil: Where are we at today?. Retrieved from https://goldenagri.com.sg/gender-equality-palm-oil-today/	2017

Blog15	Blog post	Integration and Implementation Insights	Garcia, C., Dray, A., & Waeber, P. (2017, April 11). Learning to tackle wicked problems through games [Blog post]. Retrieved from https://i2insights.org/2017/04/11/games-for-learning-complexity/	2017
Blog16	Blog post	OPAL Project	OPAL project presented to district officials in Kutai Kartanegara, East Kalimantan Province [Blog post]. (2015, July 9). Retrieved from http://www.opal-project.org/latest/-opal-project-presented-to-district-officials-in-kutai-kartanegara-east-kalimantan-province	2015
Blog17	Blog post	OPAL Project	New PhD in OPAL [Blog post]. (2015, August 25). Retrieved from http://www.opal-project.org/latest/new-phd-in-opal	2015
Blog18	Blog post	OPAL Project	Visit of Swiss State Secretary for Education, Research and Innovation to Indonesia [Blog post]. (2016, April 21). Retrieved from http://www.opal-project.org/latest/visit-of-swiss-state-secretary-for-education-research-and-innovation-to-indonesia	2016
Blog19	Blog post	OPAL Project	Companion modelling workshop in Indonesia [Blog post]. (2016, September 12). Retrieved from https://www.opal-project.org/commod-workshop-in-indonesia/	2016
Blog20	Blog post	OPAL Project	Site visit to Kurtai Kartanegara, East Kalimantan, Indonesia [Blog post]. (2016, September 22). Retrieved from https://www.opal-project.org/project-site-visit-to-kurtai-kartanegara-east-kalimantan-indonesia/	2016
Blog21	Blog post	OPAL Project	Activities in Indonesia (August - December 2017) [Blog post]. (n.d.). Retrieved from https://www.opal-project.org/activities-in-indonesia-august-december-2017/	n.d.
Blog22	Blog post	OPAL Project	Palm Oil Diplomacy at the Crossroads [Blog post]. (2018, May 24). Retrieved from https://www.opal-project.org/palm-oil-diplomacy-at-the-crossroads/	2018
Blog23	Blog post	EcoNusa	Hariandja, R. Y. (2018, November 14). Monitor Papua's Deforestation through the Papua Atlas [Blog post]. Retrieved from https://www.econusa.id/en/ecostory/monitor-papua-s-deforestation-through-the-papua-atlas	2018
Blog25	Blog post	The Gecko Project	The Gecko Project. (2020, June 25). The Consultant: Why did a palm oil conglomerate pay $22m to an unnamed 'expert' in Papua? [Blog post]. Retrieved from https://thegeckoproject.org/the-consultant-why-did-a-palm-oil-conglomerate-pay-22m-to-an-unnamed-expert-in-papua-edb486651342	2020
Doc1	Proposal	EK Project	CLUA Grant Application Proposal.	n.d.
Doc2	LOA	EK Project	Letter of Agreement (LoA) for Research Project entitled "Supporting transparent and inclusive formulation and implementation of PERDA on sustainable palm oil in East Kalimantan", CIFOR-UNMUL.	2016
Doc3	Final report	EK Project	Final Report: Center for International Forestry Research (CIFOR), grant G-1506-54974, reporting period: July 1, 2015 – March 31, 2017 [EK Project].	n.d.
Doc4	Proposal	GOLS Project	Governing Oil Palm Landscapes for Sustainability (GOLS) Theory of Change. Project Inception Workshop (19-23 October 2015).	2015
Doc5	Engagement strategy	GOLS Project	Governing Oil Palm Landscapes for Sustainability (GOLS) Draft Engagement Strategy.	2015
Doc6	Database statistics	GOLS Project	CIFOR. (n.d.) Oil Palm Mills Database, Forest Spatial Information Catalog.	n.d.
Doc7	Final report	GOLS Project	Governing Oil Palm Landscapes for Sustainability (GOLS) CIFOR Final Report: October 2015-September 2019.	2019
Doc8	Evaluation report	Lestari	Lestari, H. (2019, December). CIFOR-USAID Fellowship: A Formative Assessment. Final report produced for CIFOR [GOLS Project]. Retrieved from http://www.cifor.org/publications/pdf_files/Reports/CIFOR-USAID-Fellowship.pdf	2019
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Doc9b	ToC	OPAL Project	Theory of Change: OPAL INDONESIA (version 1).	n.d.
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Doc10	Newsletter	OPAL Project	OPAL Project. (July 2015). OPAL Newsletter Nr.1. Retrieved from https://www.opal-project.org/wp-content/uploads/2020/09/1_OPAL-Newsletter-July-2015_new-links.pdf	2015
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Doc14	Newsletter	OPAL Project	OPAL Project. (March 2017). OPAL Newsletter Nr.5. Retrieved from https://www.opal-project.org/wp-content/uploads/2020/09/5_OPAL-March-2017_new-links.pdf	2017
Doc15	Newsletter	OPAL Project	OPAL Project. (August 2017). OPAL Newsletter Nr.6. Retrieved from https://www.opal-project.org/wp-content/uploads/2020/09/OPAL-July-2017_new-links.pdf	2017
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Doc18	Newsletter	OPAL Project	OPAL Project. (October 2018). OPAL Newsletter Nr.9. Retrieved from https://www.opal-project.org/wp-content/uploads/2020/09/9_OPAL-October-2018_new-links.pdf	2018
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Doc20	Newsletter	OPAL Project	OPAL Project. (May 2020). OPAL Newsletter Nr.11. Retrieved from https://www.opal-project.org/wp-content/uploads/2020/09/11_OPAL-May-2020_new-links.pdf	2020
Doc21	Progress report	OPAL Project	Oil Palm Adaptive Landscapes (OPAL) – Indonesia, CIFOR – IPB Annual Report 1 (March 2015 – March 2016).	2016
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Doc23	Progress report	OPAL Project	Garcia-Ulloa, J., Hangartner, A., & Ghazoul, J. (2019, July 15). Oil Palm Adaptive Landscapes: Second progress report (June 2017 to May 2019).	2019
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Doc25	Output report	OPAL Project	Output data of grant 400440_177587: Oil Palm Adaptive Landscapes. Produced for SNSF.	n.d.
Doc26	Proposal	ERS Project	DFID KNOWFOR Costed Extension (2016-2017) [ERS Project].	n.d.
Doc27	Methodology	ERS Project	Elmhirst, R., Sijapati Basnett, B., & Siscawati, M. (2016, July). Impacts of Large-Scale Land Acquisitions on Local Women's Land and Forest Tenure Rights: Case Studies from Indonesia: Outline Research Protocol.	2016
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Doc29	Report feedback	ERS Project	Oxfam Novib. (April 2016). Comments to the report 'Engendering the RSPO standards for more gender equality and better performance on smallholder oil palm plantations'.	2016

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Doc31	Magazine	Horizons	Bieri, A. (September 2015). Playing the palm plantation game. *Horizons, No.106*. SNSF.	2015
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Doc50	Newsletter	UNDP	Indonesia Palm Oil Platform (InPOP) Newsletter, Issue 1 Year 15. (2015, June 16). Retrieved from https://www.id.undp.org/content/indonesia/en/home/library/environment_energy/indonesia-palm-oil-platform--inpop--newsletter--issue-01-year-15.html	2015
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Doc53	Infobrief	Tropenbos Indonesia	Purwanto, E., & Jelsma, I. (January 2020). Possibilities and challenges for developing a more inclusive and sustainable independent smallholder oil palm sector in Ketapang, Indonesia. Infobrief. Bogor, Indonesia: Tropenbos Indonesia. Retrieved from https://www.tropenbos-indonesia.org/resources/publications/possibilities+and+challenges+for+developing+a+more+inclusive+and+sustainable+independent+smallholder+oil+palm+sector+in+ketapang,+indonesia+	2020
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Doc59	Regional regulation	Government of Indonesia	PERDA No.7/2018 on sustainable plantation in Kalimantan Timur	2018
Doc60	Academic script	EK Project	Academic script for PERDA	
Doc61	Presidential instruction	Government of Indonesia	Inpres No.6/2019 on National Action Plan on Sustainable Palm Oil	2019
Doc62	Presidential regulation	Government of Indonesia	Perpres No.44/2020 on ISPO	2020
Doc63	Charter	Wilmar International	Wilmar International. (2019). Women's Charter. Retrieved from https://www.wilmar-international.com/docs/default-source/default-document-library/sustainability/policies/women's-charter.pdf	2019
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Doc70	National regulation	Government of Indonesia	Ministry of Agriculture (Kementan) Regulation No. 18/2016 PO replanting program	2016
Doc71	Press release	The Jakarta Post	Akhlas, A. W., & Ghaliya, G. (2020, February 12). Government sends omnibus bill on job creation to House [Press release]. Retrieved from https://www.thejakartapost.com/news/2020/02/12/government-sends-omnibus-bill-on-job-creation-to-house.html	2020
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Doc75	Report	Cargill	Cargill. (n.d.). Corporate Responsibility and Sustainable Development 2017-2018. Retrieved from https://www.cargill.co.id/en/doc/1432126152940/indonesia-cr-report-english.pdf	n.d.
Doc76	Press release	Mongabay	Jong, H. N. (2019, August 25). 81% of Indonesia's oil palm plantations flouting regulations, audit finds. Retrieved from https://news.mongabay.com/2019/08/81-of-indonesias-oil-palm-plantations-flouting-regulations-audit-finds/	2019
Gov1	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov2	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov3	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov4	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov5	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov6	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov7	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov8	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov9	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov10	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov11	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov12	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov13	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov14	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov15	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov16	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov17	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov18	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov19	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov20	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov21	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
Gov22	Interview	Government respondent	Unpublished case study interview transcript.	n.d.
IGO1	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO2	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO3	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO4	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO5	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO6	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
IGO7	Interview	IGO respondent	Unpublished case study interview transcript.	n.d.
PS1	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.

PS2	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.
PS3	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.3
PS4	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.4
PS5	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.5
PS6	Interview	Private sector respondent	Unpublished case study interview transcript.	n.d.6
NGO1	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO2	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO3	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO4	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO5	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO6	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO7	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
NGO8	Interview	NGO respondent	Unpublished case study interview transcript.	n.d.
Res1	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.1
Res2	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.2
Res3	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.3
Res4	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.4
Res5	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res6	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res7	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res8	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res9	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res10	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res11	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res12	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res13	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res14	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res15	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res16	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res17	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res18	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res19	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res20	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res21	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res22	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res23	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res24	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.

Res25	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res26	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res27	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res28	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res29	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res30	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res31	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res32	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res33	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
Res34	Interview	Researcher respondent	Unpublished case study interview transcript.	n.d.
SWD	Discussion	Sense-making workshops	Unpublished sense-making workshop discussions with evaluation respondents.	2020
TR1	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR2	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR3	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR4	Trip report	CIFOR	Unpublished ERS trip report.	2017
TR5	Trip report	CIFOR	Unpublished ERS trip report.	2017
TR6	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR7	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR8	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR9	Trip report	CIFOR	Unpublished EK trip report.	2017
TR10	Trip report	CIFOR	Unpublished EK trip report.	2016
TR11	Trip report	CIFOR	Unpublished EK trip report.	2016
TR12	Trip report	CIFOR	Unpublished EK trip report.	2016
TR13	Trip report	CIFOR	Unpublished EK and GOLS trip report.	2016
TR14	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR15	Trip report	CIFOR	Unpublished OPAL trip report.	2016
TR16	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR17	Trip report	CIFOR	Unpublished OPAL trip report.	2016
TR18	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR19	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR20	Trip report	CIFOR	Unpublished OPAL trip report.	2019
TR21	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR22	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR23	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR24	Trip report	CIFOR	Unpublished ERS trip report.	2016
TR25	Trip report	CIFOR	Unpublished EK trip report.	2016
TR26	Trip report	CIFOR	Unpublished GOLS trip report.	2017

TR27	Trip report	CIFOR	Unpublished trip report.	2017
TR28	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR29	Trip report	CIFOR	Unpublished CCAFS and EK trip report.	2016
TR30	Trip report	CIFOR	Unpublished OPAL trip report.	2019
TR31	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR32	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR33	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR34	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR35	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR36	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR37	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR38	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR39	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR40	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR41	Trip report	CIFOR	Unpublished trip report.	2017
TR42	Trip report	CIFOR	Unpublished trip report.	2016
TR43	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR44	Trip report	CIFOR	Unpublished OPAL trip report.	2018
TR45	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR46	Trip report	CIFOR	Unpublished GOLS trip report.	2015
TR47	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR48	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR49	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR50	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR51	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR52	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR53	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR54	Trip report	CIFOR	Unpublished trip report.	2016
TR55	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR56	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR57	Trip report	CIFOR	Unpublished GOLS trip report.	2019
TR58	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR59	Trip report	CIFOR	Unpublished ERS trip report.	2016
TR60	Trip report	CIFOR	Unpublished CCAFS and EK trip report.	2016
TR61	Trip report	CIFOR	Unpublished EK and OPAL trip report.	2016
TR62	Trip report	CIFOR	Unpublished trip report.	2016

TR63	Trip report	CIFOR	Unpublished EK trip report.	2016
TR64	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR65	Trip report	CIFOR	Unpublished CCAFS trip report.	2015
TR66	Trip report	CIFOR	Unpublished GOLS trip report.	2018
TR67	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR68	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR69	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR70	Trip report	CIFOR	Unpublished OPAL trip report.	2017
TR71	Trip report	CIFOR	Unpublished OPAL trip report.	2019
TR72	Trip report	CIFOR	Unpublished OPAL trip report.	2017
TR73	Trip report	CIFOR	Unpublished OPAL trip report.	2017
TR74	Trip report	CIFOR	Unpublished OPAL trip report.	2016
TR75	Trip report	CIFOR	Unpublished GOLS trip report.	2016
TR76	Trip report	CIFOR	Unpublished GOLS trip report.	2017
TR77	Trip report	CIFOR	Unpublished GOLS trip report.	2016
Vid1	Video	CIFOR	CIFOR. (2017, March 2). Gender and palm oil: Science in the field [Video file]. Retrieved from https://youtu.be/8STZ5NKQchU	2017
Vid2	Video	CIFOR	CIFOR. (2018, March 12). Playing for keeps: How a simple board game could lead to more sustainable oil palm [Video file]. Retrieved from https://www.youtube.com/watch?time_continue=1&v=s3Oy6zOOhYE	2018
Vid3	Video	TEDx Talks	TEDx Talks. (2019, April 3). Wicked games: using games to resolve environmental conflicts	Claude Garcia	TEDxZurich [Video file]. Retrieved from https://www.youtube.com/watch?v=v362bMWL0Yw	2019
Vid4	Video	OPAL Project	OPAL Project. (2019, August 13). The Future of Sustainable Oil Palm Plantations in Indonesia [Video file]. Retrieved from https://www.youtube.com/watch?v=bqIyCwdVNKA	2019
Vid5	Video	OPAL Project	OPAL Project. (2019, October 18). Playing the ISPO certification game [Video file]. Retrieved from https://www.youtube.com/watch?v=uHK7sF2GlQY&feature=youtu.be	2019
Vid6	Video	Our Changing Climate	Our Changing Climate. (2019, July 5). The real problem with Palm Oil [Video file]. Retrieved from https://www.youtube.com/watch?v=TNbZMJoMn6Q	2019
Web1	Website	OPAL Project	OPAL in Indonesia [Website] (n.d.). Retrieved from http://www.opal-project.org/latest/category/opal-indonesia	n.d.
Web2	Website	FoKSBI	FoKSBI. (n.d.). National Action Plan on Sustainable Palm Oil (RANKSB) [Website]. Retrieved from http://www.foksbi.id/en/activities	n.d.
Web3	Website	RSPO	RSPO. (n.d.). Human Rights & Social Standards [Website]. Retrieved from https://www.rspo.org/human-rights-and-social-standards	n.d.
Web4	Website	UNEP WCMC	WCMC. (n.d.). UKRI GCRF Trade, Development and the Environment Hub [Website]. Retrieved from https://www.unep-wcmc.org/featured-projects/trade/	n.d.
Web5	Website	CCAFS	CCAFS. (n.d.). Reducing emissions from oil palm development in East Kalimantan, Indonesia [Website]. Retrieved from https://ccafs.cgiar.org/reducing-emissions-oil-palm-development-east-kalimantan-indonesia#.XvEX_TpKiUk	n.d.

Web6	Website	Wilmar International	Wilmar International. (n.d.). Sustainability [Website]. Retrieved from https://www.wilmar-international.com/sustainability	n.d.
Web7	Website	Golden Agri Resources	Golden Agri Resources. (n.d.). Sustainability [Website]. Retrieved from https://goldenagri.com.sg/sustainability/	n.d.
Web8	Website	Musim Mas	Musim Mas. (n.d.). Sustainability [Website]. Retrieved from https://www.musimmas.com/sustainability/	n.d.
Web9	Website	Cargill	Cargill. (n.d.). Sustainability [Website]. Retrieved from https://www.cargill.co.id/en/sustainability	n.d.
Web10	Website	Asian Agri	Asian Agri. (n.d.). Sustainability [Website]. Retrieved from https://www.asianagri.com/en/sustainability-dashboard	n.d.
Web11	Website	West Papua Food Crops, Horticulture and Plantation Service	West Papua Food Crops, Horticulture, and Plantation Service [Website]. (n.d.). Retrieved from https://bunpapuabarat.com/	n.d.
	Technical report	Elmhirst et al. (2017)	Elmhirst, R., Sijapati Basnett, B., Siscawati, M., & Ekowati, D. (2017). Gender Issues in Large-scale Land Acquisition: Insights from Oil Palm in Indonesia. Washington, D.C.: Rights and Resources Initiative (RRI). Retrieved from www.cifor.org/library/6774	2017
	Peer-reviewed article	Gaveau et al. (2016)	Gaveau, D.L.A., Sheil, D., Husnayaen, Salim, M.A., Arjasakusuma, S., Ancrenaz, M., Pacheco, P., & Meijaard, E. (2016). Rapid conversions and avoided deforestation: Examining four decades of industrial plantation expansion in Borneo. *Scientific Reports, 6*: 32017. http://dx.doi.org/10.1038/srep32017	2016
	Peer-reviewed article	Gaveau et al. (2018)	Gaveau, D. L. A., Locatelli, B., Salim, M. A., Yaen, H., Pacheco, P., & Sheil, D. (2018). Rise and fall of forest loss and industrial plantations in Borneo (2000-2017). *Conservation Letters, 12*(3): e12622. https://doi.org/10.1111/conl.12622	2018
	Peer-reviewed article	Hasanah et al. (2019b)	Hasanah, N., Komarudin H., Dray, A., & Ghazoul, J. (2019b). Beyond oil palm: Perceptions of local communities of environmental change. *Frontiers in Forests and Global Change*. https://doi.org/10.3389/ffgc.2019.00041	2019
	Working paper	Jelsma & Schoneveld (2016)	Jelsma, I., & Schoneveld, G. C. (2016). Towards more sustainable and productive independent oil palm smallholders in Indonesia: Insights from the development of a smallholder typology. CIFOR Working Paper No. 210. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006222	2016
	Peer-reviewed article	Jelsma et al. (2017)	Jelsma, I., Schoneveld, G.C., Zoomers, A., & van Westen, A. C. M. (2017). Unpacking Indonesia's independent oil palm smallholders. An actor-disaggregated approach to identifying environmental and social performance challenges. *Land Use Policy, 69*: 281-297. http://dx.doi.org/10.1016/j.landusepol.2017.08.012	2017
	Peer-reviewed article	Jelsma et al. (2019)	Jelsma, I., Woittiez, L. S., Ollivier, J., & Dharmawan, A. H. (2019). Do wealthy farmers implement better agricultural practices? An assessment of implementation of Good Agricultural Practices among different types of independent oil palm smallholders in Riau, Indonesia. *Agricultural Systems, 170*: 63-76. https://doi.org/10.1016/j.agsy.2018.11.004	2019
	Occasional paper	Li (2015)	Li, T, M. (2015). Social impacts of oil palm in Indonesia: A gendered perspective from West Kalimantan. CIFOR Occasional Paper No. 124. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/005579	2015
	Infobrief	Li (2018)	Li, T, M. (2018). Evidence-based options for advancing social equity in Indonesian palm oil: Implications for research, policy and advocacy. CIFOR Infobrief No. 208. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006842	2015

	Working paper	Luttrell et al. (2018a)	Luttrell, C., Komarudin, H., Zrust, M., Pacheco, P., Limberg, G., Nurfatriani, F., Wibowo, L.R., Hakim, I., & Pirard, R. (2018a). Implementing sustainability commitments for palm oil in Indonesia. Governance arrangements of sustainability initiatives involving public and private actors. CIFOR Working Paper No. 241. Bogor, Indonesia: Center for International Forestry Research. http://dx.doi.org/10.17528/cifor/006884	2018
	Infobrief	Luttrell et al. (2018b)	Luttrell, C., Komarudin, H., Zrust, M., Pacheco, P., Limberg, G., Nurfatriani, F., Wibowo, L. R., Hakim, I., & Pirard, R. (2018b). The governance arrangements of sustainable oil palm initiatives in Indonesia: Multilevel interactions between public and private actors. CIFOR Infobrief No. 218. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006901	2018
	Working paper	Nurfatriani et al. (2018)	Nurfatriani, F., Ramawati, Sari, G. K., & Komarudin H. (2018). Optimalisasi dana sawit dan pengaturan instrumen fiskal penggunaan lahan hutan untuk perkebunan dalam upaya mengurangi deforestasi. CIFOR Working Paper No. 238. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006882	2018
	Peer-reviewed article	Nurfatriani et al. (2019)	Nurfatriani, F., Ramawati, Sari, G. K., & Komarudin H. (2019). Optimization of Crude Palm Oil Fund to Support Smallholder Oil Palm Replanting in Reducing Deforestation in Indonesia. *Sustainability, 11*(18): 4914. https://doi.org/10.3390/su11184914	2019
	Peer-reviewed article	Pacheco et al. (2018)	Pacheco, P., Schoneveld, G.C., Dermawan, A., Komarudin, H., & Djama, M. (2018). Governing sustainable palm oil supply: Disconnects, complementarities, and antagonisms between state regulations and private standards. *Regulation & Governance*. https://doi.org/10.1111/rego.12220	2018
	Peer-reviewed article	Purnomo et al. (2020)	Purnomo, H., Okarda, B., Dermawan, A., Ilham, Q. P., Pacheco, P., Nurfatriani, F., & Suhendang, E. (2020). Reconciling oil palm economic development and environmental conservation in Indonesia: A value chain dynamic approach. *Forest Policy and Economics, 111*: 102089. https://doi.org/10.1016/j.forpol.2020.102089	2020
	Infobrief	Schoneveld et al. (2017)	Schoneveld, G. C., Jelsma, I., Komarudin, H., Andrianto, A., Okarda, B., & Ekowati, D. (2017). Public and private sustainability standards in the oil palm sector: Compliance barriers facing Indonesia's independent oil palm smallholders. CIFOR Infobrief No. 182. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006556	2017
	Peer-reviewed article	Schoneveld et al. (2019b)	Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019b). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change, 57*: 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933	2019
	Infobrief	Sharma et al. (2017)	Sharma, S. K., Baral, H., Pacheco, P., & Laumonier, Y. (2017). Assessing impacts on ecosystem services under various plausible oil palm expansion scenarios in Central Kalimantan, Indonesia. CIFOR Infobrief No. 176. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006479	2017
	Occasional paper	Sharma et al. (2018a)	Sharma, S. K., Baral, H., Laumonier, Y., Okarda, B., Komarudin, H., Purnomo, H., & Pacheco, P. (2018). An analysis of multiple ecosystem services under future oil palm expansion scenarios in Central and West Kalimantan, Indonesia. CIFOR Occasional Paper No. 187. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/006953	2018
	Poster	Sharma et al. (2018b)	Sharma, S. K., Baral, H., Laumonier, Y., Okarda, B., Komarudin, H., Purnomo, H., & Pacheco, P. (2018). Oil palm and ecosystem services under different landscape management scenarios. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://www.cifor.org/knowledge/publication/6992/	2018

	Peer-reviewed article	Sharma et al. (2019)	Sharma, S. K., Baral, H., Laumonier, Y., Okarda, B., Purnomo, H., & Pacheco, P. (2019). Ecosystem services under future oil palm expansion scenarios in West Kalimantan, Indonesia. *Ecosystem Services, 39*: 100978. https://doi.org/10.1016/j.ecoser.2019.100978	2019
	Infobrief	Sijapati Basnett et al. (2016)	Sijapati Basnett, B., Gnych, S., & Anandi, C. A. M. (2016). Transforming the Roundtable on Sustainable Palm Oil for greater gender equality and women's empowerment. CIFOR Infobrief No. 166. Bogor, Indonesia: Center for International Forestry Research. Retrieved from https://doi.org/10.17528/cifor/006383	2016
	Working paper	Wibowo et al. (2019)	Wibowo, L.R., Hakim, I., Komarudin, H., Kurniasari, D.R., Wicaksono, D., & Okarda, B. (2019). Penyelesaian tenurial perkebunan kelapa sawit di kawasan hutan untuk kepastian investasi dan keadilan. CIFOR Working Paper No. 247. Bogor, Indonesia: Center for International Forestry Research. Retrieved from http://dx.doi.org/10.17528/cifor/007337	2019
	Peer-reviewed article	Yulian et al. (2017)	Yulian, B.E., Dharmawan, A.H., Soetarto, E., & Pacheco, P. (2017). Livelihood dilemma of the rural household around the oil palm plantation in East Kalimantan. *Sodality: Jurnal Sosiologi Pedesaan, 5*(3): 242-249. http://dx.doi.org/10.22500/sodality.v5i3.19398	2017

Appendix 2. Relationship between the Composite and Individual Project ToCs

Table 7. List of aggregate and corresponding projects' disaggregate outcomes

Aggregate Outcome (Composite ToC)	Disaggregate Outcome (Project ToC)	Corresponding Project and Source
Government actors learn from OP research processes and findings		EK
	Key government agencies and sustainability initiatives (e.g. ISPO) and private sector platforms (e.g. IPOP) and stakeholders in Indonesia are equipped with knowledge on governance options and socio-environmental trade-offs related to various sustainability commitments	GOLS [short-term outcome] (Doc4)
	Local gov't agencies (district, provincial) understand the consequences of OP expansion on landscape and people	OPAL [indicator] (Doc9b)
	Results are communicated in a tailored way to strategic target audience	OPAL [intermediate outcome] (Doc9c)
	Modelling teams and game players have new knowledge, perceptions, networks, and changed power relationships	OPAL [intermediate outcome] (Doc9c)
	Participatory modelling approach is better known in decision-making process	OPAL [intermediate outcome] (Doc9c)
		ERS
Government actors build their capacities and relationships within the OP sector		EK
	Stakeholders in West and Central Kalimantan provinces in Indonesia have increased capacities to implement, monitor and improve initiatives for sustainable oil palm development	GOLS [short-term outcome] (Doc4)
	Modelling teams and game players have new knowledge, perceptions, networks, and changed power relationships	OPAL [intermediate outcome] (Doc9c)
	Stakeholders/partners have the tools to make better evidence-driven decisions	OPAL [intermediate outcome] (Doc9c)
		ERS
Government actors engage CIFOR & partners to help make informed decisions on OP	All stakeholders agree to support a consultative process for the design and implementation of PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
		GOLS
		OPAL
		ERS
Policy-makers create new or adapt existing policy on oil palm (informed by research)	All stakeholders agree to support a consultative process for the design and implementation of PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
	Inputs from various stakeholders are incorporated in the academic paper which is the basis for PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
	Stakeholders in West and Central Kalimantan provinces in Indonesia have increased capacities to implement, monitor and improve initiatives for sustainable oil palm development	GOLS [short-term outcome] (Doc4)
	Decision-making processes on land use permit, land allocation, and sustainable management for smallholders (mainly at the sub-national level) are informed by OPAL evidence & methodology	OPAL [EoP outcome] (Doc9b)
	Participatory modelling approach is better known in decision-making process	OPAL [intermediate outcome] (Doc9c)
	Stakeholders/partners have the tools to make better evidence-driven decisions	OPAL [intermediate outcome] (Doc9c)
	We have a network of engaged stakeholders that are taking up and championing our work	OPAL [intermediate outcome] (Doc9c)
	Decision making processes are informed/influenced by our evidence and methodology	OPAL [EoP outcome] (Doc9c)
	Provincial government in the target countries refer to our scenarios in their decision process	OPAL [broader goal] (Doc9b)

		ERS
Smallholders and women have improved representation in policy-making around oil palm	Improved power distribution and engagement	OPAL [broader goal] (Doc9b)
		ERS
The OP sector (governments, private sector, NGOs, smallholders, CIFOR) develops more effective working arrangements	All stakeholders agree to support a consultative process for the design and implementation of PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
	Increased coordination between government and private sector to align the different sustainability commitments in Indonesia	GOLS [long-term outcome] (Doc4)
	Increased attention for alternative governance arrangements that work for sustainable commodity supply and biodiversity conservation	GOLS [long-term outcome] (Doc4)
	Stakeholders are communicating & working together more effectively (Private sector, local (district, province) government, smallholders, NGO, media)	OPAL [indicator] (Doc9b)
	Stakeholders in target countries are communicating and working together more effectively	OPAL [EoP outcome] (Doc9c)
	Improved power distribution and engagement	OPAL [broader goal] (Doc9b)
	Workable and viable platforms implementing better oil palm (landscape) management practices	OPAL [broader goal] (Doc9b)
		ERS
Policy-makers recognize and reflect environmental sustainability and social inclusion in all OP-related policy		EK
	Increased consideration of social and environmental trade-offs in planning and implementing oil palm development in Indonesia	GOLS [long-term outcome] (Doc4)
	Sustainability is part of the discourse across the supply chain	OPAL [broader goal] (Doc9b)
	Financial investment (external, public, private) in place	OPAL [broader goal] (Doc9b)
		ERS
Project partnerships facilitate mutual learning on OP		EK
	Key government agencies and sustainability initiatives (e.g. ISPO) and private sector platforms (e.g. IPOP) and stakeholders in Indonesia are equipped with knowledge on governance options and socio-environmental trade-offs related to various sustainability commitments	GOLS [short-term outcome] (Doc4)
	USAID's LESTARI and SOROT Program implementers have access to tools and approaches that help analyze landscape impacts of planning decisions and help identify priority areas for biodiversity conservation	GOLS [short-term outcome] (Doc4)
	Results are communicated in a tailored way to strategic target audience	OPAL [intermediate outcome] (Doc9c)
	NGO and research partners appreciate the utility of Companion Model as ancillary tool for influencing stakeholder behaviour	OPAL [indicator] (Doc9b)
	Modelling teams and game players have new knowledge, perceptions, networks, and changed power relationships	OPAL [intermediate outcome] (Doc9c)
	We have a network of engaged stakeholders that are taking up and championing our work	OPAL [intermediate outcome] (Doc9c)
		ERS
Project partners & allies advocate for & pursue OP issues (using research)	Key partners agree to engage and develop a common vision for transparent and inclusive process for sustainable palm oil legislations	EK [objective indicator] (Doc1)
	All stakeholders agree to support a consultative process for the design and implementation of PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
	Inputs from various stakeholders are incorporated in the academic paper which is the basis for PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
		GOLS

	Media present a more balanced picture of OP expansion	OPAL [indicator] (Doc9b)
	Intermediary groups are connecting OPAL to decision makers	OPAL [intermediate outcome] (Doc9c)
		ERS
Partner organizations use project research to inform planning decisions and project development	Key partners agree to engage and develop a common vision for transparent and inclusive process for sustainable palm oil legislations	EK [objective indicator] (Doc1)
	Stakeholders in West and Central Kalimantan provinces in Indonesia have increased capacities to implement, monitor and improve initiatives for sustainable oil palm development	GOLS [short-term outcome] (Doc4)
	USAID's LESTARI and SOROT Program implementers have access to tools and approaches that help analyze landscape impacts of planning decisions and help identify priority areas for biodiversity conservation	GOLS [short-term outcome] (Doc4)
	Increased consideration of social and environmental trade-offs in planning and implementing oil palm development in Indonesia	GOLS [long-term outcome] (Doc4)
	NGO and research partners appreciate the utility of Companion Model as ancillary tool for influencing stakeholder behaviour	OPAL [indicator] (Doc9b)
	Stakeholders/partners have the tools to make better evidence-driven decisions	OPAL [intermediate outcome] (Doc9c)
	Decision making processes are informed/influenced by our evidence and methodology	OPAL [EoP outcome] (Doc9c)
	Financial investment (external, public, private) in place	OPAL [broader goal] (Doc9b)
	Workable and viable platforms implementing better oil palm (landscape) management practices	OPAL [broader goal] (Doc9b)
		ERS
Private sector actors learn from OP research		EK
	Key government agencies and sustainability initiatives (e.g. ISPO) and private sector platforms (e.g. IPOP) and stakeholders in Indonesia are equipped with knowledge on governance options and socio-environmental trade-offs related to various sustainability commitments	GOLS [short-term outcome] (Doc4)
	Stakeholders involved globally in sustainable land use and deforestation-free supply chain processes are informed on governance options for more effective implementation of sustainability commitments based on public and private actors' experience in Indonesia	GOLS [short-term outcome] (Doc4)
	Producer associations understand consequences of OP expansion on landscape and people	OPAL [indicator] (Doc9b)
	Results are communicated in a tailored way to strategic target audience	OPAL [intermediate outcome] (Doc9c)
	Modelling teams and game players have new knowledge, perceptions, networks, and changed power relationships	OPAL [intermediate outcome] (Doc9c)
	We have a network of engaged stakeholders that are taking up and championing our work	OPAL [intermediate outcome] (Doc9c)
		ERS
Private sector responds to (research-informed) policy change	All stakeholders agree to support a consultative process for the design and implementation of PERDA on sustainable palm oil	EK [objective indicator] (Doc1)
	Stakeholders involved globally in sustainable land use and deforestation-free supply chain processes are informed on governance options for more effective implementation of sustainability commitments based on public and private actors' experience in Indonesia	GOLS [short-term outcome] (Doc4)
	Increased consideration of social and environmental trade-offs in planning and implementing oil palm development in Indonesia	GOLS [long-term outcome] (Doc4)

	Stakeholders/partners have the tools to make better evidence-driven decisions	OPAL [intermediate outcome] (Doc9c)
	Decision making processes are informed/influenced by our evidence and methodology	OPAL [EoP outcome] (Doc9c)
		ERS
Private sector adopts more sustainable and inclusive business models	Stakeholders involved globally in sustainable land use and deforestation-free supply chain processes are informed on governance options for more effective implementation of sustainability commitments based on public and private actors' experience in Indonesia	GOLS [short-term outcome] (Doc4)
	Stakeholders in West and Central Kalimantan provinces in Indonesia have increased capacities to implement, monitor and improve initiatives for sustainable oil palm development	GOLS [short-term outcome] (Doc4)
	Increased consideration of social and environmental trade-offs in planning and implementing oil palm development in Indonesia	GOLS [long-term outcome] (Doc4)
	Options that deliver sustainability commitments with social inclusion of the poor are widely considered in corporate planning	GOLS [long-term outcome] (Doc4)
	Sustainability is part of the discourse across the supply chain	OPAL [broader goal] (Doc9b)
	Consumers and consumer goods companies are committed to sustainable supply	OPAL [broader goal] (Doc9b)
	Oil palm producers have adopted and comply with sustainable production initiatives	OPAL [broader goal] (Doc9b)
	Financial investment (external, public, private) in place	OPAL [broader goal] (Doc9b)
		ERS
Smallholders and women have improved oil palm market access and share of benefits	Options that deliver sustainability commitments with social inclusion of the poor are widely considered in corporate planning	GOLS [long-term outcome] (Doc4)
	Improved power distribution and engagement	OPAL [broader goal] (Doc9b)
	Improved social capital in oil palm landscapes	OPAL [broader goal] (Doc9b)
	Viable smallholder sector	OPAL [broader goal] (Doc9b)
		ERS
CIFOR & partners are recognized for expertise in OP research		EK
		GOLS
		OPAL
		ERS
Researchers use projects' findings and methods		EK
		GOLS
	Research leverages greater investment in oil palm scientific research	OPAL [intermediate outcome] (Doc9c)
	Enhanced understanding of system (natural and social components, stocks and dynamics) in target countries	OPAL [intermediate outcome] (Doc9c)
	Wider science community has access to new information and analyses	OPAL [EoP outcome] (Doc9c)
		ERS
Researchers pursue new questions on oil palm		EK
		GOLS
	Research leverages greater investment in oil palm scientific research	OPAL [intermediate outcome] (Doc9c)

	Enhanced understanding of system (natural and social components, stocks and dynamics) in target countries	OPAL [intermediate outcome] (Doc9c)
		ERS
Graduate students build their research capacities		GOLS
	We have developed capacity through successful PhD students and post-docs	OPAL [intermediate outcome] (Doc9c)
Graduate students continue careers in oil palm research to build on knowledge base		GOLS
		OPAL
The research agenda on OP advances toward sustainability and inclusion		EK
	Increased consideration of social and environmental trade-offs in planning and implementing oil palm development in Indonesia	GOLS [long-term outcome] (Doc4)
	Options that deliver sustainability commitments with social inclusion of the poor are widely considered in corporate planning	GOLS [long-term outcome] (Doc4)
	Universities reconcile different perceptions on OP expansion	OPAL [indicator] (Doc9b)
	Wider science community has access to new information and analyses	OPAL [EoP outcome] (Doc9c)
	Sustainability is part of the discourse across the supply chain	OPAL [broader goal] (Doc9b)
		ERS
Accumulation of scholarship on OP influences organizational practice		EK
	Options that deliver sustainability commitments with social inclusion of the poor are widely considered in corporate planning	GOLS [long-term outcome] (Doc4)
		OPAL
		ERS
Negative social and environmental impacts of oil palm production are reduced		EK
		GOLS
	Oil palm is sustainably produced across the tropics	OPAL [broader goal] (Doc9b)
		ERS

Appendix 3. Semi-structured Interview Guide

A) General questions about the respondent, their expertise on the topic, & recent/significant changes in topic (purpose to build rapport & clarify the context)

Main Question	Probes	Intent: What we are trying to find out **Do NOT ask these directly.**
1. What is your role within [organization]?	• How is your work related to [topic]? • How long have you been doing this kind of work?	*Understanding the respondent's job/organization and the relevance of the topic to their work.*
2. What role does [organization] play in [topic]?	• How long has your organization been involved in work related to [topic]?	Finding out the expertise of the respondent and their professional connection to the topic, as well as their influence on the topic of focus.
3. What are the main challenges related to [topic]?	• What is the reasoning for these challenges?	*Personal expertise & perceptions on the topic of focus.* Interviewee's knowledge level, understanding, and perceptions on the problems & issues relevant to the focus of the project – what do they think the problems are and how they frame the problems. QAF: Rel1, Rel2, Rel3, Rel5
4. What have been the most important developments related to [topic] in the last five years?	• In the discussions, events, ideas, institutions, policy, and/or practice?[10] • What are the implications of these developments? • Why do you think these are important?	*Understanding people's perceptions of the situation and identifying possible changes in policy & practice.* Getting an idea of the way in which the issues in question are perceived by interviewees, and get a range of various perspectives/understandings of the developments, causalities & people's values in relation to issues. QAF: Rel1, Rel2, Rel3
5. Who are the key players in the discussion, policy, or practice of [topic]?	• What role do government/academic/NGO /international/ private sector/communities play[11]? • In what ways have they (each) been influential?	*Understanding people's perceptions of who is who in changing policy & practice.* Getting an overview of who people consider as key actors in the process. This question will also provide insights about the power dynamics between the stakeholders (e.g., who's got power over whom). QAF: Rel1, Rel3
6. What information/knowledge has been the most influential in related to [topic]?	• Who is promoting the information/knowledge or event in question? • In your opinion, has the information [what they mentioned] influenced policy and practice? How? Probe for examples.	*Understanding what kind of knowledge is used in decision-making in general.* Getting a better picture of what kind of knowledge & other factors are influencing [topic], and from where the ideas are coming. More detailed information about possible changes in policy & practice because of new information/scientific knowledge. QAF: Rel1, Rel2, Rel3

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[10] All terminology should be adjusted & verbally explained so it is appropriate to each interviewee (please record any adaptations in the post-interview notes).

[11] It is not necessary to ask all questions to every respondent – the list merely illustrates what kind of information we are trying to find out.

B) Understanding links between knowledge sharing & decision-making processes (purpose to assess important sources of influence on policy & practice)

Main Question	Probes	Intent: What we are trying to find out **Do NOT ask these directly.**
7. When doing work related to [topic], where do you (or your organization) get the information you need to do your work?	• What kinds of information? • How does that information help guide decisions around what your organization does?	*Understanding what kind of knowledge is used in decision-making in general.* Getting a better picture of what kind of information is seen as important and/or used in decision-making (scientific or non-scientific). QAF: Rel6, PfU2
8. Do you use scientific information in your work in relation to [topic]?	• How has it influenced or contributed to your work? • Where did you get that information? (Any specific events, publication, meetings, etc.) • What are the main barriers to using scientific information?	*Understanding what the role of science is in decision-making.* Getting a better picture of the ways in which scientific knowledge is used by organisations, how they get the science they use, and what prevents them from basing their decision-making on scientific research findings. QAF: Rel6, PfU2, PfU6

9. Which factors are influence your (personal and/or organization) decision-making around issues related to [topic]?	• Political factors • Political factors
	• Individual or • Public opinion
	  organizational • Precedent in other
	  advocates jurisdictions
	• Scientific information/ • Global pressures/
	  research influences
	
	• Are there any additional factors?
		Understanding what other aspects influence decision-making.
		Understanding how people see decision-making situations, which aspects matter most in making changes in policy & practice, and how research findings matter in relation to other factors.

C) Determine respondent's awareness of and/or involvement in the principal investigator's project

Main Question	Probes	Intent: What we are trying to find out **Do NOT ask these directly.**
10. Have you heard about [researcher]'s research on [topic]? *if they do not recognize the principal investigator's name, prompt with details about the project	[to non-partners] • What do you know about the research project? • How did you hear about it? • How would you describe your interactions with the project or the principal investigator? (e.g., presentations, workshops, etc.) [to partners] • How did you get involved in the project? • What was your role in the project? • What was your contribution to the project? (e.g., meetings, provide information, connect people, make recommendations, etc.) • Do you think that your input was taken into account?	*Understanding awareness, role, & length of engagement with relevant actors and/or project partners.* Finding out respondent's awareness & opinions about the project. Finding out to what extent the degree & length of engagement in the project may be associated with changes in policy & practice. QAF: Rel3, Rel6, Cre7, Cre8, Leg1, Leg2, Leg3, Leg4, PfU2

| 11. How would you describe your participation/collaboration experience in the project? | • How would you characterize your opportunity to participate and engage in the research? (i.e., rigid/ restricted by student, open/facilitated by researcher/ participatory)
 • Do you have any suggestions regarding how engagement/participation could have been made more meaningful for you?
 • Do you think any key stakeholders were excluded from the research?
 • Any examples of positive experiences/what was done well? Any promising practices?
 • How could the participation/collaboration work even better in the future? | *Understanding personal experience and feedback.*

 Further details of the influence of the project on the personal level, possible additional aspects (re: knowledge translation).

 Potential for improvement.

 QAF: Leg2, Leg3 |

D) Research outcomes assessment (ask only if they are aware of the project) (purpose to determine extent of outcome achievement and research influence on knowledge or social process contributions around [topic])

Main Question	Probes	Intent: What we are trying to find out **Do NOT ask these directly.**
12. What contributions do you think [the principal investigator]'s project has made to [topic]?	• Changes in knowledge/understanding? • Changes in attitudes? • Changes in skills? • Changes in relationships? • Changes in behaviour? • At what level do these changes mostly occur? (i.e., organizational, individual, governmental, policy, practice) • When did these changes occur? (during, post-project) • What are the implications of these changes? • Were there any negative outcomes of this project? If yes, please describe. • Probe for specific outcomes the principal investigator thought the respondent could speak to. • What do you think the principal investigator did well to achieve these results? • How accessible did you find the results and communication during the process? • Do you think the research can be transferred to other contexts?	*Understanding the respondent's opinion about the contributions of the research.* Finding out the respondent's opinion on the student's research contributions (without leading to specific outcomes). Can give an indication of the utility of the research. Finding out how the student's research is/was perceived and conceptualized by interviewees to get an overall characterization of the change process. This will help us construct narratives about alternative and/or supplementary theories of change. Finding out about the explicit outcomes/impacts of the project in question **anywhere** (in the world) of which the respondent is aware, not just within their own work/organization. QAF: Rel6, Cre7, Cre8, Cre10, Leg3, PfU2, PfU3, PfU4, PfU5, PfU6, PfU7

Main Question	Probes	Intent: What we are trying to find out
13. Has the research contributed to or influenced your work on the topic?	• What were the most important things you learned? • Have there been any positive or negative impacts on knowledge, awareness, policy, capacity, or practice? • In what ways? [ask for examples] • [If respondent mentions knowledge, ask about what knowledge product it came from]	***Understanding how the student's research has influenced their work (re: the topic of focus).*** Finding out about linkages between project and respondent's work on the topic of focus*, and whether the research has contributed to changes in policy & practice, the debate, awareness in the topic, knowledge, capacity, or any other type of contributions. Getting a sense whether the change is perceived as positive or negative. QAF: Rel5, PfU2, PfU3, PfU4, PfU5, PfU6, PfU7
14. If there was more time and resources available, what do you think [the project] could have done differently to produce more useful findings and/or change?	• Why do you think these would be useful? [ask for examples] • How do you think [the principal investigator] could have integrated these into their project? • Why do you think this [suggestion] was not done? • Do you think resources were efficiently and appropriately allocated?	***Understanding alternative ToCs and perspectives of the research potential beyond what it did achieve/intended to, and other opportunities.*** Hold to the end of the interview – if the interviewee starts talking about it at the beginning, please lead them back to any of the questions above and ask to return to the question. This Q allows participants to give feedback to the project and helps identify gaps/challenges, but we know many of the problems already and do not want to let this dominate/ mislead the main focus of the interview. Use this opportunity to increase the depth of any previous answers by probing and relating this question to any other points respondents raise – if/when appropriate. QAF: Rel3, Rel5, Rel5, Rel6, Cre1, Leg3
15. What would have happened in the [topic] if this research had not been conducted?	• Probe to clarify if needed (the role of the project in improving collaboration, social networks, participation, engagement, etc.)	***Testing "zero hypothesis".*** Using a different angle to understand the true influence of the portfolio by asking what would be different the research had not been done. QAF: PfU7

F) Closing Questions

Main Question	**Probes**	**Intent: What we are trying to find out** **Do NOT ask these directly.**
16. What does effective research mean to you?	• What does effective research look like?	***Understanding opinions on research effectiveness.***
17. Do you have any additional remarks with regard to the role of [the project], or research in general, in change processes?	• Is there anything else you would like to add that has not been discussed that will be useful for our evaluation?	***Closing*** Last remarks, things they might want to add that were not addressed, and closure.

Appendix 4. Outcomes Codebook

Code	Description	Comment
Alternative explanation(s)	Factors, actors, or processes external to the project that contributed to outcome achievement.	Aligned with questions from interview guide on other developments, factors, and challenges. • Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • Evaluation Research Question 1c: *Could the outcomes have been realized in the absence of the portfolio?* • Cre9. Sound argument
Application	Any reference to possible practical applications resulting from the research (or any other related research in the region/topic). Include comments of whether participants have used or applied knowledge from the project (or another project/training) in their work, and how it changed practices. Include any indication of future intentions to apply or use knowledge in academic, policy, or practice contexts.	• Evaluation Research Question 2d: *To what extent and how are target audiences aware of and using portfolio outputs?* • Cre10. Transferability/generalizability of findings • PfU6. Practical application
Assumptions	Comments related to the theoretical or contextual logic behind research processes, outcomes, and how impact/change happens.	• Evaluation Research Question 1e: *Were the assumptions pertaining to why these changes were expected sustained?* • Rel4. Explicit ToC
Barriers	Comments related to factors that obstructed the research process and its contributions.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • Evaluation Research Question 2a: *What elements of research design and implementation supported outcome achievements?* • Evaluation Research Question 3a: *What lessons can be learned from the portfolio to enhance research design, management, and assessment of research-for-development programs in the future?* • Cre4. Feasible research project
Changes in attitudes	Evidence of changes in attitudes.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • PfU3. Influencing attitudes
Changes in behaviour	Evidence of changes in behaviour.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • PfU4. Capabilities • PfU7. Significant results

Changes in knowledge	Evidence of changes in knowledge.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • PfU2. New knowledge contribution • PfU4. Capabilities
Changes in policy	Evidence of changes in policy. Policy is defined as: "A decision regarding or a commitment to a particular course of action" (Pielke, 2007, p.26)	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • PfU6. Practical application
Changes in relationships	Evidence of changes in relationships.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • Leg2. Effective collaboration • PfU5. Relationship-building • PfU7. Significant results
Changes in skills	Evidence of changes in skills.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • PfU4. Capabilities
Characteristics of project design & implementation	Comments relating to perceptions of the design and implementation of the project(s).	• Evaluation Research Question 2a: *What elements of research design and implementation supported outcome achievements?* • Evaluation Research Question 2b: *To what extent and how did the projects engage with relevant stakeholders?* • Rel1. Clearly defined problem context • Rel2. Socially relevant research problem • Rel3. Engagement with problem context • Rel4. Explicit ToC • Rel5. Relevant research objectives and design • Rel6. Effective communication • Cre1. Broad preparation • Cre2. Clear research problem definition • Cre3. Clear research question • Cre4. Objectives stated and met • Cre5. Feasible research project • Cre7. Appropriate research framework • Cre8. Appropriate methods • Cre11. Limitations stated • Cre12. Ongoing monitoring and reflexivity • Leg2. Effective collaboration • Leg3. Genuine and explicit inclusion • Leg4. Research is ethical

Characteristics of researcher/research team	Comments relating to perceptions of the researcher, how they conducted themselves, their personality, and their soft skills, etc.	• Rel6. Effective communication • Cre6. Adequate competencies • Cre7. Appropriate research framework • Leg1. Disclosure of perspective
Characteristics of CIFOR	Comments relating to perceptions of CIFOR and the organization's research in general.	• Leg2. Effective collaboration • PfU2. New knowledge contribution • PfU4. Capabilities • PfU7. Significant results
Decision-making	Any data pertaining to decision-making done during the project, or influences on stakeholder decision-making. Include any discussion related to 'policy' here based on above-mentioned definitions.	Aligned with questions in the interview guide pertaining to decision-making and knowledge.
Dissemination & knowledge sharing	Information on how, where, and with whom the research was shared (planned or unexpected opportunities). Code aspects of 'knowledge translation' and 'brokering'.	• Evaluation Research Question 2a: *What elements of research design and implementation supported outcome achievements?* • Evaluation Research Question 2d: *To what extent and how are target audiences aware of and using portfolio outputs?* • Rel6. Effective communication • Cre9. Sound argument • Cre10. Transferability/generalizability of findings
Engagement	Discussion of engagement with social actors or ecological factors. Engagement at any stage of the project cycle: pre-project, mid-project, end-of-project, and post-project.	• Evaluation Research Question 2b: *To what extent and how did the project engage effectively with relevant stakeholders?* • Rel3. Engagement with problem context • Rel6. Effective communication • Leg2. Effective collaboration • Leg3. Genuine and explicit inclusion
Facilitating factors	Comments related to factors that facilitated/supported the research process and its contributions.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?* • Evaluation Research Question 2a: *What elements of research design and implementation supported outcome achievements?* • Evaluation Research Question 3a: *What lessons can be learned from the portfolio to enhance research design, management, and assessment of research-for-development programs in the future?* • Rel6. Effective communication • Cre5. Feasible research project • Cre6. Adequate competencies • Cre8. Appropriate methods
Knowledge sources	Comments of where people get their knowledge and how they use it in their work. Comments of what type of knowledge/research people perceive to be credible or useful.	• Evaluation Research Question 2c: *To what extent were project findings sufficiently relevant to achieve stated objectives?*

		• Evaluation Research Question 2d: *To what extent and how are target audiences aware of and using portfolio outputs?*
Lessons	Comments related to project context, design, and implementation that supported the project(s) or could be improved. Comments related to how to conduct research in the Indonesian context. Comments related to the evaluation and how it could be improved.	• Evaluation Research Question 3a: *What lessons can be learned from the portfolio to enhance research design, management, and assessment of research?*
Perceptions on research effectiveness	Respondents' ideas on what constitutes effective research. Discussion of effective research qualities.	• Evaluation Research Question 3a: *What lessons can be learned from the portfolio to enhance research design, management, and assessment of research?*
Perceptions on research findings	Opinions on the utility and relevance of the project(s) outputs and/or CIFOR's outputs in general.	• Evaluation Research Question 2c: *To what extent were project findings sufficiently relevant to achieve stated objectives?* • Evaluation Research Question 2d: *To what extent and how are target audiences aware of and using portfolio outputs?* • Cre2. Clear problem definition • Cre9. Sound argument • Cre10. Transferability/generalizability of findings • PfU2. New knowledge contribution
Power	Any aspects related with power and power dynamics.	
Relevant actors	Identification and information pertaining to actors relevant to the context, whether they be direct participants in the research, actors within the context, actors working on issues/topics within the context/system, or boundary partners. Comments could indicate CIFOR's positionality in the sector.	Aligned with questions in the interview guide pertaining to key players in the problem context. • Evaluation Research Question 2b: *To what extent and how did the project engage effectively with relevant stakeholders?*
Partnerships	Comments related to partnerships and collaborations between CIFOR/the research team(s) and other actors. Comments about partner-like engagements and expressions of (dis)interest for future partnerships with CIFOR.	• Evaluation Research Question 2b: *To what extent and how did the project engage effectively with relevant stakeholders?* • Leg2. Effective collaboration • Leg3. Genuine and explicit inclusion
Social networks	Any reference to networks and connections between people or organizations that go beyond knowing about the other's existence.	
Trust	Comments related to relationships and trust. Also trust of researcher, findings, organizations, or other actors in the system.	
Unexpected outcomes	Comments of other changes in knowledge, attitudes, skills, relationships, and/or behaviour resulting fully or in part from the research that were not identified by the researcher. This can be a positive or negative change.	• Evaluation Research Question 1d: *Were there any positive or negative unexpected outcomes?* • PfU. Significant results
Zero hypothesis	A different angle to understand the true influence of the research by asking what would be different had the student not done their research.	• Evaluation Research Question 1c: *Could the outcomes have been achieved in the absence of the portfolio?*

Case-specific Outcomes List of outcomes reflected in the composite ToC model (Figure 2).		
Government actors learn from OP research processes and findings	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Government actors build their capacities and relationships within the OP sector	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Government actors engage CIFOR & partners to help make informed decisions on OP	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Policy-makers create new or adapt existing policy on oil palm (informed by research)	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Smallholders and women have improved representation in policy-making around oil palm	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Policy-makers recognize and reflect environmental sustainability and social inclusion in all OP-related policy	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Project partnerships facilitate mutual learning on OP	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Project partners & allies advocate for & pursue OP issues (using research)	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Partner organizations use project research to inform planning decisions and project development	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
The OP sector (governments, private sector, NGOs, smallholders, CIFOR) develops more effective working arrangements	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Private sector actors learn from OP research	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*

Private sector responds to (research-informed) policy change	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Private sector adopts more sustainable and inclusive business models	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Smallholders and women have improved oil palm market access and share of benefits	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
CIFOR & partners are recognized for expertise in OP research	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Researchers use projects' findings and methods	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Researchers pursue new questions on oil palm	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Graduate students build their research capacities	Intermediate outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
Graduate students continue careers in oil palm research to build on knowledge base	End-of-project outcome.	• Evaluation Research Question 1a: *To what extent and how were outcomes in CIFOR's oil palm research portfolio realized?*
The research agenda on OP advances toward sustainability and inclusion	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Accumulation of scholarship on OP influences organizational practice	High-level outcome.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*
Negative social (e.g., inequitable benefit distribution) and environmental (e.g., GHG emissions, biodiversity loss) impacts of oil palm production are reduced	Impact.	• Evaluation Research Question 1b: *Are the higher-level changes likely to be realized?*

Appendix 5. Quality Assessment Framework

Transdisciplinary Research Quality Assessment Framework (adapted from Belcher et al., 2016)

Relevance: The importance, significance, and usefulness of the research problem(s), objectives, processes, and findings to the problem context.

Criteria	Definition	Guidance
Clearly defined problem context[12]	The context is well defined, described, and analyzed sufficiently to identify a research problem and corresponding entry points.	✓ The researcher(s) demonstrates holistic understanding of the problem context in which the research is situated (description of the system, including actors situated in the context) ✓ Connection is made between the problem context and the research problem ✓ Research entry points are determined by the problem context
Socially relevant research problem[13]	The research problem is well defined and described, and considers the application to the problem context and current academic discourse.	✓ The research problem is a timely issue in society or aligns with current actions (e.g., international commitments, governmental mandate, policy development, etc.) ✓ There is a demand from system actors[14] for the research problem to be addressed
Engagement with problem context	Researchers demonstrate appropriate[15] breadth and depth of understanding of and sufficient interaction with the problem context.	✓ Understanding drawn from the literature ✓ System actor perspectives are understood ✓ Where possible, researchers incorporate insights from prior research or professional experiences relevant to the problem context
Explicit theory of change	The research explicitly identifies its main intended outcomes[16], how they are expected to be realized, and how they are expected to contribute to longer term outcomes and impacts.	✓ The logic of the research contributions to a process of change is well described and sound ✓ Key actors, processes, and assumptions are identified ✓ End-of-project outcomes are reasonable to expect with the resources available
Relevant research objectives and design	The research objectives are appropriate to the research problem, and the research design is aligned with the objectives.	✓ Objectives identify what the research project aims to do or produce ✓ Objectives can be justified in how they address the research problem (e.g., fill a knowledge gap)

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[12] **Problem context** refers to the social and environmental setting(s) that gives rise to the research problem, including aspects of: location; culture; scale in time and space; social, political, economic, and ecological/environmental conditions; resources and societal capacity available; uncertainty, complexity, and novelty associated with the societal problem; and the system actors and processes are discussed (Carew & Wickson, 2010).

[13] A **research problem** is the particular topic, area of concern, question to be addressed, challenge, opportunity, or focus of the research activity. Research problems highlight a gap in understanding or knowledge that contributes to the social problem.

[14] **System actors** include policy actors, NGOs, and intended beneficiaries

[15] Words such as '**appropriate**', '**suitable**', and '**adequate**' are used deliberately to allow for quality criteria to be flexible and specific enough to the needs of individual research projects (Oberg, 2008).

[16] Outcomes are defined as "changes in knowledge, attitudes, skills, and relationships manifested as changes in behavior" (Belcher, Davel, & Claus, 2020, p.9).

		✓ The research design logically plans how the project will meet the objectives (i.e., identify what methods, activities, and engagement are needed)
Relevant communication[17]	Communication during and after the research process[18] is appropriate to the context and accessible to stakeholders, users, and other intended audiences.	✓ Communications with system actors help focus the research, source information, and co-generate and share learning ✓ Communications are timely and responsive to other system processes ✓ Communications are tailored to the target audience

Credibility: The research findings are robust and the sources of knowledge are dependable. This includes clear demonstration of the adequacy of the data and the methods used to procure the data, including clearly presented and logical interpretation of findings.

Criteria	*Definition*	*Guidance*
Broad preparation	The research is based on a strong integrated theoretical and empirical foundation.	✓ Breadth and depth of literature and theory from relevant disciplines are reviewed and integrated ✓ Empirical demonstration of gaps is based on previous research or interventions, or identified by system actors (e.g., joint problem formulation)
Clear research problem definition	The research problem is clearly stated and defined, researchable, and grounded in the academic literature and problem context.	✓ A research/knowledge gap is identified ✓ The importance of and need for the research is demonstrated ✓ The research problem can be answered empirically
Clear research question	The research question(s) is clearly stated and defined, researchable, and justified as an appropriate way to address the research problem.	✓ The research question(s) is logically derived from the research problem ✓ The research question(s) can be answered empirically (i.e., is researchable) ✓ Justification is given on how answering the research question will address the research problem
Objectives stated and met	Research objectives[19] are clearly stated and sufficient to answer the research question(s).	✓ Objectives are clear, coherent, and feasible ✓ Objectives indicate what knowledge is needed, and how that knowledge will be acquired ✓ Collectively, satisfying all objectives will answer the research question(s)
Feasible research project	The research design and resources are appropriate and sufficient to meet the objectives as stated, and adequately resilient to adapt to unexpected opportunities and challenges throughout the research process.	✓ Research design is logically derived from the objectives ✓ The project can be completed with the resources available (i.e., budget, time, hardware, software, human capital, and social capital) ✓ Research design is flexible to accommodate unexpected changes

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[17] **Communication** refers to both written communication (e.g., proposal, documents, presentation of findings, etc.) as well as engagement communications (e.g., scoping, data collection activities, meetings, workshops, etc.).

[18] **Research process** refers to the series of decisions made and actions taken throughout the entire duration of the research project and encompasses all aspects of the research project.

[19] **Objectives** explain what the research will do (i.e., generate specific knowledge, create or facilitate specific processes) and what steps will be undertaken in order to answer the research question(s).

Adequate competencies	The skills and competencies of the researcher(s), team, or collaboration (including academic and societal actors) are sufficient and in appropriate balance (without unnecessary complexity) to succeed.	✓ The knowledge, skills, and expertise needed to carry out the research are identified ✓ The necessary knowledge, skills, and expertise are represented in the research team
Appropriate research framework	Disciplines, perspectives, epistemologies, approaches, and theories are combined and/or integrated to meet stated objectives and answer the research question(s).	✓ Explanation of the theoretical framework is given ✓ Explanation is provided for why and how disciplines, epistemologies, and theories are used ✓ The process of integration of disciplines, epistemologies, and theories is explained, including how paradoxes and conflicts between integrated components are addressed ✓ Justification is given for the framework selected in relation to the problem context
Appropriate methods	Methods are fit to purpose and well suited to achieving the objectives and answering the research question(s).	✓ Clear descriptions of methods and how they were applied are given ✓ Selection of methods are justified and logically connected to the objectives ✓ Novel (unproven) methods or adaptations are explained and justified, including why they were used and how they maintain rigour
Sound argument	The logic from analysis through interpretation to conclusions is clearly described. Sufficient evidence is provided to clearly demonstrate the relationship between evidence and conclusions.	✓ The argument is logical and defensible ✓ Analyses and interpretations are adequately explained and supported by evidence ✓ If applicable, alternative explanations of results are explored
Transferability and/or generalizability of research findings	The degree to which the research findings are applicable in other contexts is assessed and discussed. In cases that are too context-specific to be generalizable, aspects of the research process or findings that may be transferable to other contexts and/or used as learning cases are discussed.	✓ Researcher(s) discusses the ability to transfer results and/or methods to other contexts ✓ Justification of transferability/generalizability of results is logical
Limitations stated	An explanation of how the characteristics of the research design or method may have influence on the results or conclusions is given.	✓ The influence of internal (e.g., sampling) and/or external factors (e.g., responsiveness of interviewees) on the results is acknowledged and discussed ✓ Researcher(s) assess the extent to which the limitations influence the results
Ongoing monitoring and reflexivity[20]	Researchers engage in ongoing reflection and adaptation of the research process, making changes as new obstacles, opportunities, circumstances, and/or knowledge surface.	✓ There is an indication that the researcher(s) considers the need to reflect on and adapt during the research process ✓ Efforts to monitor progress and identify, consider, and respond to changes in context or understanding are discussed ✓ Processes of reflection (whether formal or informal), and the resulting action(s) taken, are explained

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[20] **Reflexivity** refers to an iterative process of formative, critical reflection on the important interactions and relationships between a research project's process, context, and product(s).

Legitimacy: The research process is perceived as fair and ethical. This encompasses the ethical and fair representation of all involved and the appropriate and genuine inclusion and consideration of diverse participants, values, interests, and perspectives.

Criteria	Definition	Guidance
Disclosure of perspective	Actual, perceived, and potential bias is clearly stated and accounted for.	✓ Potential for actual or perceived bias (e.g., positionality, sources of funding, partnerships, mandate, etc.) is identified and acknowledged ✓ Implications of potential bias on the conclusions are discussed
Effective collaboration[21]	Individuals[22] involved in the research process pool their knowledge, experience, and skills together in a constructive atmosphere and in appropriate measure to produce new knowledge and/or social processes that contribute to a common goal.	✓ A shared understanding of goals and expectations is established ✓ Roles and responsibilities are clear and explicitly agreed upon ✓ Decision-making structures are transparent and fair ✓ A synergistic process capitalizes on the strengths of collaborators (across disciplinary, professional, organizational, and cultural boundaries)
Genuine and explicit inclusion[23]	The research offers authentic opportunities to involve relevant actors to share their perspectives, knowledge, and values, and/or participate in the research process.	✓ Participants' roles and contributions, perspectives, and cultural backgrounds are described ✓ Steps taken to ensure the respectful inclusion of diverse actors and views are explained
Research is ethical	The research adheres to standards of ethical conduct.	✓ Ethical practice is followed: research does no harm; participants have informed consent; anonymity and confidentiality are maintained ✓ Procedural ethics (e.g., ethical review process) are pursued and documented

Positioning for Use: The research process is designed and managed to enhance sharing, uptake, and use of research outputs and stimulates actions that address the problem and contribute to solutions.

Criteria	Definition	Guidance
Strategic engagement	Research process stimulates and/or engages with change opportunities.	✓ Engagements are timely and responsive to other system processes ✓ Researcher(s) is well positioned to have influence within the problem context ✓ Opportunities to influence change processes are identified and/or generated, and acted upon ✓ Resources are mobilized to influence/act on change processes

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[21] Collaboration encompasses both internal dynamics within the core research team and external processes with participants, collaborators, partners, and allies. Collaboration comes in many forms in research, ranging from general advice-giving to co-generated knowledge production.

[22] Within and external to the core research team.

[23] Some system actors may not want to participate in the research process, but still want their views to be represented in the findings. It is the task of the researcher(s) to ensure that their perspectives are accurately represented.

New knowledge contribution	Research generates new knowledge and understanding in academic and social realms in a timely, relevant, and significant way.	✓ An academic knowledge gap is filled ✓ System actors' knowledge gaps are filled ✓ System actors gain a better understanding of the problem context
Influencing attitudes	Research process and/or findings stimulates and supports system actors to reflect on and/or change their attitudes or perspectives on the problem and solutions to address it.	✓ Awareness-building of the research problem, the research findings, or a solution/innovation is a first step in changing attitudes ✓ System actors gain a different perspective on the targeted problem as a result of the research process and/or findings
Capabilities	System actors develop skills relevant to the problem context and/or for solving the social problem through the research process and/or findings.	✓ Research capacities of the researcher(s) and/or partners are developed (e.g., gain research experience, training, testing of new methods/approaches) ✓ Participants and partners gain new or build on existing skills as a result of the research process and/or findings ✓ Skills developed are transferable to other aspects of system actors' professional or personal lives
Relationship-building	The research process supports new or fortifies existing relationships, networks, and ways of working for solution-building in the problem context.	✓ Trust between system actors is fostered by the research process ✓ Mutual interests between system actors are recognized ✓ A forum, platform, or network is created or strengthened as a result of the research process ✓ System actors work together in new ways as a result of the research process ✓ The research contributes to shifting the power dynamics toward solution-building ✓ Open communication, equality and equity, co-identification/co-development across the research process, feedback processes, and conflict management and resolution are important components of effective relationships
Practical application	The findings, process, and/or products of research have high potential for use by system actors.	✓ The potential utility of the research outputs for system actors are discussed ✓ System actors convey intentions to use or apply the research ✓ System actors pilot, adopt, or adapt a method, tool, approach, or innovation from the research ✓ System actors use or refer to the research findings to inform their work
Significant results	Research contributes to the solution of the targeted problem or provides unexpected solutions to other problems.	✓ The research process and/or findings contribute to behaviour change in the problem context ✓ Expected changes are realized or have potential to be realized in the future

Appendix 6. QAF Scores and Justifications

Table 8. Individual evaluator and average QAF scores for the EK Project, with justifications for the score allocated

Principle	Criteria	E1	E2	E3	E4	Avg.	Justification/Comments
Relevance	Clearly defined problem context	1	2	2	2	1.75	Proposal describes the problem context (non-transparent and exclusive decision-making is a problem), system actors, and similar PERDA processes, though greater detail could have been given; opportunity to feed into the draft process of the PERDA for East Kalimantan identified a relevant and timely project entry point.
	Socially relevant research problem	1	2	2	1	1.5	Proposal describes challenges faced by decision-makers regarding transparent and inclusive policy-making, though this is not framed as a research problem; district actors in East Kalimantan previously indicated value of HCV knowledge for decision-making (indicating project relevance); little consideration given for other actors in the system; practical application of the project is described (i.e., engagement activities and academic script to inform the development of the PERDA).
	Engagement with problem context	1	1	1	1	1	Project engaged actors involved in prior PERDA processes to learn lessons from previous experiences; low literature engagement; a couple respondents noted the lack of project grounding, but did not clarify; one government respondent felt the most important gap was not identified; respondents believed relevant and sufficient connections were developed through project engagement.
	Explicit theory of change	1	1	1	1	1	No explicit ToC; objectives and indicators in proposal indicate implicit ToC and project intentions, but lacked detail.
	Relevant research objective and design	1	1	1	1	1	Objectives linked to stated project purpose, but not framed in terms of the knowledge gap; design (i.e., engagement activities) is relevant to meet the objectives, but the research component done by UNMUL is less clear.
	Relevant communication	2	2	1	2	1.75	Sufficient preparatory meetings with relevant stakeholders were organized; communications were timely and responsive to the PERDA process; diverse dissemination strategies planned (e.g., blogs, video interviews, press releases, media, social media), but unclear if all were leveraged in the end; impression of good communication between partners (i.e., meetings, check-ins, feedback).
Credibility	Broad preparation	1	1	1	1	1	The research gap for the project is not strong, and the theoretical and literature bases are unclear (brief mention of literature from law is made in the academic script); the project had a clear empirical basis and made connections to existing policy and regulation (RANKSB); the project is based on, connected to, or a continuation of other oil palm projects (e.g., CCAFS project, OPAL).
	Clear research problem definition	1	1	1	1	1	Problem definition described in proposal, but the research aspect was not present (i.e., less emphasis given as a research problem); the stated gap/problem is explicitly connected to the context; missed opportunity to fill a knowledge gap on to best facilitate multi-stakeholder engagement for policy-making.
	Clear research question(s)						Guiding research questions were not included in the proposal or LOA with UNMUL; there are no explicit research questions in the academic script.

	Comprehensive objectives	1	1	1	1	1	Objectives are clearly articulated in proposal, but do not reflect the spatial analyses done by UNMUL; no connections made between objectives and research questions (non-existent); project engagement was sufficient to meet the stated objectives.
	Feasible research project	2	2	2	2	2	The EK Project was feasible, despite its small budget; proposal notes the capacities each partner brought to the project to help address the problem; partnerships supported project feasibility to develop the academic script and engage stakeholders; short timelines limited ability to do co-generative processes; lessons learned from engagement with actors on prior PERDA processes increased feasibility.
	Adequate competencies	2	2	2	2	2	Competencies were balanced across partners, and documented in the proposal: academic script development and spatial analysis filled by UNMUL, facilitation and engagement filled by CIFOR, networking and support filled by TNC; respondents believed CIFOR brought credibility and valuable experience to the process.
	Appropriate research framework	0	0	0	0	0	No conceptual framework is discussed or used in the academic script.
	Appropriate method	1	1	1	0	0.75	Methods to collect and analyze data are briefly discussed in the academic script (e.g., observation, interviews, focus groups), but are insufficient and not connected to the stated objectives; engagement activities to solicit stakeholder input to the PERDA are described in project documentation, but these are not research methods (though suitable to the listed objectives).
	Sound argument	0	0	1	0	0.25	The argument presented in the academic script is a descriptive exercise; the analyses and interpretations are not adequately explained; it is unclear how the recommendations and conclusions are derived from the data or the analysis; alternatives are not explored as the PERDA is the only proposed solution.
	Transferability and generalizability of the findings	0	0	0	0	0	The EK Project produced region-specific data, which are not generalizable; transferability of the methods may be possible, but this is not discussed.
	Limitations stated	0	0	0	0	0	The proposal briefly discusses anticipated obstacles, and the final report discusses challenges faced by the research (e.g., government turnover resulted in the loss of champions, difficulty in involving smallholders) which are framed as limitations, but these are not research limitations per se; the academic script does not discuss limitations of the data or the results.
	Ongoing reflexivity and monitoring	1	1	0	1	0.75	The project did not use a ToC or other mechanism to support monitoring; feedback on the academic script sought from multiple stakeholders via engagement workshops; trip reports sometimes indicate reflection of the process, but not consistently used by all partners.
Legitimacy	Disclosure of perspective	1	1	1	0	0.75	Proposal describes project goals, sources of financial support, CIFOR researchers' positions, and partners' networks and influence capacity; biases and implications of bias on the project were not discussed; project had an agenda to influence a policy decision in a certain direction.
	Effective collaboration	2	2	2	2	2	Roles and responsibilities clearly documented in the proposal and LOA; respondents described the collaboration between partners positively (i.e., partners shared mutual understanding of the project purpose, trust existed between partners, UNMUL researchers were given freedom to conduct the analyses, CIFOR provided oversight and guidance, collaborative sponsoring of activities with TNC); synergistic process

							capitalized on strengths of the stakeholders involved; some respondents did not view the project as a 'CIFOR project' (believed it was commissioned by the Plantation Agency), and had the impression that CIFOR played a minor role.
	Genuine and explicit inclusion	2	2	2	2	2	A key goal of the project was to facilitate an inclusive multi-stakeholder policy process, which was achieved; a diverse set of actors (i.e., government, NGOs, private sector, researchers) were engaged in the project and had opportunities to contribute to the decision-making process; partners discuss the genuine engagement approach to stimulate exchange; the final report indicates clear intentions to ensure diverse stakeholders' aspirations and inputs were reflected in the drafting of the PERDA in how the workshops were facilitated.
	Research is ethical	1	1	1	1	1	The EK Project had low ethical risk, but ethics should have been discussed (i.e., implications of PERDA policy change for the people residing on or using land designated as HCV); engagement and facilitation processes conducted ethically. No ethical review was conducted for the project.
Effectiveness	Strategic engagement	2	2	2	2	2	The opportunity to influence the PERDA was strategic by providing inputs to and facilitating engagements for the development of the academic script; strategically sought lessons from prior PERDA processes to inform the project; CIFOR and partners well-positioned to influence the local government (e.g., involvement on FKPB, building connections and networks in East Kalimantan); it was strategic to work in East Kalimantan as actors are more open to engaging in policy processes.
	New knowledge contribution	2	2	2	2	2	HCV maps were developed; system actors learned about HCV classification during the process; government respondents recognized the project's contributions to the academic script; the project team has waited to publish new knowledge at the request of government partners.
	Influencing attitudes	2	2	2	2	2	Some engagements were dedicated to awareness-building on the issue and opportunity for HCV integration in PERDA; there is evidence that stakeholders were convinced to include HCV in policy.
	Capabilities	2	2	2	2	2	There is evidence that UNMUL researchers built on their spatial analysis skills (i.e., HCV identification); Plantation Agency staff have expressed interest in receiving training from CIFOR to do HCV analysis independently, but this has not yet happened (n.b., intentions to follow-up on this unexpected capacity-building opportunity were noted).
	Relationship-building	2	2	2	2	2	Relationships between partners were strengthened, and new relationships built with stakeholders involved in the project; indications of system actors working together in new ways as a result of the project; continuation of the PERDA process via the OPAL Project (leveraging relationships built in the EK Project).
	Practical application	2	2	2	2	2	Academic script informed the development of the PERDA; HCV is reflected in PERDA; HCV map referenced on BAPPEDA Kotawaringin Barat's geoportal.
	Significant results	2	2	2	2	2	The project made a contribution to a more effective policymaking arrangement in East Kalimantan to improve provincial-level policy-making; next steps are underway in the development of a pergub (i.e., governor's regulation outlining the technical guidelines for the implementation of the PERDA).

Table 9. Individual evaluator and average QAF scores for the GOLS Project, with justifications for the score allocated

Principle	Criteria	E1	E2	E3	E4	Avg.	Justification/Comments
Relevance	Clearly defined problem context	2	2	2	2	2	The proposal clearly defines the negative social and environmental impacts and drivers affecting the oil palm sector; documentation identifies system actors and other processes happening in the context; GOLS researchers have familiarity of the problem context from experience on previous oil palm projects in Indonesia; project entry points are identified from previous projects (e.g., LIFFE Options, Corporate Commitments on Sustainability) and documented in the proposal.
	Socially relevant research problem	2	2	2	2	2	The research problem is broadly defined, but clearly situated in ongoing sustainability and private sector commitments debates; GOLS was timely in its alignment with system interventions (e.g., IPOP, New York Declaration on Forests, ISPO, SPOI, etc.); the identified research and knowledge gaps stemmed from topics relevant within the policy sphere (e.g., CPO Fund, regularization of smallholder tenure, lack of available spatial data on biodiversity, plantations, smallholders, etc.).
	Engagement with problem context	1	1	1	1	1	GOLS built on previous projects (e.g., LIFFE Options, Corporate Commitments on Sustainability), bringing former experience, networks, and engagement with the problem context; some components undertook pre-project engagement, scoping, and socialization with relevant stakeholders to build interest in the project and attract participation; respondents had the impression that GOLS was not rooted in proper policy processes, and further understanding of the Indonesian context and how to interact with system actors was needed; given project aims, stronger emphasis on problem co-identification through stakeholder engagement would have increased project relevance.
	Explicit theory of change	2	1	2	2	1.75	Explicit ToC documented for the project; pathways and outcome logic are described; an engagement strategy was developed to operationalize which actors to engage and how; ToC outcomes are reported on in the final report; researchers did not find the ToC helpful (i.e., too mechanical, unclear direction); one researcher noted the ToC required revisions in response to the IPOP collapse, as the ToC had strong linkages to the IPOP process, but this did not happen.
	Relevant research objective and design	2	1	1	1	1.25	Proposal explains how objectives were guided by gaps in the problem context; each components' design aligned with its respective objective; the design for Components 1, 2, and 3 to feed into Component 4 did not consider the limited geographical overlap between components.
	Relevant communication	1	1	1	1	1	Multi-level engagements and communications planned and carried out; engagement strategy identified relevant target audiences (e.g., government, NGOs, private sector, researchers, etc.) and opportunities to engage them in a tailored way; diverse outputs (e.g., peer-reviewed articles, policy briefs, occasional papers, infographics, blogs, etc.) produced and promoted through academic channels and social media; impressions that not all outputs are accessible to all target audiences (i.e., language, medium, translated for knowledge uptake); some respondents felt that not all communications were well-prepared, coherent, and evidence-based, and required more direct communication of outputs (e.g., e-mails preferred over workshop presentations) and follow-up; project partners had different opinions on internal project communication (i.e., some required improvement, greater management, and more proactive communication while others found communications sufficiently regular and informative); interviews revealed effective communication was a challenge for project implementation.

Credibility	Broad preparation	1	1	1	1	1	Multidisciplinary research team; literature basis for each component has sufficient breadth and depth; empirical bases stemmed from previous projects on oil palm; integration of the components worked in theory, but did not occur as the components worked in siloes.
	Clear research problem definition	1	1	1	1	1	Overarching research problem identified in the proposal; each components' research objectives were outlined, but each individual research problem was not explicitly defined in documentation (researchers could articulate the research problem in the interviews); most component foci could be answered empirically.
	Clear research question(s)	0	1	1	0	0.5	Research questions are not documented in the proposal or reports; the objectives imply research questions; the proposal explains that research questions were to be co-generated with IPOP members, but this did not happen as IPOP was dissolved.
	Comprehensive objectives	1	1	1	1	1	Objectives are clearly articulated in the proposal and engagement strategy, and are coherent and feasible; as research questions are not documented, how the objectives will address the research problem is unclear; the extent to which each component met their objectives is unclear because of various internal and external factors.
	Feasible research project	1	1	1	1	1	GOLS received a large budget, a significant portion of which financed the CUF program (though considering CUF did not feed into GOLS research indicates resources were not appropriately allocated); flexibility in the budget supported capacity-building opportunities for partners (e.g., P3SEPKI); GOLS had appropriate hardware, software, and human resources necessary to conduct the research (supplemented by partnerships with government agencies and local universities); project timelines were insufficient, as delays in other components required Component 4 to make adjustments; GOLS required adaptation in response to the collapse of IPOP (also at the request of the donor), but respondents commented that not a lot of thought went into adaptation.
	Adequate competencies	1	1	2	1	1.25	Each component appears to have the appropriate knowledge, skills, and expertise needed to carry out the research (e.g., contextual, methodological, technical, communication, engagement skills, etc.); researchers brought former research experience on oil palm to the project; partners competencies complemented the capacities of GOLS researchers; respondents critiqued the lack of integrative and management capacities to bring the components together as one coherent project.
	Appropriate research framework	0	0	0	0	0	A theoretical framework is not discussed or presented, despite having four different project components (this likely affected the feasibility for components to feed into Component 4); no explanation is given regarding conflicts or paradoxes arising from integration.
	Appropriate method	2	2	2	2	2	Methods within each component are well described, logically connected to the stated objectives, and fit to purpose; connections between methods, activities, and outputs are laid out well in project documentation; household surveys were tested in the field and adjusted to ensure appropriateness; components using mixed methods provided justifications (e.g., provided triangulation).
	Sound argument	2	2	2	2	2	GOLS outputs make a logical arguments, and analyses and interpretations are adequately explained; the soundness of GOLS argumentation is also indicated by successful submissions of peer-reviewed articles.
	Transferability and	2	2	1	2	1.75	Generalizability of the findings is not discussed and unlikely as region-specific data is produced, but concept of smallholder heterogeneity is generalizable (the specific typologies identified may not be); transferability of methods is not discussed in reporting, but evidence of methods being tested, taken up by

	generalizability of the findings						other academics, and applied in other projects by GOLS researchers in other contexts (e.g., Ghana) and commodities (e.g., cocoa) empirically demonstrates transferability of the methods; the Borneo Atlas is being scaled out to cover other regions in Indonesia (e.g., Papua, Sumatra); one researcher acknowledged the questionable scalability of data for policy application (i.e., extrapolating from a sample of villages to inform policy affecting stakeholders nation-wide).
	Limitations stated	1	1	1	1	1	Limitations of the methods or findings were not discussed in project documentation (included in some, but not all, of the peer-reviewed articles); researcher interviews discussed limitations in more detail; no reflections are given regarding the implications of limitations on the results.
	Ongoing reflexivity and monitoring	1	1	1	1	1	Systematic reflection of engagements and feedback were limited and not consistently documented; the ToC was not used as a monitoring tool; one researcher felt monitoring in the project was low overall; interviews demonstrated researchers reflect on which actors to engage and how, but unclear how much of this reflection stimulated adjustments moving forward; indications that some methods were tested and revised, and feedback from target audiences was sought for the scenario modelling and integrated; project events and workshops did not use feedback forms.
Legitimacy	Disclosure of perspective	1	2	1	1	1.25	Proposals, reports, and media adequately acknowledge funding sources and partnerships; alignment of the project with external sustainability and donor agendas is documented; interviews indicate researcher recognize and reflect on researcher bias (e.g., positionality as a foreigner vs. Indonesian, access barriers to governments when labelled as an academic, delivering normative recommendations, etc.), but this was not documented explicitly; implications of bias on the results are not discussed.
	Effective collaboration	1	1	1	1	1	Internal project collaboration between the components had low cohesion and was siloed (e.g., different objectives, geographic locations, networks, teams, etc.); some activities were added after the proposal was developed at the request of the donor, affecting cohesion; missed opportunity for cross-learning between the components, which could have been facilitated by better project management and collective goals; there was scope for problem co-identification and co-development of research questions and objectives which did not happen; partners noted the project had regular meetings to collaborate and coordinate (initially these were effective, but later ran out of time); while roles and responsibilities were explicitly documented between GOLS researchers and partners, not all followed through; researchers felt they got sufficient support and freedom to complete their research; some partners were satisfied by the collaboration, while others wished for more involvement in decision-making or noted tensions emerged during the collaboration; CUF collaboration did not benefit GOLS research. Effective collaboration, particularly with the national government was lacking.
	Genuine and explicit inclusion	1	1	1	1	1	Not all researchers and partners felt included in the project design; some components included diverse system actors during scoping activities, outreach meetings, or requested feedback; respondents felt their input was taken into account; Component 3 aimed to support disenfranchised smallholder activities and have this group included and represented in government policy; some partners felt not all key stakeholders were involved in the project, though acknowledged that some are difficult to access considering the politicization of oil palm; genuine inclusion of government actors from the outset and as partners could lead to results being co-owned, endorsed, and more easily integrated into government policy; genuine adherence to the 'no surprises' policy would make partners in the KHLK feel more respectfully included.

	Research is ethical	1	2	1	1	1.25	Documentation does not indicate that an ethical review was conducted; indications that researchers followed ethical principles and identified potential ethical dilemmas in how the data could negatively impact certain groups (making decisions to ensure their protection); indications that anonymity and confidentiality were upheld.
Effectiveness	Strategic engagement	1	2	1	1	1.25	Strategic engagement was planned with the intention of being responsive to system processes as well as exerting and expanding GOLS influence; original engagement in IPOP was strategic to collaborate with private sector actors, and shift away from IPOP was also strategic considering the political tensions; GOLS researchers engaged in relevant dialogues and processes (e.g., ISPO Working Group, SPOI); partnership with P3SEPKI was strategic to have influence and champions for the research within the KHLK; the CUF element was not strategic to the project, as resources were not mobilized in such as way as to feed into GOLS.
	New knowledge contribution	2	2	2	2	2	Each component produced new knowledge (e.g., governance arrangements, Atlas, smallholder typologies, policy scenarios, etc.); evidence indicates partners, government actors, NGOs, private sector, and researchers learned from GOLS research.
	Influencing attitudes	1	1	1	1	1	Governments recognize policy changes need to happen (e.g., governments better understand smallholder heterogeneity and inability to comply with ISPO as a result of GOLS); researcher had the impression that the scenarios influenced governmental attitudes, but this could not be corroborated; the oil palm sector remains highly polarized around deforestation issues, despite GOLS findings demonstrating plantation-driven deforestation has decreased over time.
	Capabilities	2	2	2	2	2	CUF graduate students gained research capacities to apply in their future careers; some GOLS researchers are applying lessons from the research experience to future projects; P3SEPKI partners gained expertise on oil palm research, as well as built English writing and presentation skills; SPKS, UNTAMA researchers, and BAPPEDA Kotawaringin Barat gained research skills when assisting GOLS data collection and analysis.
	Relationship-building	1	1	1	1	1	CUF graduate students built professional relationships, though GOLS researchers struggled to build relationships with the American supervisors; partnerships with P3SEPKI researchers and local universities strengthened through the project; existing relationships and networks could not be leveraged across the components owing to different geographic locations; unclear if system actors are working together in new ways as a result of project contributions.
	Practical application	2	2	2	2	2	Most GOLS outputs have been referenced and used by researchers, NGOs, private sector actors, and governments; respondents found GOLS research to be relevant and useful; while some government agencies indicated opportunities to use GOLS outputs (e.g., vegetation maps, Atlas, etc.), endorsement from the KHLK is said to be required before governments can officially use the data.
	Significant results	2	2	2	2	2	Policy changes are too early, but GOLS contributions to ISPO and other processes have potential to be realized in the future; there are clear indications that GOLS made contributions to change processes affecting government policy, private sector practice, partners, and the research agenda.

Table 10. Individual evaluator and average QAF scores for the OPAL Project, with justifications for the score allocated

Principle	Criteria	E1	E2	E3	E4	Avg.	Justification/Comments
Relevance	Clearly defined problem context	2	2	2	2	2	Research proposal documents and describes the Indonesian, Colombian, and Cameroonian socio-ecological and political contexts and actors; project builds on EK, GOLS, and Sentinel Landscapes projects; multiple research entry points identified in OPAL proposal, and links to national and international debates and policy processes are identified.
	Socially relevant research problem	2	2	2	2	2	Overarching research problem outlined in the proposal; more specific research problems identified through scoping exercises with system actors; previous research on the topic of sustainable oil palm has typically been single discipline, and OPAL identified the opportunity to do inter- and transdisciplinary research.
	Engagement with problem context	2	2	2	2	2	OPAL builds on previous project processes (e.g., EK, GOLS, and Sentinel Landscapes) and partners' networks across all three countries; partners have prior experience with the context and research on oil palm; significant engagement undertaken in Indonesia with multiple stakeholder groups for scoping, meetings, and dialogues to more fully understand the problem context.
	Explicit theory of change	2	2	2	2	2	An explicit ToC was documented for the project; ToC co-developed with stakeholders to reflect country dynamics and targeted policy processes; the team reviewed the ToC periodically to ensure alignment of activities, inform planning, and make revisions (i.e., functions as a living document); a progress reports discusses synergizing the ToC with other projects (e.g., GOLS); project assumptions were documented; the OPAL ToC is theoretically grounded in psychological and behaviour theory; members of the OPAL team found the ToC to be a useful tool.
	Relevant research objective and design	2	2	2	2	2	Flexible design of the proposal enabled scoping activities to more accurately define project objectives; researchers conveyed OPAL was led by clear objectives; design tailored to fit the context and useful to address the stated problem; graduate students' research was linked and built on each other; multi-country implementation facilitated cross-project learning to improve implementation; multi-functional and appropriate use of Companion Modelling in the design (i.e., engage diverse stakeholders on a polarized debate, facilitate dialogues, influence stakeholder knowledge and attitudes, graduate research generates the Companion Modelling scenarios and results of the games feed back into the research).
	Relevant communication	2	2	2	2	2	The proposal documents a well-planned communication strategy, identifying relevant target audiences and opportunities to engage them; multi-level engagement planned and carried out (district, provincial, national, international); OPAL invested in tailored engagements and outreach; diverse outputs and media used during and after the project (e.g., workshops, conferences, dialogues, peer-reviewed articles, project website, blogs, videos, practitioner magazines, public news outlets, etc.); respondents commented positively on the communication during activities (e.g., clear explanations and instruction).
Credibility	Broad preparation	2	2	2	2	2	Transdisciplinary research team; OPAL clearly integrated literature from natural sciences, political science, and social science; academic research foci with on-the-ground application built into the project; Companion Modelling had been empirically tested in other contexts and topics.
	Clear research problem definition	2	2	2	2	2	Research gaps are identified and stated, and the problem is explicitly connected to the context; documentation and researchers could clearly articulate the need for the research to better understand processes that facilitate inclusivity and sustainability in the oil palm sector.

Clear research question(s)	2	2	2	2	2	The proposal identifies the research questions for the eco-hydrological studies; other research questions are documented in the graduate students' theses or dissertations; each research focus is defined, researchable, and justified; researcher interviews discussed how the research questions were developed through scoping.
Comprehensive objectives	2	2	2	2	2	Objectives were clearly stated in documentation and on the project website; most objectives appear to have been met (n.b., the OPAL Project is still in progress).
Feasible research project	2	2	1	2	1.75	OPAL received a successful project extension until 2021; OPAL team discussed the flexibility afforded to them in the ToC; typical project limitations were noted (e.g., time, funding, staff turnover, stakeholder access), but project activities do not appear to have been impeded as a result; OPAL team recognized initial budget for internal training was insufficient, so some funds were reallocated because this aspect was considered important; some graduate students wished for more time and resources for training; some researchers noted that time and budget are insufficient to meet all the demand for games and scale-up opportunities.
Adequate competencies	2	2	2	2	2	There was a complementarity of competencies between partners (e.g., ETHZ brought the ecological background and methodology, IPB the natural sciences background and research experience in Indonesia and on oil palm, CIFOR the social sciences background, research experience in Indonesia and on oil palm, and networks); the ToC was used to identify the competencies and networks needed to support the project; ETHZ provided partners and graduate students with training to ensure all had the competencies to apply Companion Modelling.
Appropriate research framework	2	2	2	2	2	OPAL drew upon knowledge and theory from several disciplines (e.g., natural sciences, political sciences, social sciences); project documentation explains how Companion Modelling is used as a framework to both capture diverse perspectives and integrate theoretical and empirical knowledge; documentation details how the framework of each Companion Modelling game was tested by and received feedback from relevant system actors to address any inconsistencies of the integrated components; justification is given for the appropriateness of Companion Modelling for the problem context, to meet the stated objectives, and to frame the results.
Appropriate method	2	2	2	2	2	The proposal outlines the methods and their strengths, and provides justification for their appropriateness for the project's multi-country contexts and to fulfill the objectives; Companion Modelling was adapted for each contextual situation and research focus, and further refined with participatory testing and input from stakeholders; Companion Modelling is fit to purpose as an effective means to bridge academic and non-academic knowledge, foster dialogue between diverse system actor perspectives, and internalize learning.
Sound argument	2	2	2	2	2	OPAL is still in progress, but outputs produced to date (i.e., peer-reviewed articles, Masters theses, doctoral dissertations, etc.) would require and do demonstrate sound argumentation.
Transferability and generalizability of the findings	2	2	2	2	2	OPAL is still in progress, but one aim is to compare findings from each country to be able to recommend universally valid oil palm governance strategies; project demonstrates the testing and transferability of the methods across multiple contexts and research foci; Companion Modelling games can be adapted and played with any stakeholder; respondents discussed application of Companion Modelling to other contexts and commodities; scaling up of Companion Modelling was questioned, but determined to be feasible with adequate resourcing.

	Limitations stated	1	1	1	1	1	OPAL is still in progress, so not all findings have been developed; methodological limitations are not discussed in the proposal, but included to varying degrees within the graduate student research produced to date.
	Ongoing reflexivity and monitoring	2	2	2	2	2	OPAL had an explicit monitoring, evaluation, and learning strategy and a built-in monitoring process (e.g., multiple project audits, feedback, gameplay adjustments, pre- and post-game interviews, etc.), which researchers described as constructive; internal reflections and discussions were done collaboratively and documented; the ToC was reviewed and revised, and used to strategize how to capitalize on opportunities (e.g., new partnerships, windows for influence); there are indications that project learning informed adaptations.
Legitimacy	Disclosure of perspective	2	2	2	2	2	Documentation acknowledges researchers' backgrounds, partners and their roles, funding sources, and project goals; interviews indicate that the OPAL team was cognizant of researcher bias, urban bias, and importance of accurately representing stakeholder perspectives and experiences (e.g., coherence of the voices).
	Effective collaboration	2	2	2	2	2	OPAL was co-developed from project inception; while ETHZ led proposal development, all partners felt they had the opportunity to provide input to its development; tasks were divided amongst the partners and aligned with their strengths; all roles and responsibilities were clearly defined and understood; graduate students reflected positively on the team dynamic and the linking between their respective projects; similarly, partners reflected positively on the collaboration; collaboration with the communities was approached in the same manner as within the team; one partner felt the project missed the opportunity to fully leverage CIFOR's internal research and engagement capacities.
	Genuine and explicit inclusion	2	2	2	2	2	OPAL had a high focus on co-generation, inclusion of diverse stakeholders, and a philosophy of mutual benefits (e.g., sharing knowledge, sharing ownership of the findings); Companion Modelling game scenarios were co-developed, tested, and validated with relevant partners and system actors; the Companion Modelling approach facilitates equitable representation of differing perspectives and space to discuss them in a constructive way; partners and participants appreciated how their engagement was facilitated, feeling their feedback was taken into account; genuine inclusion of smallholders and communities in the research process.
	Research is ethical	1	2	1	1	1.25	Documentation does not indicate that an ethical review was conducted; proposal briefly discusses the risks working in highly politicized environments, and notes how strategic partnership could help navigate those challenges; researcher interviews reflected on ethical concerns and how addressed (e.g., steps taken to ensure informed consent, a non-extractive process, and mutual benefits with communities), but this was not explicitly documented.
Effectiveness	Strategic engagement	2	2	2	2	2	OPAL identified opportunities for the project to feed into various policy processes (e.g., ISPO, PERDA); project strategically engaged government actors from district, provincial, national, and international levels; Companion Modelling games have been used to strategically engage and assemble diverse actors to influence their understanding; partners are well-situated to influence relevant policy spaces (e.g., ISPO); members of the OPAL team have been invited to be resource people in multiple government policy processes (e.g., ISPO, LTKL, SPOI).

	New knowledge contribution	2	2	2	2	2	Graduate student research generated new knowledge; Companion Modelling games intentionally aimed to stimulate learning and make new knowledge resonate; participants found the games useful to learn and understand different actors' perspectives and incompatibility with ISPO policy.
	Influencing attitudes	2	2	2	2	2	Companion Modelling games intentionally aimed to influence attitudes by stimulating new understanding of different actors' perspectives; evidence indicates participants' attitudes changed as a result of the games' experiential learning (e.g., governments, smallholders, farmers' associations, etc.); government participants are now more cautious and reflective when making policy decisions; indications of changes in graduate student attitudes (e.g., valuing of equitable participation, community empowerment, and ownership of research, etc.).
	Capabilities	2	2	2	2	2	Graduate students built their research capacities (e.g., Companion Modelling methodology, workshop organization and facilitation, presentation skills, etc.); graduate students invited to be resource people in government policy processes (indicating they have developed expertise); potential that changes in knowledge on sustainable oil palm production via the fieldwork or games could lead to smallholder farmers changing their practices; Companion Modelling participants felt the games facilitated space for solutions-building among players, but felt follow-up training was needed.
	Relationship-building	2	2	2	2	2	Companion Modelling aimed to shift power dynamics to solutions-building; partnerships between ETHZ, IPB, and CIFOR were strengthened; graduate students developed academic, professional, and personal relationships; relationships were built with communities during the fieldwork (e.g., one student was invited by the community to facilitate a village planning process) and government actors (e.g., invitations to be resource people); the project took advantage of an opportunistic international research collaboration with two external graduate students during the Indonesian fieldwork.
	Practical application	2	2	2	2	2	In Indonesia, three game innovations developed (e.g., ComMoDO, LUCOPE, and ComMod ISPO); insight from games was thought to have practical application for players to inform decision-making and policy development; OPAL partners plan to continue the to apply Companion Modelling in future projects; post-project potential for NGOs or governments to apply the games as a planning tool; potential for digitization of the games.
	Significant results	2	2	2	2	2	Stakeholders are interested for OPAL to facilitate more games in Indonesia; policy changes are too early, but OPAL contributions to ISPO and other processes have potential to be realized in the future; continuation of OPAL objectives in other projects.

Table 11. Individual evaluator and average QAF scores for the ERS Project, with justifications for the score allocated

Principle	Criteria	E1	E2	E3	E4	Avg.	Justification/Comments
Relevance	Clearly defined problem context	2	2	2	2	2	ERS research proposal describes the socio-ecological and political contexts of gender in Indonesia's oil palm sector; entry points identified from previous research on social aspects of oil palm and gaps in the RSPO standards and certification mechanisms.
	Socially relevant research problem	2	2	2	2	2	Project identifies research gap on gender and oil palm; gender-blindness of relevant debates and policy discussions is identified, noting the opportunity for the project to raise awareness and bring gender discussions into the policy circuit; research problem is relevant as the research was commissioned by Oxfam Novib and of interest to system actors.
	Engagement with problem context	2	2	2	1	1.75	Engagement with the literature is discussed, but extent of understanding drawn is unclear; prior interaction with the field sites is unclear; partners have previously engaged with the problem context at the national and international levels to have influence; project researchers made genuine efforts to keep apprised of ongoing processes and opportunities.
	Explicit theory of change	1	1	1	1	1	No explicit ToC; objectives in proposal indicate implicit ToC and strategic plan in place (though some activities were opportunistic).
	Relevant research objective and design	2	1	1	2	1.5	Stated objective is relevant and aligned to the fill gaps within the problem context (e.g., RSPO standards); description of connection between objectives and project design is vague; ERS researchers felt more could have been done with the project.
	Relevant communication	2	2	2	2	2	Fieldwork communication was tailored and sensitive to different educational levels, local expressions, and ways of knowing; communication with partners was responsive to requests and feedback; diverse dissemination strategies employed (e.g., report, infobrief, events, webinar, and video); respondents described the findings as quotable.
Credibility	Broad preparation	1	2	1	2	1.5	Previous research on social aspects of oil palm served as a foundation; ERS conducted a review of available literature and theory, but impression that a diversity of disciplines was not drawn upon; feedback to an event noted the foci were well-identified.
	Clear research problem definition	2	2	2	2	2	Research gaps are identified and stated, and the problem is explicitly connected to the context; the research problem was clearly defined in the TOR by the partner.
	Clear research question(s)	2	2	2	2	2	Set of research questions documented in the methodology and report; research questions are clearly connected to the research problem.
	Comprehensive objectives	1	1	1	1	1	A single objective was stated, but does not note what knowledge is needed to answer the research questions; objective appears to have been met.
	Feasible research project	1	1	1	1	1	Small project budget, which only covered operational/engagement costs and co-authors' time (i.e., principal investigator's time had to be supplemented with FTA funding); additional funding sought to generate the video; initial human resources were insufficient (e.g., an additional researcher was brought in mid-project to support report writing); time was noted as a limiting factor.

	Adequate competencies	1	2	1	2	1.5	ERS researchers had complementary research skills and areas of expertise (e.g., gender, RSPO context); partners thought research skills were high, but the client was disappointed with the writing skills (however, this was rectified when an additional researcher was brought onboard); partners' competencies were thought to improve the traction of the project.
	Appropriate research framework	1	2	2	1	1.5	An explicit analytical framework is not documented, but an intersectional gender analysis was applied; respondents commented on the sufficient bridging of academic and practical aspects of the research; interdisciplinary integration occurred, but the process of integration is not explained.
	Appropriate method	2	2	2	2	2	Activities and methods are clearly described, justified, and appropriate to the purpose of the project (e.g., literature review, policy gap analysis, multiple community case studies: field observation, interviews, household surveys); respondents commented on the rigour and quality of the research.
	Sound argument	1	1	1	1	1	Respondents felt the findings were objective, well-informed, and reliable (evidence-based), and found the gender lens useful; partner felt initial deliverables were not well-written or structured (this was rectified in the final report); partner felt the argument would have been stronger if more detailed guidance for the recommendations was presented.
	Transferability and generalizability of the findings	1	1	1	1	1	Generalizability or transferability are not discussed; however, one partner has applied some of the results in other platforms and commodities, demonstrating generalizability of the recommendations to fill existing gender gaps in private sector commitments.
	Limitations stated	0	0	0	0	0	Limitations are not discussed.
	Ongoing reflexivity and monitoring	2	2	2	2	2	ERS researchers recognized need for reflexivity to adapt during fieldwork; fieldwork built in periods following activities to review notes and make additional observations; participant feedback solicited from events; feedback from partners integrated into the final outputs.
Legitimacy	Disclosure of perspective	1	2	2	2	1.75	Bias is identified and noted as important for consideration in the methodological protocol; ensuring gender balance within the team is considered (e.g., note-takers, assistants, etc.); separating out the researcher (i.e., researcher bias) is emphasized in note-taking so as to not impose interpretations or subjective analyses; implications of bias on the results are not explicitly documented.
	Effective collaboration	2	1	1	1	1.25	Fieldwork roles and responsibilities are clearly documented; teamwork emphasized in the fieldwork (i.e., built in space to support each other and improve the research); partners had mixed feelings on the collaboration (e.g., CIFOR fulfilled agreed deliverables, yet initial deliverables were not up to expected standards); decision-making power was not shared between partners.
	Genuine and explicit inclusion	2	2	2	1	1.75	Intersectional approach taken to ensure diverse perspectives (i.e., women and men) and marginalized voices were represented; vulnerable groups included in the research process; the nature of community engagement was extractive and not participatory.
	Research is ethical	2	2	1	2	1.75	A section of the methodology is dedicated to a discussion of ethics and informed consent (included in the data collection protocol), outlining how the research team should approach the field work; vulnerable actors (e.g., women, marginalized groups) were engaged ethically, though no consideration is given to potential negative outcomes or implications for vulnerable groups' participation; permission to record was requested,

							secure management of data was documented, provisions to ensure confidentiality were made, and findings were anonymized.
Effectiveness	Strategic engagement	2	2	2	2	2	Partners are well-situated to influence the problem context (e.g., Oxfam Novib is involved in the RSPO Working Group on Human Rights); ERS researchers engaged with relevant boundary partners and in the right for a (e.g., RSPO, World Bank conference, Forum for the Future).
	New knowledge contribution	2	2	2	2	2	ERS findings contributed a gender lens to the oil palm debate, and generated knowledge of women and men's realities and experiences working in the oil palm sector; respondents commented on the objective yet critical knowledge contribution, which does not demonize oil palm.
	Influencing attitudes	2	2	2	2	2	Clear project contribution to gender awareness and the stimulation of collective action on gender issues in the oil palm sector; knowledge generated influenced system actors' attitudes about oil palm (i.e., depolarizing the debate).
	Capabilities	2	2	2	2	2	The ERS Project did not have a capacity-building focus or component; researchers gained new or built upon existing researcher competencies on gender issues, which they have transferred to new organizations; RSPO has become more gender-responsive as a result of project contributions.
	Relationship-building	1	1	1	1	1	Partnership with Oxfam Novib depended on winning the proposal bid; Oxfam Novib were disappointed with some aspects of the collaboration which have affected their interest to partner with CIFOR again; some relationship-building occurred during the process with government and NGO actors; relationships were built between individuals, and not necessarily between institutions, so CIFOR has lost several of these connections when researchers moved to new organizations.
	Practical application	2	2	2	2	2	Findings have been referenced and used in discussions and to inform revisions of RSPO standards; a partner has used the findings in their advocacy of gender at other platforms and for other commodities (e.g., seafood).
	Significant results	2	2	2	2	2	As a result of the revised RSPO standards, member companies have adopted new gender-responsive policies (e.g., Wilmar developed a Women's Charter); Forum for the Future is supporting companies to become gender-responsive; project contribution to more effective working arrangements around gender and oil palm; high potential for implementation to follow RSPO policy changes.

Appendix 7. Perceptions and Use of Portfolio Outputs

Respondents shared their perceptions of the relevance of research outputs generated by the four projects under evaluation, and provided evidence of both formal and informal uptake and use of these outputs (see Table 12). Specific tailored products are also included in this table, notably ten peer-reviewed publications or working papers (*italicized*), which contain many of CIFOR's oil palm portfolio knowledge contributions.

Table 12. List of outputs, perceptions of relevance, and evidence of use

Output	*Type*	*Perceptions of Relevance*	*Evidence of Use*[24]
Academic script on HCV (EK Project) (Doc60)	Tailored product	• CIFOR's input provide a scientific basis for policy, and can shape debates during policy development process (Gov21, NGO7, Res31)	• Used in East Kalimantan PERDA (Doc3, Gov2, Gov21, IGO1, NGO7, PS6, Res6, Res25, Res31) • HCV discussed in a couple articles of the PERDA (Doc3, Gov2, Res6)
HCV maps (EK Project)	Tailored product	• Includes social aspects of HCV (Res25) • Provides data and technical mapping support (Gov7, Gov9) • Relevant to gain a nuanced understanding of HCVs for governmental activities, policies, and programs going forward (Gov14) • Useful to inform pergub development (Gov2)	• Intended inclusion in pergub (Gov2, Gov14, Res6, Res25, TR11) • Referenced on BAPPEDA Kotawaringin Barat's geoportal website (Res25) • Used by East Kalimantan Plantation Agency (Gov9)

Review and assessment of disconnects, complementarities, and antagonisms between state regulations and private standards (GOLS C1)
Pacheco et al. (2018)
Luttrell et al. (2018a)
	Knowledge contribution
	Tailored product
		• Useful quality analyses that help derive a comprehensive understanding of the oil palm system and ideas for how to bring about sustainability in the sector (IGO1, IGO6, PS5, Res7, Res26)	• Pacheco et al. (2018) cited 22 times, downloaded 236 times, Atlmetric score: 11
			  • Referenced in Tropenbos infobrief (Doc53)
			• Luttrell et al. (2018a) cited 6 times, downloaded 1582 times, Altmetric score: 0
			  • Referenced in TNC research for Project LEOPALD (Mafira et al., 2019)

Policy recommendations on CPO Fund allocation (GOLS C1) *Nurfatriani et al. (2019)[25]*	Knowledge contribution *Tailored product*	• Provides a scientific basis to discuss solutions for effective CPO Fund allocation (Gov4, Gov15)	• Used to inform KHLK inputs to the BPDPKS research commission (e.g., biofuel development, plantation rejuvenation programs) (Doc68, Gov1)

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[24] Research metric data (e.g., citations, downloads, altmetrics) were collected between March and April 2020; it is likely these numbers have changed by the time this report is published.

[25] Metrics of Nurfatriani et al. (2018), a working paper in Bahasa on which Nurfatriani et al.'s (2019) peer-reviewed article was based, have been included to illustrate uptake and use of portfolio knowledge. This also illustrates that outputs published in Bahasa versus English reach different target audiences.

			• Nurfatriani et al. (2019) cited 0 times, downloaded 936 times, Altmetric score: 0 • Nurfatriani et al. (2018)[25] cited 2 times, downloaded 2278 times, Atlmetric score: 13 • Referenced in Tropenbos policy brief (Doc52)
Policy options for smallholder land tenure issues (e.g., agrarian reform, TORA, social forestry, land amnesty) (GOLS C1) *Wibowo et al. (2019)*	Knowledge contribution *Tailored product*	• Provides a scientific basis to discuss solutions for smallholder oil palm plantation expansion on forest estates (Gov4, Gov15)	• Used to inform P3SEPKI's policy recommendations for plantations located in forest-designated areas (Gov15) • Used in KHLK policy brief on forest amnesty (Gov1) • Used in P3SEPKI position paper on ILUC (Gov1) • Used to inform Ministry of Foreign Affairs' handbook for palm oil diplomacy (Gov1, Gov15) • Wibowo et al. (2019) cited 0 times, downloaded 1015 times, Altmetric score: 0
Vegetation land cover maps (GOLS C2)	Tailored product	• Useful to understand differences in oil palm growth in peat and mineral soils (Gov3) • Filled gaps in mapping capacity by providing more detailed information on land cover (60 classes vs. 25 classes at the ministry), useful basis of comparison with KHLK land cover map (Doc7, Gov8, Gov11, TR53) • Provides a basis for HCV identification at the landscape level (Gov8, Gov11, Res27) • Useful for spatial planning assessment of habitat fragmentation at regency and district level (Doc7)	• Used by Tropenbos for landcover analysis of West Kalimantan (Res28)

Borneo Atlas (GOLS C2)
Gaveau et al. (2016)
	Tailored product
	Tailored product
		• Useful visualization of plantation concession boundaries, deforestation, and land use change over time in Borneo; to make clear distinction where oil palm is causing deforestation, and areas where oil palm has been planted on already deforested areas (Doc46, IGO5, IGO6, NGO1, Res30)
		• Shows correlation between forest loss and industrial plantation expansion, slowdown in expansion and deforestation attributed to declining price of crude palm oil (Doc46, NGO1, Res30)
		• Useful to validate land ownership (Gov10)
		• Provides independent and scientific monitoring of how, when, and where oil palm expansion occurs to distinguish plantations abiding by NDPE committments
			• Referenced in Tropenbos infobrief (Doc53)
			• Used by BAPPEDA Kotawaringin Barat to compare/ validate estate locations and size (Gov10)
			• Reportedly used by Wilmar to compare and validate plantation boundary data (Doc7, Res2, Res6, Res19, Res33)
			• Used by Greenpeace:
			  • To compare data used on Greenpeace's mapping platform (NGO3)
			  • Referenced in *Burning Down the House* report (Doc65, NGO3)
			  • Referenced in *Dying for a Cookie* report (Doc7, Doc36, Doc56, Res19)

		(Blog3, Blog4, Blog6, Blog10, Doc46, Gov12, IGO2, NGO3)
		• Useful to hold companies to account on NDPE commitments (Blog3, NGO3)
		• Complements similar tools, but has enhanced data (Res30)
		• Officials from West Kalimantan Forest Service expressed interest in the Atlas as a tool for forest monitoring (TR51)
		• Impression of utility for KPK to identify illegal plantations/concessions and conduct follow-up investigations of alleged cases using drone flight paths provided by portfolio researchers (Gov5, Res2, Res6, Res19)
		• KHLK is said to be critical of Atlas' data quality and sources of data (IGO6)
		• Useful to qualify impacts of deforestation on conservation of key species (Doc57)
			• Used by EcoNusa Foundation (Blog23, Doc6)
			• Used by Pusaka to corroborate data (Res19)
			• Used mills database to compare with WRI's Global Forest Watch data (Res7, Res30)
			• Used by IUCN in an action plan for sun bear conservation in areas experiencing oil palm-driven deforestation (Doc57)
			• Gaveau et al. (2016) cited 205 times, downloaded 1383 times, Altmetric score: 220[26]
			  • Cited by KHLK and Kerinci Seblat National Park Management Authority researchers (Macdonald et al., 2018)
			  • Cited by WWF researchers (Langston et al., 2017; Santika et al., 2017b)
			  • Cited by IUCN researchers (McAlpine et al., 2018; Meijaard et al., 2018)
			  • Cited by Borneo Futures researchers (Budiharta et al., 2018; Morgans et al., 2018; Sanitka et al., 2017a, 2017b, 2019a, 2019b; Voigt et al., 2018; Wolff et al., 2018)
			  • Cited by Borneo Nature Foundation researchers (Macdonald et al., 2018; Santika et al., 2017b; Voigt et al., 2018)
			  • Cited by Living Landscape Alliance researchers (Santika et al., 2017b; Voigt et al., 2018)
			  • Cited by various wildlife and orangutan conservation NGOs (Macdonald et al., 2018; Santika et al., 2018; Voigt et al., 2018)
			  • Cited by European Bank for Reconstruction and Development researchers (Ostfeld et al., 2019)
			  • Cited by Permian Global researchers (Asner et al., 2018)
			  • Cited by PT Austindo Nusantara Jaya (Santika et al., 2017b)

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[26] Gaveau et al. (2016) falls within the top five percent of all research outputs scored by Altmetric (indicating a high attention score for research of the same age and source).

Papua Atlas (continuation of GOLS C2 work)	Tailored product	• Useful visualization tool that is user-friendly and publicly available (Gov12) • Useful to compare with governmental data (Gov12) • Useful to monitor concession permits and violations (Gov12, IGO2)	• Used by Papua Plantation Agency to monitor concession permits (Gov12, IGO2) • Referenced on Papua's Plantation website (Gov12, IGO6, Res19, Web11) • Used by Gecko Project (Blog25, Res19)

Smallholder typologies and smallholder plantation maps (GOLS C3)
Jelsma et al. (2018)
	Knowledge contribution
	Tailored product
		• Useful to understand characteristics of the community, management, and compliance with regulations (Gov8, Gov10)
		• Classifications of smallholders illustrate heterogeneity and the need for diverse policy responses (Blog9, Gov4, Gov16, IGO2); one respondent questioned its applicability to the policy process (Res32)
		• Useful to assist with smallholder legality and integration into sustainable supply chains (Blog9, Gov8, IGO2)
		• Useful to identify eligibility for district government support (e.g., technical assistance) (Gov4)
		• Useful to consult when developing district government assistance programs and prioritize program delivery (Gov4, Gov8)
		• Opens new avenues of research (IGO2)
			• Satellite data used by LAPAN (Gov3)
			  • Spatial analytical methods applied by LAPAN in other contexts (e.g., West Kalimantan, Sumatra) (SWD)
			• Maps used by BAPPEDA Kotwaringin Barat to validate estate locations and size (Gov10)
			• Maps used by Kotawaringin Barat Plantation Agency to identify plantations located in forest-designated areas (Gov4)
			• Maps and typologies used to determine smallholder eligibility for governmental assistance (Gov4, Gov8)
			• Smallholder heterogeneity and compliance gap reflected in RANKSB (Doc7, Doc61, Gov4) and ISPO (Doc7, Doc62)
			• Referenced in GIZ policy briefs (IGO1)
			• Jelsma et al. (2018) cited 40 times, downloaded 247 times, Altmetric score: 3
			  • Cited by P3SEPKI researchers (Cadman et al., 2019; Luttrell et al., 2018a; Wibowo et al., 2019)
			  • Cited by WRI (Jefferson et al., 2020)
			  • Cited by Borneo Futures researchers (Santika et al., 2019a, 2020)
			  • Cited by PROFOR and World Bank researchers (Watts & Irawan, 2018)
			  • Cited by PT Riset Perkebunan Nusantara researchers (Sokoastri et al., 2019)

Scenarios (GOLS C4) *Sharma et al. (2018a)*	Knowledge contribution *Tailored product*	• Useful to control APL licensed for oil palm plantations (Gov22) • Useful to understand trends of deforestation in Indonesia (PS1)	• Used by BAPPEDA Kalimantan Barat in the implementation of land conservation (one task of RPJMD) (Gov22) • Sharma et al. (2018a) cited 1 time, downloaded 784 times, Altmetric score: 12

		• Useful to understand a sustainable intensification scenario is possible (PS1) • Useful input for development and implementation of a RPJMD (Doc7, Gov22, Res23, TR56)	• Cited by OPAL researchers (Hasanah et al., 2019b)
Companion Modelling games (e.g., ComMoDO, LUCOPE, ComMod ISPO) (OPAL) *Yulian et al. (2017)* *Hasanah et al. (2019b)*	Adapted method *Tailored product*	• Useful to understand dynamics and drivers influencing actors' decision-making in the oil palm sector (Gov6, Gov17, Vid5) • Useful to understand challenges for smallholder compliance with ISPO (NGO7) • Useful to reflect on consequences of policy decisions and improve participatory decision-making capacities in natural resource management contexts (Blog21, Doc19, Gov2, Gov6, Gov19, TR70) • Useful approach to facilitate multi-stakeholder discussions in polarized debates (Blog21, Gov14, Gov19, TR70) • Useful for communities to better understand their resources and how to sustainably manage them (Blog21, Doc17, Doc18, Vid2)	• Game experience discussed in governmental report submitted to the DG of Plantations (Gov19) • OPAL findings used to inform teaching (Blog13, Res14, Res20) • OPAL learning used to inform new projects and collaborations (e.g., SPOS Project, ANGIN-supported project) (Doc20, Doc24, Res6, Res20) • Yulian et al. (2017) cited 2 times, downloaded 555 times, Altmetric score: 9 • Hasanah et al. (2019b) cited 0 times, downloaded 147 times, Altmetric score: 19
Policy recommendations for the reflection of gender in RSPO (ERS Project) *Sijapati Basnett et al. (2016)*	Knowledge contribution *Tailored product*	• Provides information from the ground-level (PS2) • Useful to understand vulnerabilities experienced by women and smallholders (e.g., land rights, unequal representation, income differentials) (PS1, PS2, NGO4) • Useful to inform revisions to RSPO P&C (PS1, NGO4) • Useful to share in discussions with the private sector to coalesce around action point to improve working conditions for women via the DRLI (PS2)	• Used in literature review that informed revisions to RSPO P&C (Doc54, Doc55, PS1, PS2, Res3, Web3) • Used by RSPO Task Force (NGO4) • Used by RSPO's Human Rights Working Group (NGO4, Res3) • Used to inform gender debate in other commodities (e.g., seafood) (NGO4) • Sijapati Basnett et al. (2016) cited 2 times, downloaded 0 times, Altmetric score: 23 • Cited by Heinrich Böll Foundation researchers (Dewi et al., n.d.)

Appendix 8. Evidence of Outcome Realization

Legend: Outcome Realization

	Green = realized		Orange = not realized
	Light green = partially realized		Grey = insufficient evidence

Table 13. Extent of outcome realization, supporting evidence, degree of project contribution, and evidence rating for intermediate, end-of-project, and high-level outcomes

Expected Outcome	Summary of Results	Evidence Supporting Results' Realization	Evidence Rating: Low (L), Medium (M), High (H) Justification
Government actors learn from oil palm research processes and findings [intermediate outcome]	**EK** Government respondents perceived CIFOR's input on HCV definition, how to manage HCV, the role of local government in the management, and the academic draft to be valuable to support the development and ratification of the PERDA. Researchers involved in the project perceived the process and input facilitated by CIFOR to be intensive, informative, and valuable, as well as respectful to the smallholders (Res25, Res31). As the research process was collaborative, involving UNMUL, TNC, and GIZ, learning was mutual among facilitators and the officials from district and provincial level plantation offices (Gov7, Gov14, Res6, Res31). **GOLS** Government respondents from KHLK noted that the research carried out by the P3SEPKI team produced policy recommendations, particularly with respect to equitable CPO Fund allocation for replanting activities, and options for solving the oil palm tenure issue (releasing unproductive forest in the estate for conversion or through the social forestry schemes), and simultaneously built the research skills and knowledge base of the research team for oil palm (Gov1, Gov15). Some respondents responsible for the CPO Fund were not aware of the research (Gov16, Gov18). Some government officials from Kementan have developed an enhanced understanding of smallholder complexities (Gov8, Gov12), which helped to further recognize the need to integrate this learning in developing targeted policy and program development that embraces the heterogeneity of smallholders for replanting programs (Gov10, Gov16, IGO3, IGO7, Res9, Res17). Spatial visualization in the Borneo and Papua Atlas tools, and the large-	**General** "*they* [CIFOR] *like to do interviews, but the feedback is* […] *not back, even though we need it too*" (Gov18) **EK** "*In East Kalimantan, we did, only at that time because it was indeed to support the draft of the plantation,* […] *the output was limited to the plantation allocation area, in the spatial plan, so we plot,* […] *'I see, oh this is the HCV on the plantation'.* […] *Well finally, that output eventually became a very important input for the drafting of the sustainable draft regulation, which until now has been in the PERDA*" (Res25) "*they* [CIFOR] *are helping us with preparing regulations on certain programs, this is mainly in the handling of HCVs* […] *in the context of sustainable plantations, but previously we only just received information, so I just open my status from the CIFOR website, we see it, actually we are helped by seeing it, but it is better if we can describe the results here, so we are proactive here. We can see, maybe we can exchange experiences from its policies, so that this material more or less sharpens our policies, our programs, our activities going forward*" (Gov14) **GOLS** "*P3SEKPI researchers have conducted research activities well. CPO Fund research has produced relevant policy recommendations, especially in terms of the need to rationalize the proportion of CPO Fund allocation, which is more equitable, that is not only for biofuel development, but is proportionally improved for the replanting of*	**H** **Realized, clear portfolio contribution** Evidence from government actors engaged by the portfolio (except for the ERS Project, where government actors were not interviewed to discuss their learning) and document review indicates portfolio findings stimulated learning among governments by providing data, facilitating the exchange of ideas in workshops, or co-developing solutions through the research process.

scale vegetation maps, have been useful for governments to learn and better understand the areas in their jurisdictions; for example, officials in the plantation offices in Papua and Kalimantan Timur, and BAPPEDA staff in Kotawaringin Barat have used these tools as an independent source to verify concession boundaries when issuing permits, and after issuing the permits, to know what the impact has been in terms of how much deforestation has resulted (Doc7, Gov8, Gov12, IGO2, IGO3, Res28). Scenarios were perceived by project researchers to be of interest for their tangibility for planners and government officials, and were intended to be a useful input to implement the West Kalimantan's RPJMD (Res23), particularly with respect to the optimal area size needing to be controlled in the licensed areas of the province that have been issued licenses but have not yet planted oil palm (Gov22, TR56).

OPAL

Government participants learned from the research process, noting that the games helped them understand the consequences of decisions, provided a space to practice decision-making, understand different perspectives of drivers behind the decisions that shape the dynamics of oil palm expansion, explore challenges (e.g., ability of smallholders to comply with ISPO), illustrated new ideas for multi-stakeholder facilitation, and demonstrated areas for collaboration and solutions (e.g., company and smallholder partnerships) (Blog21, Gov2, Gov6, Gov19). Government representatives from Kementannoted that this learning made them more aware of potential challenges and to be careful when making decisions and devising strategies for smallholders (Gov2, Gov19).

ERS

Government representatives attended a multi-stakeholder dialogue entitled 'Governing oil palm for gender equality and women's empowerment' (TR5). Feedback to the workshop indicated appreciation by participants to have an opportunity to share ideas and learn, noting that time was a limiting factor (Doc30). Discussions focused mostly on identifying challenges and problems, which expand understanding on issues from multiple perspectives leaving little discussion of solutions (Doc30). News media suggests that the Minister of KHLK was aware of gender-blindness in the sector, citing the research as a source (Doc45). New commitments to include a gender impact assessment to be included in environmental impact assessments prior to awarding licenses was based on a growing recognition that large-scale

smallholder oil palm plantations for increased productivity. From the topic of land tenure, the results of this research will provide various options for solving the problem of oil palm in the forest area of around 3 million ha. One option is the release of unproductive forest areas for conversion or other options through the Social Forestry scheme" (Gov15)

"*I think with the typology we can see the characteristics of the community, in Kotawaringin Barat District, how they manage the plantation, how obedience and compliance with regulations, here we can see the characteristics of the smallholders [...] but the data provided is very helpful, very helpful for the local government in identifying smallholder oil palm plantations*" (Gov10)

"*This* [CIFOR's maps] *is an application that helps, this can only help, but it cannot become our guideline, the sources of the map later, there must be a forestry official who confirms, that this is the permit for the location of the area to be liberated*" (Gov12)

"*the Atlas does seem to be very, you know, nicely designed as a tool for monitoring, you know, what happens over time in plantations, looking backwards and it's an accountability tool. I kind of hear that it's gotten a positive response from governments around in Papua*" (IGO2)

"Some expressed that this type of scenarios would provide useful input to the development of mid-term development plan or Rencana Pembangunan Jangka Menengah Daerah (RPJMD), currently being prepared by local stakeholders in West Kalimantan. Discussions on scenarios would also provoke useful discussion among stakeholders and provide useful input to the current review or peninjauan kembali of the province' [*sic*] spatial plans" (TR56)

"*CIFOR's research* [on scenarios] *is very helpful in determining the actual size of the optimal area that need to be controlled. This is to control the development of licensed areas for oil palm plantations. This is due to already built plantations of the licensed areas are only around 1.9 million hectares*" (Gov22)

"*For example, the research [...] considered having that particular map, a sustainable development scenario it can happen, so it is something that is in the minds of RSPO secretariat to know that this is an option that we can go to but of course decision making is not just this is how you*

industrial plantations have uneven social impacts, with women disproportionately experiencing negative impacts; it is likely that the ERS Project contributed to the learning on this aspect (Doc45).

Portfolio

Overall, there is evidence that some government officials involved reached by the portfolio have learned from research findings and processes by having increased access to relevant data and information (e.g., maps, spatial analyses, smallholder typologies, scenarios), having opportunities to share ideas and discuss in unique multi-stakeholder forums on a particular aspect of oil palm (e.g., games, gender dialogue), and receiving inputs to policy processes (e.g., academic draft for PERDA, policy recommendations for CPO Fund allocation and mechanisms for resolving tenure). This outcome was realized through strategic project engagement and networking with government officials and RSPO with the interest and mandate of realizing inclusive oil palm, which is on the political agenda (Gov12, PS1, Res15, Res19). All projects aimed to promote collaborative action and uptake of research, both in the research process, and when sharing findings through relevant networking opportunities (Res2, Res3, Res6, Res10, Res18, TR77). Improving the presence and access to data that is otherwise cumbersome to retrieve has supplemented government official's databases and knowledge pertaining to oil palm, particularly at the provincial and district levels (Gov12, Res1, Res2). There are other organizations supplementing the knowledge base, with similar data, research findings, and/or messages which corroborates the importance and relevance of the research, and further contributes to the realization of outcomes. Other organizations conducting research are raising attention to gender disparities in oil palm labour, smallholder typologies and heterogeneity, mapping the impact of oil palm expansion, and on HCV areas to be conserved (IGO2, NGO3, PS1, Res1, Res6). CIFOR's strength in independence, rigour and credibility was noted by many respondents to be the distinguishing feature (Gov9, Gov18, IGO2, NGO3, PS1, PS2, PS3). Many respondents could not recall the specific details of CIFOR's oil palm portfolio, and noted a lack of communication and feedback with the results, indicating that there is scope to increase the participation of target audiences in projects in order to expand the sphere of influence of the research (Gov17, Gov18, IGO2).

should proceed, it also involves engagement with governments and other parties, everyone who is involved there has to agree this is the way forward so at this moment right now, RSPO is still working on engagement with governments and the different parties that are involved in those countries, but once that has been settled, or organized, then we can say okay this is something we can consider, research has shown us that this is something that can work" (PS1)

OPAL

"Participant Ms Ita Munardini, the head of plantation processing and marketing [unit in the Ministry of Agriculture], said in her closing remark that "this game is positive, reflects a portrait of ISPO with its components, offers us to reveal problems, a useful tool to further refine plantation development policies"" (Doc19)

"*when we decide to provide policy recommendations to the leadership, […] we are careful enough, it turns out that the level of difficulty we remember, 'Oh yes, apparently it is not easy', so we are more sensitive to see what it is, give a review or assess, yes, especially in deciding to give recommendations to the leadership, that's the most important thing*" (Gov19)

ERS

"Issues on gender are highlighted and discussed at length at the small group discussions, but solutions are yet to be identified. […] Overall good workshop for knowledge sharing in oil palm farm and gender equality" (Doc30)

"A recent commitment by Indonesia's environment and forestry minister, Siti Nurbaya Bakar, may see a greater role for women in land-use decisions. In March 2018, Siti pledged to include a requirement for a gender impact assessment to be conducted as part of environmental impact assessments that must be undertaken by companies before any development projects, including oil palm plantations, can be issued a full license to operate. The minister's commitment reflects a growing recognition that large-scale industrial plantations have uneven social impacts (https://www.cifor.org/library/5579/socialimpacts-of-oil-palm-in-indonesia-a-genderedperspective-from-west-kalimantan/), with women disproportionately experiencing negative impacts including loss of control over sources of

	food and income, compounded by difficulties accessing social benefits. Such safeguards go some of the way to giving women in rural Indonesia greater decisionmaking powers over the land on which their livelihoods depend. If implemented, it could go some way to ensuring that the full implications of a development project for social inequalities and food security are considered, and to ensure that land acquisition is based on truly informed consent" (Doc45)	
Government actors build their capacities and relationships within the oil palm sector [intermediate outcome]	**EK** The EK Project supported the facilitation of multi-stakeholder processes, which fostered mutual learning and technical capacity-building for those involved in the process of drafting the academic script (Gov7, NGO7, PS6) and the PERDA (Gov2, Gov21, NGO7, Res25, Res31). Evidence of improved capacity and relationships is also observed through the request of CIFOR to be a board member on the FKPB in East Kalimantan (Gov2, Gov21, NGO7). This forum is mandated in the PERDA with aim to improve the inclusive decision-making process, particularly in solving conflict in plantation sector. **GOLS** Respondents gave the impression that the partnership between P3SEPKI and CIFOR resulted in increased research capacity of P3SEPKI researchers on oil palm and specific knowledge on tenure and CPO Fund issues (Gov1, Gov15, IGO3, Res6). This has translated to others in the KHLK, increasing institutional knowledge and confidence when providing ministerial briefings on oil palm issues, and determining policies related to oil palm (Doc7, Gov1, Gov3, Gov15). P3SEPKI continue to publish research citing portfolio outputs and CIFOR researchers. Other components of GOLS supported government capacities by providing data resources to supplement data available to governments. Capacities and relationships of subnational government officials and local universities were perceived to have increased with their involvement in smallholder research in Kotwaringin Barat (Gov8, Gov10, PS3) The project had an official MoU with LAPAN (and BAPPEDA Kotawaringin Barat) (TR76), and the relationships built during the project expanded LAPAN's networks and opportunities to co-author research (Gov3). The open cooperation offered LAPAN researchers a "*deep research*" (SWD) experience and they learned how to collect data, synthesize, and communicate data from the field and remote-sensing. Subsequently, LAPAN has	**EK** "*It was more collaborative, supporting processes, deliberation, a lot of. We worked together, but we have a specialist here, who helped particularly the local government, because one of the challenges for local government is the lack of capacity to do this kind of spatial analysis. Even at some point they have maybe resources, they have people trained in this, but then now I have heard that have been moved to other institutions and other organizations*" (Res6) "*It was both sort of bringing in the right actors, stakeholders, so really facilitating a sort of raising and getting people together, sort of to exchange information. And the other was basically sort of the input to developing that regulation. So one needs to be done, so CIFOR was part of that, so giving technical and legal advice, 'Is this necessary? Is it too elaborate? Or overlapping with other regulations?' to really ensure that the final regulation really is as strong as it can be*" (PS6) "*The government has learned a lot there,* [government actor] *who was involved a lot. 'Oh, it turned out like this, it turns out this way' compared to his experience in the field it would be so good, 'if I look for it, how come I don't see any of this', because the caliber of the world helps*" (NGO7) "*Yes, in the sense of increasing capacity,* […] *because there are some new things that we find out,* […] *like mapping, but after doing there are calculations that we don't know about it. Suppose we didn't get* [that] […] *there's a role for CIFOR, CIFOR or someone else.* […] *Yesterday because we were also limited, the team* […] *from the plantation office, at least two of them* […] *from the spatial planning office, one from the environmental service one*" (Gov7) **GOLS**	**M** **Realized, clear project contribution** Limited evidence from government respondents pertaining to characterizing changes in relationships within the oil palm sector resulting from research activities. There is variable emphasis on capacity and relationship development across the portfolio.

applied these methods for spatial analysis to other contexts (e.g., West Kalimantan, Sumatra) (SWD).

OPAL

Government personnel involved in the projects appreciated contributions of project personnel aiding with mapping queries on an *ad hoc* basis, this was welcome to be continued (Gov7, Gov14). CIFOR are training government staff in Kutai Kartanegara in mapping, requested as a follow opportunity from the EK Project. Games provide a suitable tool for participatory natural resource management, encouraging stakeholders to sit together and have constructive dialogues, thereby building decision-making capacity; government officials participating in the games noted this to manifest as more careful consideration of the implications of their decisions for those affected by them (e.g., smallholders) (Blog21, Gov2, Gov9, Res10, Res16, Res18, Res24). While OPAL researchers and project documentation illustrates the intention to build relationships through the games, government respondents who had played did not specify how their relationships had changed.

ERS

Limited evidence. This project aimed to engage with governments via RSPO, hosting a dialogue (TR5), and working with other multi-stakeholder conveners, and did not directly target changes in government capacities and relationships through its research activities. A government representative from the Ministry of Women participated in the multi-stakeholder dialogue hosted by the ERS Project (Doc30), but none joined from the KHLK despite being invited (Res3).

Portfolio

Some projects had a more explicit capacity and relationship building component than others, depending on the levels of engagement and participation of target audiences planned and implemented. CIFOR's oil palm research contributed to increasing the government's data capacity (in terms of volume and accuracy), technical capacity (i.e., how to do mapping and spatial analyses), and decision-making capacity (i.e., awareness and understanding of oil palm issues from different perspectives) (Gov2, Gov3, Gov7, Gov8, Gov9, Gov14, Gov15, Gov19), which also in some cases strengthened relationships and trust between these officials, CIFOR, and portfolio partners. Changes in government staff have proven challenging for sustaining capacities within the institution (Gov8, Gov10, Gov14, Res6). There are indications that more

"*The collaborative research between CIFOR and P3SEKPI above contributed positively to my work […] especially to increase my knowledge of palm governance. In addition, together with the P3SEKPI research team, I am more confident in assisting the Minister's task in determining policies related to oil palm*" (Gov15)

"Building on the knowledge from GOLS research, our research partner from P3SEKPI has become the go-to research group for palm oil issues within the Ministry of Environment and Forestry" (Doc7)

"*if the Minister gets asked for a policy review or there's a hot issue regarding the palm oil and forestry, we have to review, we have to analyze that issue, and make a report to our boss, to our director, to our head of FOERDIA* [Forestry and Environmental Research Development and Innovation Agency]*, and then later the head of FOERDIA deliver it to the Minister or to the other ministries*" (Gov1)

"*I rate it well, because the first is personally quite intense, and also meetings are often held regularly, then the third also produces output in the form of scientific publications, then the fourth can be implemented by the local department. […] if the others are of course we can interact with many parties, individually I can interact with CIFOR friends I feel the link […] the network becomes wider*" (Gov3)

"*So yeah, I do think that we're collaborating with civil society more, we're collaborating the private sector more. We can still do it more, of course, I think we can do a more, in our research have a stronger capacity development component […]it's a bit more investment, but these are people which are going to carry that and which are going to learn about things on the ground and carry them forward in their activities and their engagements. So how we set up our research becomes then quite important*" (Res5)

"*what was important in the invitation was that we wrote to CIFOR in the form of a good relationship between the ministry and CIFOR*" (Gov13)

"[In the absence of CIFOR] *There are differences, especially in terms of data, spatial data related to community plantations, I think that is most important here. We can see how much land is used by communities for oil palm plantations, […] and we can also see where land is*

participatory projects and activities make greater contributions to the realization of this outcome. Those who have collaborated with CIFOR more intensively tend to value the experiential learning and networking opportunities (Gov3, IGO5, NGO7, Res25).

Other organizations are actively working to increase the capacity of district staff to update spatial data, and there is likely scope for greater collaboration with those actors (e.g., INOBU, WRI, etc.), and others in the system to bridge the capacity and relationship development gap in future projects (Res5, Res7, NGO6). However, CIFOR should consider carefully the potential benefits and risks of any partnership.

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owned by only a few people, which is owned by one person in large numbers" (Gov10)

OPAL

"*The idea is not so much to deliver solutions, it is more to engender a discourse among people who are typically in conflict or who have complex challenges to address and the games help them see a way through that and many of the conflicts, and develop many strategies to some of the problems that they face*" (Res10)

"*The relationship that we wanted to create with the stakeholders is exactly the nature and kind relationship we wanted to create among each other within the* [OPAL] *project*" (Res16)

"*I also saw it was very good, so we support once from CIFOR's assistance, hopefully it can be sustainable.* […] *if the changes are* […] *very good,* […] *so we already have the data, so if the change is a matter of accuracy, sir, so far we don't have really accurate data.* […] *with CIFOR, this will help us to have a very accurate data that we want to present, if not accurate we don't want to present it*" (Gov9)

"[We are] *helping them through it, you know, what can they do themselves. You know? And what relationship they can build with others, external entities outside their village. Something like that, that's something maybe the implications at the village-level and also at the regional-level*" (Res24)

"*Yes, invite people, invite multi-stakeholders there, feel and experience and can provide something better solutions, so the experience of the field, the field conditions will be in class and simulated in the modeling, I feel it helps a little*" (Gov2)

| Government actors engage CIFOR & partners to help make informed decisions on oil palm

[intermediate outcome] | **EK**
Government actors perceived EK researchers to bring expertise to the PERDA development process that was critical to shaping the regulation, and resulted in CIFOR being appointed by the provincial government to facilitate and assist the government in preparing an HCV map for Kutai Kartanegara and remain involved in ongoing meetings to prepare the pergub in East Kalimantan (Gov14, Gov21, NGO7). Owing to EK Project contributions, progress in decision-making was made regarding the provincial-level Forest Carbon Partnership Facility commitments, which | **EK**
"*they are helping us with preparing regulations on certain programs, this is mainly in the handling of HCVs* […] *in the context of sustainable plantations, but previously we only just received information,* […] *maybe we can exchange experiences from its policies, so that this material more or less sharpens our policies, our programs, our activities going forward* [...] *they* [CIFOR] *are open, meaning that if we are wrong, 'please let us know'*" (Gov14) | **M**
Realized, clear project contribution
Government respondents were able to articulate their appreciation for CIFOR and partners oil palm |

proceeded quicker than in other jurisdictions assisted by other development partners (Gov10). Several activities started in the EK Project have carried forward in the ongoing OPAL Project. The engagement between government officials and EK Project partners (including TNC) became more intense as several meetings focused on the academic script were held in CIFOR's office in Bogor (NGO7, Res31).

GOLS

Engagement between Kotawaringin Barat government staff, university students, and CIFOR was intense as the fieldwork was done collaboratively to collect smallholder data, and better understand the situation (Gov8, PS3). Turnover of government staff in Kotawaringin Barat is a challenge for sustained changes after project engagements, as staff move into other positions with different agencies (Gov10).

Smallholder typologies and maps were perceived to be useful in raising government attention to the issue of smallholder heterogeneity not being represented in policies and programs aimed at assisting smallholders, give a clearer picture of the area and land ownership (and overlapping land use and the extent to which smallholders have encroached on the forest estate), were perceived useful to make decisions at the plantation agency on issuing permits, how to provide better support programs for smallholders, and reflect weak points with respect to smallholder compliance in ISPO (Gov2, Gov4, Gov8, PS3, Res5). CIFOR contributed to discussions facilitated by the Coordinating Ministry of Economic Affairs aiming to solicit input for the strengthening of ISPO standards, and brought perspectives on smallholder typologies and complexities to a multi-stakeholder meeting to prepare the Inpres on ISPO (IGO3, Doc7).

CIFOR and partners have been involved in providing input to RANKSB through their membership with FoKSBI, and have participated at corresponding events (IGO3, Doc7). Participation of researchers in working groups facilitated by UNDP SPOI, a process which contributed to the development of Inpres 6/2019 on RANKSB (Gov4). The input from CIFOR on smallholder typologies was noted to be beneficial (Gov4).

The P3SEPKI team has engaged with the research on options to resolve the palm oil issue within the state forestry area, and have indicated their participation in the project helped develop their recommendations for policy mechanisms to target (social forestry, and the regulation on land control in state forest area), and that

"*In the experts, because CIFOR itself has a significant contribution, I think, yes, when we compiled the plantation regulations* […] *We have been invited to a meeting a number of times here in Bogor, yes, I think this has contributed to the drafting process, including the preparation of articles, because our regulations have been arranged in a participatory way,* […] *since the beginning, it has involved all multi-stakeholders related from NGOs from the company*" (Gov21)

"*Well, this is CIFOR's support. Aside from the pure research side, all of it is from the independence of a research,* [CIFOR] *also supports the process of a policy, for example for drafting a draft regulation, there is a lot of support from CIFOR., Then this long list of governor's regulations, and many other things supported by CIFOR, in my opinion. East Kalimantan still needs CIFOR's support for that*" (Res25)

GOLS

"*CIFOR is one of the international research institutes that still maintains stringent values of scientific study procedures, both in terms of methodology and theory, which makes it still credible to influence, not only in the discourse of world scientific knowledge but also in terms of public policy*" (Gov15)

"*Yes. That means there is a change, meaning that it* [CIFOR's research] *makes it easier for us to take such steps* […] *I think a lot of thing in the Inpres is sourced from the results of research from CIFOR, that CIFOR provided significant input on real facts on the ground in our region*" (Gov4)

"Through GOLS scientists' engagement we contributed to two main policy processes at national level: (1) as a member of FOKSBI (a multistakeholder platform by the Ministry of Agriculture) GOLS contributed to developing a national action plan for sustainable palm oil in Indonesia; (2) as a member of Tim Penguatan Sistem Sertifikasi Kelapa Sawit yang Berkelanjutan, a team commissioned by the Coordinating Ministry for Economic Affairs, GOLS contributed to strengthening the sustainable palm oil certification system. Through these processes we provided input in: (a) the development of National Action Plan on Sustainable Palm Oil, (b) development of database on

research, but were in some cases unable to specify exactly how it helped inform which policy decisions beyond characterizing the research as one of many inputs to a participatory processes (e.g., ISPO, PERDA, pergub, RANKSB, and Presidential Instruction No.6 2019). Government respondents were not interviewed to assess the outcome realization as a result of the ERS Project.

maps they generated in GOLS helped identify the size and location of plantations located in the state forest area (Gov1, Gov15). A position paper prepared by the P3SEPKI team is said to be consulted as a handbook for palm oil diplomacy by the Ministry of Foreign Affairs (Gov1).

Scenario models were expected to be useful for BAPPEDA to apply to the RJMPD (Res23, TR56). However, the policy window to inform the RJMPD development was missed as the results were delivered after it was developed, however the research has been used to inform strategies to control the development of oil palm plantations in APL areas that have already been licensed (Gov22).

The spatial visualization possible through the Papua and Borneo Atlas has provided an additional data source to the official system that is consulted by the provincial Forest Agencies during license reviews to better understand the planted area claimed by companies and monitor the expansion (Blog10, Doc7, Gov8, Gov12, IGO2, IGO3, Res19, Res28, TR51). Scope for possible integration with One Map has been discussed to improve government access to spatial data (Doc7, Gov12). The large-scale vegetation maps provide more detail than other available sources; respondents report that district and provincial governments in West Kalimantan are using the map to identify independent smallholders and as a basis for social forestry. These maps are said to be of value in filling a gap and a need for the accurate identification of HCV areas; at a scale of 1:50000, it allows 45 rather than 23 vegetation categories (Gov11, Res1, Res28).

However, the Atlas and vegetation maps cannot be used as official data sources by the government as these data and tools are currently not endorsed and recognized by the KHLK (Gov11). This demonstrates that CIFOR needs to have more effective strategy with regards to early engagement, coordination, and communication with Kementan and KHLK to increase research utility.

OPAL

The assistance provided by OPAL researchers and partners in the Companion Modelling games was appreciated by government actors to enable critical reflection and provide practical insight on the policy strategies to think through the regulatory implications from multiple perspectives, to become more aware of problems and issues that need to be reflected in policy recommendations and decisions (Gov2, Gov6, Gov7, Gov14, Gov19, Res16). It was hoped that such supportive collaboration could continue. It is

smallholders and growth yield, (c) increase awareness among key stakeholders of smallholder heterogeneity and the importance of taking different typologies into account when policies such as CPO fund allocation and agrarian reform are to be implemented with appropriate smallholder target.[…] The ecological vegetation maps with detailed classes are also being discussed by CIFOR, BIG and Ministry of Environment and Forestry's Agency for Forest Planning and Environment on how they could be part of one-map policy databases. We also worked closely with the District Plantation Office in Kotawaringin in Central Kalimantan to resolve issues facing smallholders whose plantations are located in kawasan hutan" (Doc7)

"*it is quite difficult for us to identify, to map the independent smallholder oil palm plantations, because it is quite expansive and it is not compacted and* [there are unclear boundaries] *and sometimes mixed with other crops. So we use the map for West Kalimantan as* […] *our reference to identifying the independence of smallholder plantations. The map from CIFOR is quite useful for us, because of the classification of the landcover is quite detailed* […] *I think government is quite happy with the map, because the map is quite detailed,* […] *I think it is good, I think the map is also developed in other provinces, yes, because there is quite good information about the detailed land cover. The classification is quite detailed. We have map from KHLK, but only 23 classifications. When the CIFOR map has 45, it is more detailed. I think it is also useful if this one is used for developing in other provinces, the map could be a basis to identify HCV at the landscape level*" (Res28)

"*CIFOR is a good thing, a research institution* […] *that can support engagement, engagement data related to mapping, but that should be coordinated*" (Gov11)

"'As a monitoring tool, this atlas is very useful,' said Sasmita Nugroho of the Directorate of Prevention of Impacts of Environment and Sector Policy. 'It can help detect [incidents] quickly, before further steps can be taken. This is a very reliable support tool to add to our existing official system'" (Blog10)

"*For example, we can also link information with which company, the big company is confused with people's plantations, so we can get the information, so we can*

indicated that in some cases, OPAL workshops were held to respond to requests from subnational governments to provide input to policies governing oil palm development entering review (Blog21). Assessments of smallholder readiness for ISPO have proven useful to inform policymaker responses that are expected to enable smallholders to be able to comply with sustainable oil palm practice (Gov2). Advice to the National Action Plan has been provided by OPAL researcher participation on FOKSBI to share complexities faced by smallholders as portrayed in the games. According to project researchers and documentation OPAL students have been engaged by a coalition of district governments (LTKL) interested in implementing sustainability, and have shared lessons from the games (Doc18, Doc19, Res14). However, engagement during the games was not followed up in some cases, and one government staff noted they did not know how to use his experience of playing the game to improve the situation since no further guidance from CIFOR after engaging him into playing the games (Gov6).

ERS

Insufficient evidence to fully assess. Workshop feedback from participants (including governments) indicated that while the information provided was good, and making the event public was appreciated to facilitate the sharing of ideas, there was insufficient time (Doc30). KHLK representatives declined the invitation to participate in the dialogue (Doc30, Res3). Turnover of researchers has also proven challenging to sustain continued engagement for CIFOR and the government on this topic during and following the project (Res3).

Portfolio

Research dissemination and engagement strategies have raised the profile of CIFOR and partners' research on oil palm among government actors by leveraging diverse networks (Gov4, Gov8). Portfolio engagements have led to strengthened relationships and positioning within the oil palm sector that have resulted in new opportunities for CIFOR and partner researchers to conduct follow up support, as well as for corresponding outputs to be consulted in decision-making (Gov2, Gov6, Gov4, Gov7, Gov8 Gov14, Gov19, Res16). The consensus among government actors at all levels who were involved in projects is that they appreciate CIFOR and it's partners' contributions and hope they continue to increase knowledge and information resources from field experiences on which policy decisions can be taken through their active

review, what are the patterns we need applied, 'here are the people's gardens, here are the large plantations', […] there we get some kind of information. That is very important, yes" (Gov8)

"*We maybe sent, like, in the policy, they can use the maps. I think yeah… so they know about the forest area, the size of the forest… the size of palm oil that is located in the state forests*" (Gov1)

"*Yes, the positive experience means that, the research Yes, we discussed together with stakeholders so that people can see the benefits and the results were discussed at the national level and did not rule out the decision material also means supporting our efforts to improve the oil palm plantation system. for benefit, one example might be after contributions to Inpres No. 6/2019*" (Gov4)

"*Okay, and we feel that it* [Papua Atlas] *is very helpful for us to be able to monitor the growth of palm oil, now that it becomes accurate, when the source data is accurate, for example there is a change in data from our HGU, we can, we see, we can see, there is permit is permitted or not, it is most important for supervision, at least we have a comparison,* […] [for] *monitoring our company, we have a map like this, meaning we have material to permit that the conditions are like this, now the connection with the Papua principle, I have conveyed with CIFOR that we are lacking spatial personnel, that is becoming common in Indonesia, I see that spatial power is lacking in plantations, so that basic training, geographical information systems, and the Papuan Atlas, will be carried out* [in the] *near future, we are looking for time*" (Gov12)

OPAL

"[Companion Modelling] *gives more practical insight*" (Gov6)

"In particular, the workshop was intended to provide input to the development and revision of local regulations governing plantations and partnership. This is in response to the request from local authority to OPAL project team to provide input to two major district policies governing oil palm development currently under review, namely on the governance of plantations (Peraturan Daerah No.6/2014) and partnership between local communities and oil palm companies (Peraturan Bupati No. 1/2016)" (Blog21)

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involvement in policy development platforms (RSPO, ISPO, RANKSB, Presidential Instruction No.6/2019, PERDA and pergub in East Kalimantan), which have stimulated new partnerships and collaborations moving forward (Doc7, Gov2, Gov3, Gov4, Gov7, Gov8, Gov9, Gov13, IGO3, IGO6, PS1, PS2, PS5). For example, engagements from both GOLS and OPAL have led to CIFOR's involvement in advisory processes around the RANKSB. Likewise, CIFOR assistance with developing the PERDA through the EK Project has led to opportunities to influence the PERDA's implementation through the pergub, and increase mapping capacity among government officials at the provincial and district levels (Doc7, Gov14, Gov21, NGO7, Res10). It was perceived by some respondents that open-mindedness to hearing from multiple perspectives in negotiations, mutual value for sustainability goals, and appreciation for additional expertise are key facilitating factors to realizing the outcome, indicating CIFOR is in some cases targeting government officials with the willingness and collaborative spirit to integrate inputs from research as a supplemental source of information on which to base their decisions (Gov1, Gov4, Gov14).

CIFOR's reputation from other projects in other areas, as well as their international affiliation have also contributed to the perception that they bring credible research to policy processes (Gov3, Gov4, Gov7, Gov14, Gov21, PS1, Res25, Res32). Official endorsement remains a challenge for official use of certain outputs, for example vegetation maps and the Borneo Atlas, and there is scope for improving communication and collaboration with certain agencies earlier on in projects to inform of the research, receive input and feedback while simultaneously building the foundation for trust and buy-in, as opposed to delivery of results at the project's end (Gov1). Leveraging the existing knowledge base and relationships have proven challenging considering research personnel turnover, and it was suggested that targeting national policy changes would be more impactful than focusing on the local (Gov4, Res3). CIFOR's lack of follow up on results and turnover of government staff are key challenges for long-term government engagement (Gov4, Gov6).

"*For example, we have obtained information that there is data from IPB for example, how is development ... certification for farmers* [smallholders] *is about how they have research studies that might be conveyed. Then from not becoming oil palm, for example sugar cane from what it is research centers such as* [the] *Indonesian Sugar Research Center, from all sorts of things, we have asked them to do a research, then we make the results of the research as the basis of policy-making*" (Gov19)

"[referring to playing the Companion Modelling game that simulated the ISPO case] *we talked about this and that, woo but no, like that we appeared, yeah. Apparently, this needs to be strengthened, oh it turns out it's weak,* […] *I think if it continues to be developed. I think that it will change the perception of policy each region, because this was never thought of by us. Always we only focus on focus discussion, is it not clear by releasing like that, everyone will be invited to think of having a solution, and experience themselves, both top level, and farm level, and we have proven this*" (Gov2)

"*because of the deep engagement process, we are now involved in developing and advising on the national plan for palm oil*" (Res10)

"Upon invitation from the organizer Lingkar Temu Kabupaten Lestari – a new coalition that brings together district govermments [*sic*] committed to implementing sustainability. Key people from national, provincial and district agencies (mostly in Sumatra) who are concerned with green growth development, sustainable development and landscape approaches attended […] The OPAL team was invited to share lessons from the innovative tool they use, that is companion modelling (role-playing games) to help stakeholders learn about complexities around oil palm sectors, and to explain how such a game could help facilitate dialogues and decision making in constantly changing landscapes" (Doc18)

"*Now the involvement is to facilitate, which means especially achievements in the framework of thinking of regulations that we need to emulate, we need to highlight so that what we make in the agreement, in the same direction* […] *will be requested by the province and the center, so CIFOR's role is quite large. in order to help us, this*

assistance, hopefully, this communication, then this collaboration can continue" (Gov14)

"*Become aware. Yes, […] for example, it has to do ISPO certification, it turns out that is hard for the planters, it turns out it's not that easy, […] so that by knowing their difficulties at least in determining our policy we will be more careful, and will accommodate, look for solutions, the layout what if later applied to the planters for example, what if later applied by other stakeholders for example, we become more careful […] because I just know for this one, I just know there are a lot of CIFOR studies, maybe yes in this variety, but I only know about those glasses* [perspective, view] *but from that aspect only, from one it has brought the least impact on personal, or my friends, that oh it makes us aware too. So in our opinion it is significant to what […] gives that recommendation*" (Gov19)

"*we have managed to get officials from the government of Indonesia questioned and critiqued the strategy of their ministry thanks to the understanding this game from playing. Small scale producers, in a game that represented the policy changes the ministry wants to implement. This is something that cannot happen normally*" (Res16)

ERS

"*I feel like there is a lot of institutional amnesia, […] there is no trace of anything that we have done in the system, rather than constantly generating new work there is also, it is also important to reflect back and compile and collate and then use that to inform policy, whatever that is*" (Res3)

General

"*Probably all the involvement in this or* [CIFOR researcher's] *involvement in this for* [ISPO] *strengthening,* [a CIFOR researcher] *is on the national action plan and* [a CIFOR researcher] *is on strengthening, I think they* [the government] *use our findings to feed into the process, […] involved in multi-stakeholder groups, negotiations, on the key processes*" (Res17)

"*What is clear is that CIFOR is here to give […] the repertoire of knowledge. How the government sees the problem of Indonesia is not only based on policy […] but also sees the results of research, including from CIFOR as one of the considerations. When the government wants to deliver a policy, or wants to continue with existing policies,*

		or improvise from existing policies, so the government needs CIFOR as a partner, as well as research institutes, according to its proposals, according to their main tasks and functions, according to their timings" (Gov13) "*Data related to farmer groups that are worthy of being the object of research, in order to support the development of environmentally friendly plantations, they do that, and they examine their readiness to what extent, well that's what we get yesterday and it was input, so that the next workshop needed, for improvement and where the point is, the farmer is for us to encourage the acceleration of preparation to participate in environmentally friendly programs in the community, that must be followed up on, and until now I am waiting actually , where the critical point is, so we can analyze and be able to carry out other policies, that's the first*" (Gov2) "*[CIFOR's] role is very decisive, good role, to guide us*" (Gov9) "*Basically on the data quality and also, how you get the data, […] but with the local government, they are very receptive, they are like wow, this is great, can we integrate it in our own planning for example and you see their excitement*" (IGO6)	
Policy-makers create new or adapt existing policy on oil palm (informed by research) [EoP outcome]	**EK** Respondents noted that CIFOR's scientific contribution and experience brought nuance to the policy development process that enhance reflection of types of HCV, incentives for companies to identify and manage HCV areas, and the scope of the definition of a sustainable plantation (Doc59, Gov2, Gov21, Gov14, Res31, TR10). The PERDA defines sustainable plantation as the development of plantations that are carried out sustainably with due regard to economic, socio-cultural, and ecological aspects. The PERDA also regulates the scope of sustainable plantation include: Planning for plantation development; land use for plantation; seedling; plantation cultivation; plantation business; processing, marketing and pricing; environmental management; research and development; data and information system; conflict management; monitoring and supervision; investigation; sanction; financing, and valuation and evaluation (Doc59). The PERDA outlines regulations for land permits, new measures to enhance biodiversity and conservation efforts through outlining the need to set aside HCVs, and a new communication forum (i.e., FKPB) (Doc59). It	**EK** "*In the experts, because CIFOR itself has a significant contribution I think yes, when we compiled the plantation regulations*" (Gov21) "*So far, the data is there, even though we are not full, we are still searching. We have prepared the two Draft SKs for HCV, so we will need to reaffirm them later to the legal department to be able to manage what is needed again, well then the requirements, the results of the document meeting we have prepared are also one of them to support the legal side, notification to the local government. […] obviously knowledge increases, […] because there are images, the results of their research, their experiences, on several continents, does that give a new nuance, in compiling policy, […] for example, the problem of forests, what is the area of forest cover, well how* [is] *this* [managed]*, because of the six HCVs, how much carbon navigation that leads to carbon. This is what we need to explore, so that in making policies, the optimal is achieved […] at that time I was in a*	**M** **Realized, clear portfolio contribution** The portfolio has had clear influence on subnational policies, but evidence is insufficient to qualify portfolio influence on national policies. OPAL is still ongoing so while policy influence is anticipated, the exact contribution

was noted that the development of the pergub (in progress) to support implementation of the PERDA will contain the EK Project's HCV map as a reference (Gov2, Gov14, Gov21, Res25). As result, HCV areas will be defined, governments will know where HCV areas are when issuing permits, and newly established plantations will have to comply with conserving HCV areas should they receive a permit, and when issuing permits, governments will not issue proposals for plantations in designated HCV areas (Gov2). This marks a positive step forward in local policy toward conservation. It was also assumed that policy changes and contributions at the local level would be brought to the central level in order to facilitate synergy between national policy and local regulations (Gov14).

GOLS

The policy recommendations generated by the P3SEPKI team were taken up in a decision letter and subsequent Agricultural Decree regarding replanting for smallholders to embody the recommendation to strengthen the implementation of rules on the use of palm funds to encourage sustainable practices (Doc68, Gov1). The Decree in particular outlines activities references specific criteria and indicators for replanting that were not possible before due to funding constraints (Doc68).

Perpres No.44/2020 on ISPO was prepared through a series of public consultation in Sumatra, Kalimantan, Sulawesi, and Papua. The public consultation was attended by various stakeholders from smallholders, companies, academics from IPB, and research organizations including CIFOR. Smallholders are now obliged to register with ISPO within five years of the preparation period, which has been considered in light of the complexities including around land legality, but it is unclear the degree to which the portfolio influenced ISPO given the lack of knowledge of CIFOR's research on oil palm from key players involved in the ISPO revamping process led by Kemenko (Doc61, NGO5, NGO8).

Inpres 6/2019 has been prepared with various ministries including Kemenko, Kementan, and facilitated by UNDP and SPOI, and contains brief instructions for Kementan to manage the smallholders, indicating action toward resolving smallholder challenges. UNDP as part of the SPOI project invited GOLS researchers to present findings pertaining to smallholder typologies to Kementan officials working group for developing the RANKSB. The reflection of the research in the policy is unclear. The Inpres contains RANKSB to improve the conditions of palm oil

meeting at a meeting in Samarinda with the ministry, I was involved as a guest speaker, I could not say I was HCV, because now this is for the peat, [...] [a] minister mentions it, that means there is a regulation, there is a policy, so this is our basis for giving pressure to those who have no memory so that's one of them. Later, the results of the CIFOR research, the results of our collaborative research and policy can be submitted to the top level, so that there are the same regulations used throughout" (Gov14)

GOLS

"*Directorate General of Plantations of the Ministry of Agriculture issued "Guidance for Rejuvenation of Oil Palm Planters, Human Resource Development and Facilities and Infrastructure Assistance in the Framework of Funding for Palm Oil Plantation Fund Management Agencies" as stipulated in the Decree of the Directorate General of Plantation Number: 29 of 2017. In the decree, several criteria and indicators for the rejuvenation of oil palm plants were set in line with the policy recommendations* [produced from P3SEPKI research]. *Some of the activities above are carried out by technical agencies in regions that were not yet optimal due to funding constraints, namely the absence of a plantation service budget for these activities including the preparation of CP/CL. With the existence of the Directorate General of Plantation Decree, the above activities can be funded by a palm levy fund. This is in line with our research recommendations. To communicate the results of* [the] *research with relevant agencies,* [P3SEPKI researchers] *held discussions to collect data and information and conducted hearings on the results of* [the] *research with relevant agencies managing the palm oil sector through FGDs and workshops*" (Gov1)

"*We are also using this* [smallholder map] *in the revised RTRW*" (Gov10)

"*The government intervention program should be more specific, for example by farmers below four hectares, what needs to be intervened, if the 25 hectares should be taxed, what kind of tax or what because that is already a large scale, yeah so like that I see, there are more there, more to that aspect. Yes, yes, but our hope is that it should be from the ministry after seeing it adopting and maybe making a*

to new or existing policies informed by the research has not yet been observed.

plantations from 2019 to 2024, a new initiative for the country (Doc62). RANKSB contains president's instructions to its ministers and the subnational government, to increase the capacity and capability of smallholders, settling land status and legalization, utilizing oil palm as renewable energy and increasing diplomacy to achieve sustainable oil palm plantations, thereby accelerating the achievement of sustainable Indonesian oil palm plantations (Doc62).

There are some signals that as a result of the increased awareness to the heterogeneity of smallholders, government intervention programs targeting smallholders (e.g., ISPO, STDB, land legality, permit issuance) will shift to become more specific to more effectively address the needs of smallholders with different landholdings considering the information, but policy change has not yet happened (Gov2, Gov4, Gov8, IGO7, PS3, Res5). The district government of Kotawaringin Barat has claimed to use the smallholder map as a reference in the development of their RTRW for 2023, which is updated ever five years (Gov10). Kotawaringin Barat's spatial plan notes intentions to use the smallholder maps alongside the district government official map to design a RPJMD (Gov8).

The scenarios developed under GOLS have been considered by the RSPO working group on zero deforestation, and other studies (including the Atlas) were perceived to have been consulted as useful inputs to RSPO (NGO2, NGO3, PS1).

OPAL

Evidence provided in antecedent outcomes suggests that policy influence and input is possible given active engagement and contributions to policy processes (ISPO, RANKSB, and local regulations on partnerships between companies and local communities and oil palm governance), but there was either insufficient evidence to conclusively connect OPAL's influence on the shape that these policies have assumed, or it is yet to be seen what exact changes in policy will be observed through this involvement. Evidence is also limited on the subnational policies to which the project provided input (Doc20, Res14, Res20).

ERS

As a result of the contribution of this research, and others in the dossier compiled by the Human Rights Working group in RSPO, RSPO P&C shifted to incorporate gender, transitioning from gender blind to gender responsive, including new standards and establishing a gender subgroup (IGO3, NGO4, PS1, PS2).

regulation which is […] more specific, right, or in implementing policies can be based on that policy" (IGO7)

"*at this point RSPO* [has] *adopted the high carbon stock tool as well as the high conservation value, so there is a strict no deforestation standard within Indonesia at this point, so that particular research when they had developed the conservation scenarios as well as the sustainability scenario […] it really depends on the discussion at the no deforestation working group, but this is something that has informed to the respective people working on it*" (PS1)

ERS

"*So in terms of in the previous one we have gender related issues so those are the gaps in RSPO P&C in terms of gender so this is something we have taken into account during the review of our principles and criteria process, and if you can see the RSPO P&C right now, the gender has been strengthened a lot. […] I wouldn't say it is just based on CIFOR but, there were so many reports out there that have all contributed to a decision to look more closely at gender and how it is addressed in the principles and criteria. So what happened a lot of this decision-making for the P&C […] we went through each and every standard, criteria that is listed […] and say 'Okay, this is how we should address it, what are the gaps' [...] so right now we are working on a gender guidance document […] I appreciate the research CIFOR has done and I look forward to more research from them. I also hope to engage more with them*" (PS1)

"*Yeah, so the* [ERS] *research formed part of the dossier of any research that was thought to be relevant at the start of the eighteen-month revision work of the Task Force that was established. So that was a good start, and so that research was also part of it. And then I could easily quote and easily work out my recommendations while using the research. And people are sensitive to that, because they do not want it to be something only […] [we] obtain, because we also have our political agenda, so the research part also makes it a bit more neutral and more acceptable to the other categories of membership, largely the private sector. […] we are confident to say is that the RSPO has moved from*

	CIFOR's role as a neutral science provider in discussions was appreciated to diffuse conflicts and focus on concrete issues for collective action and solutions, and RSPO has since expressed interest in further engagements with CIFOR indicating scope for future collaboration (NGO4, PS1, PS2). RSPO principles and standards undergo review every five years, which involves a lengthy process led by Task Forces to compile research and discuss action points with stakeholders; CIFOR was trusted to do the work given their perceived credibility and network access (NGO4). **Portfolio** The portfolio of projects has had policy influence at multiple scales, and on multiple topics relating to oil palm, and influenced the development of key policies governing the sector including: • RSPO (international) • ISPO (national) • RANKSB (national) • PERDA (provincial – East Kalimantan) • Pergub (ongoing) (provincial – East Kalimantan) • Spatial plan of West Kotawaringin 2023 Policy processes involve multiple stakeholders. While other researchers and organizations have provided technical support and research on similar issues, the portfolio contributed to building momentum and collective action to support intended policy development, such as incorporating consideration for HCV areas, smallholder heterogeneity, and gender in policies governing the oil palm sector (Doc58, Gov14, Gov21, IGO7, NGO4, PS1, PS2). RSPO was perceived to be an effective platform for influence at the global scale and a key player (Gov6, NGO4, PS2, Res28), indicating good strategic engagement to exert global policy influence in the sector by GOLS and ERS projects, and indicating scope for future collaboration with RSPO. CIFOR was involved in the ISPO multi-stakeholder forum, but influence on the policy itself is not clear. While the complexities faced by smallholders in registering for ISPO are indicated in PerPres No.44/2020, it is not clear whether the GOLS component on smallholders has contributed. KEHATI, IPB, WRI, and UI have also put forward similar research indicating smallholder heterogeneity, which have also been considered as significant inputs to the ISPO, it is more likely that these have collectively worked to influence the contents of the PerPres on ISPO (Doc62, IGO7, Res32).	*being gender-blind to gender-responsive on the gender ladder*" (NGO4)	

	The development of the PERDA in East Kalimantan was informed by collaborative input by CIFOR, TNC, and UNMUL, and was perceived critical to gain inclusion of an article pertaining to HCV. mapping work by CIFOR will feed into the map which accompanies the follow up regulation (pergub) currently being developed by a multi-partner process to implement the PERDA. specify HCV areas that must be preserved, and not converted to plantations (Doc59, Gov14, Gov21, Res31, Res25). It was also suggested that CIFOR should provide more targeted advice on the implementation of policy, and should seek out letters of cooperation agreement (e.g., SPK) when entering into collaborations with government agencies to make them more official, and therefore more likely to influence policy (Gov2, PS2, PS5).	
Smallholders and women have improved representation in policy-making around oil palm [high-level outcome]	The research was perceived by project researchers to have contributed by developing a better understanding among stakeholders of the diversity of smallholders, the challenges and realities they face, and succeeded in putting these topics more explicitly into policy discussions (Res18). Several of the policies to which the portfolio contributed imply improvements in the representation of smallholders and women in policymaking, both in process, and in the implicated changes in practice that the policies mandate. For example, it was perceived that GOLS smallholder typologies had contributed to raising awareness about the lack of adequate definitions of smallholders to ensure more effective policy to give the right assistance to the right kind of smallholder (Gov10, Gov19, IGO5, IGO7, Res5, TR57). The ERS Project successfully contributed to the RSPO P&C to reflect and respond to challenges women face working in the sector, which has had a trickle-down effect (via requiring) member companies to create gender committees to better include women in decision-making (Doc63, NGO4, PS1, PS2). However, policy processes involve multiple inputs from other stakeholders and face barriers outside the control of the project. RSPO changes to ensure the rights of women are protected have led to the development of new standards and indicators to certify member companies, that better reflect the need for adequate consultation of women, and mechanisms to ensure fair working conditions for women working in the sector (Doc58, Doc63, NGO4, PS2). Despite the positive spirit that these changes embody, it was noted however, that for these changes to be truly realized on	"*Yes, what kind of PERDA* […] *the outcome will be to build a plantation that first meets good aspects, economic aspects benefit*[ing] *all parties, both companies and communities, and community involvement is* […] *non-exclusive*" (Gov2) "*The last five years,* [the most important developments in the sector] *must indeed be, in my opinion* […] *strengthening for the planters* [smallholders], *yes, because the governance must be ours, whatever we have to improve ourselves*" (Gov19) "By understanding the characteristics, typology and diversity of independent oil palm growers and also the various sustainability challenges faced by each group of growers, each intervention carried out in the form of policy and program implementation (eg palm oil for rejuvenation, TORA) is expected to be more targeted, and the government and decision makers can respond appropriately to the needs and challenges of each group of growers" (TR57) "A recent commitment by Indonesia's environment and forestry minister, Siti Nurbaya Bakar, may see a greater role for women in land-use decisions. In March 2018, Siti pledged to include a requirement for a gender impact assessment to be conducted as part of environmental impact assessments that must be undertaken by companies before any development projects, including oil palm plantations, can be issued a full license to operate. The minister's commitment reflects a growing recognition that large-scale industrial plantations have uneven social impactshttps://www.cifor.org/library/5579/socialimpacts-	**M** **Partially realized, clear portfolio contribution** Relies on some theoretical extrapolation of the implication of policy changes.

the ground, auditing capacity and mechanisms need to be improved at RSPO (NGO4).

The complexities faced by smallholders in registering for ISPO are indicated in the PerPres, and smallholders have been included as representatives of the working groups aiming to improve the conditions of oil palm plantations. There is no evidence clarifying the extent to which these changes in policy have resulted from the research projects, but it is plausible to expect some influence over the policy content given researchers' active participation in working groups, and engagements with policymakers to support their development (Doc60, IGO7). Some respondents also noted that CIFOR's contribution is not particularly visible in the ISPO policy space (IGO5, NGO1, NGO8).

The PERDA mandates the development of a communication forum (i.e., FKPB, the first of its kind at the subnational level), which mandates the improvement of stakeholder representation, including smallholders, with the aim of improving multi-stakeholder decision-making (Doc59, Doc60, Gov2, Gov21). CIFOR is a member of this advisory board, indicating scope for influence, but implementation will be congingent on the shape of the pergub.

Despite the inclusion of smallholders and women in policy documents, some of which implicate better inclusion in process, representation in policymaking practice remains contingent on implementation.

of-oil-palm-in-indonesia-a-genderedperspective-from-west-kalimantan/) [*sic*], with women disproportionately experiencing negative impacts including loss of control over sources of food and income, compounded by difficulties accessing social benefits. Such safeguards go some of the way to giving women in rural Indonesia greater decisionmaking powers over the land on which their livelihoods depend. If implemented, it could go some way to ensuring that the full implications of a development project for social inequalities and food security are considered, and to ensure that land acquisition is based on truly informed consent" (Doc45)

"The revised P&C (2018) has developed indicators which require special attention to be given to areas which requires considerations for ensuring that the rights of women are protected. These indicators include: ● Ensuring that gender groups are consulted during the FPIC process; ● There is evidence to show that equal opportunities are provided to both men and women to hold titles for smallholdings; ● In independent smallholder schemes, there is evidence available that all parties, including women are involved in decision making processes and understand the contracts. ● Including women in consultation processes in smallholders' units; ● Having a publicly available non-discrimination policies are implemented to prevent discrimination based on gender, sexual orientations, and gender identity amongst others; ● Units of certifications are required to demonstrate that recruitment is done based on skills capabilities, qualities and medical fitness based on the position; ● Pregnancy testing is not conducted as a discriminatory measure and is only permissible when legally mandated; ● There is a gender committee in place to specifically raise awareness, identify and address issues of concern, as well as opportunities and improvement for women; ● Evidence is present on equal pay to be provided for the same work;

● Maternity protection is provided for all workers and payroll documents give accurate information on compensation for all work performed, including work done by family members; ● There is a policy in place to prevent sexual and all other forms of harassment and violence which is implemented and communicated to all levels in the workforce; ● A policy to protect the reproductive rights of

		all, especially women. ● Management to assess the needs of new mothers in consultation with new mothers, and actions are taken to address the needs which have been identified" (Doc58)	
Policy-makers recognize and reflect environmental sustainability and social inclusion in all oil palm-related policy [high-level outcome]	As the assessments above for antecedent outcomes demonstrate, the portfolio has contributed to progress toward the reflection of environmental sustainability (i.e., recognition for HCV and optimal use of APL) and social inclusion (i.e., smallholder realities, better working conditions for women) in various policies governing the oil palm sector (e.g., RSPO, RANKSB, ISPO, subnational regulations) by bringing knowledge and facilitating activities to support changes. CIFOR's independence, credibility, experience, collaborative spirit of engagement, and value for moving sustainability in the oil palm sector forward were key in supporting policymakers to reflect environmental sustainability and social inclusion in policy. There were instances and scope for improved communication, collaboration, and engagement moving forward. There are other significant reasons for government interest in adopting policies that reflect sustainability and inclusion, namely in response to global pressure arising from advocacy campaigns intending to raise awareness of the negative consequences associated with oil palm expansion, in attempts to maintain the economic benefits that arise from the commodity (Gov12, NGO3, PS2). While there have been important steps forward in oil palm policy toward sustainability and inclusion, barriers including the politics of governance and competing policy agendas operating beyond the sphere of control of the projects are important factors to consider (Doc35, Doc45, Gov12, Gov15). Different conceptions of sustainability between the government, researchers, NGOs, and private sector remain a critical barrier to overcome. So-called "*sectoral ego*" (Gov11, Gov16, Gov20) between government agencies and the implications of an incoming omnibus bill were noted to be pertinent challenges, among various others, in realizing sustainability in the oil palm sector (Gov16, Gov20, NGO4, Res7, Res21). There is scope for CIFOR to be more strategic in their engagement of government agencies to facilitate co-ownership and endorsement of research results and enable governemntal use of outputs to support environmentally, economically, and socially sustainable oil palm.	"[CIFOR] *have enough, enough to concentrate there, the research staff are also quite experienced too because they have references to other places, even foreign countries that can be applied here so that if I'm not mistaken, they are also actively involved in the national level with UNDP, with BAPPENAS […] who have an interest in sustainable palm oil. Later on, to the oil palm trade, because the world will not accept unsustainable palm oil, that's CIFOR's point there, how this country benefits, farmers benefit but nature is maintained, I agree with that.*" (Gov12) "*CIFOR is one of the international research institutes that still maintains stringent values of scientific study procedures, both in terms of methodology and theory, which makes it still credible to influence not only in the discourse of world scientific knowledge but also in terms of public policy*" (Gov15) "*Yeah, it's* [incoming Ominbus bill] *something very dangerous. It has to do with attracting foreign investors. So no matter whether communities like it or dislike it, there will be palm oil plantations, because that will attract foreign investment or the other way around*" (NGO4) "A recent commitment by Indonesia's environment and forestry minister, Siti Nurbaya Bakar, may see a greater role for women in land-use decisions. In March 2018, Siti pledged to include a requirement for a gender impact assessment to be conducted as part of environmental impact assessments that must be undertaken by companies before any development projects, including oil palm plantations, can be issued a full license to operate" (Doc45)	**M** **Partially realized, clear portfolio contribution** CIFOR has contributed variably to policy and support steps toward their reflection of environmental sustainability and inclusion. This has primarily been at the subnational level, and to a lesser degree at the national level. To fully assess this outcome requires policy analysis of all policy related to oil palm, which is beyond the scope of this evaluation.
Project partnerships facilitate mutual learning on oil palm	**EK** Partnership was a strong focus of the EK Project as part of the PERDA development process. CIFOR partnered with local	**EK** "discussed a possibility for CIFOR and TNC to support financially and conceptually the public discussion (or talk	**H**

| [intermediate outcome] | research institutions, subnational government actors, and NGOs. Based on a letter of agreement (LOA) (Doc1, Doc2, TR10), the project partnered with UNMUL to conduct "the identification and mapping of HCVs on plantation (perkebunan) areas within the land classified as KBNK under the Provincial Land Use Plan (Tata Ruang) of East Kalimantan" (TR10). This activity built on UNMUL research capacities (Res25, TR10, TR12, TR13), and facilitated mutual learning for all partners on HCV mapping, types, and distribution across East Kalimantan, as well as local policy processes (Gov14, NGO7, PS6, Res6, Res25, Res31). UNMUL researchers gained insights on a new issue, learned how to apply spatial methods and analysis to the HCV context, and felt they were able to generate more accurate data as a result (Res31). CIFOR scientists supported UNMUL researchers by reviewing and providing feedback to the HCV work (TR10). The experience also provided the UNMUL research team with the opportunity to present results to provincial government audiences (TR12, TR13). One partner compared the PERDA collaboration with previous experience on developing academic scripts for other policy processes and felt the EK Project was a beneficial and satisfying experience (Res31).

TNC was brought on as a partner by local government for financial support to supplement the HCV mapping with social assessments, as well as for their input to the development of the PERDA (Res25, TR10). TNC partners felt they benefited from their participation in the project (NGO7). Daemeter Consulting also partnered in the PERDA process, providing network connections and input, and learned from their involvement (PS6, TR25).

The project partnered with local government (i.e., the plantation office in East Kalimantan) responsible for leading the PERDA process, and who brought their networks to the collaboration (TR10). Respondents had the impression that government partners learned from the engagements facilitated by the EK Project (Gov2, NGO7, Res6, TR10). While both subnational (e.g., Plantation Office) and national governmental partners (e.g., KHLK, KPK) were involved in the project, engagement with subnational government actors was more intensive and mutual learning was stronger as a result (Gov14, Gov21). Government partners noted that mutual benefits are an expectation from collaborations, and this was satisfied in the EK Project as they have a way forward with the PERDA (Gov14). It is likely that the subsequent development | show) and hold it together with the Plantation Office. [The contact] responded positively with the proposal and said that this is in line with the new TNC project to be implemented in East Kalimantan for the next five years. It I [*sic*] likely that we will organize the event with TNC and Plantation Agency (Dinas Perkebunan)" (TR10)

"*We are very appreciative of the trust given* [by CIFOR] [...] *for the method then how we do it, it is really left to us, and they* [...] *made sure that it was suitable, so there was no intervention. That was what we appreciated the most, then because the CIFOR context was indeed academic, it was rather academic standard, so it suited us well*" (Res25)

"*I am directly involved with CIFOR there* [...] *maybe because of the change in new regulations, reinforcement of friends, so I have a lot that I* [learned], *in terms of issues from what* [I] *used to not understand, 'Oh, it turns out this'* [...] *lots of stories of NGO friends, scientifically, in data terms. In comparison I make other academic manuscripts* [...] [that were] *not this intensive* [...] *in terms of the process and the results, I think* [we] *are satisfied*" (Res31)

GOLS

"*there is knowledge creation which happens at that level, which is then internalized into the institution.* [...] *instead of thinking of research in a sort of linear sort of way, from research products* [...] *We can have policy engagement or stakeholder engagement for impact at the inception level at the research design level, research surveying and interpretation. Along the whole research cycle, really* [...] [and] *that's one thing that we've been doing a lot more, and in GOLS also, and other oil palm projects*" (Res5)

"The participants said they have improved their skill, knowledge, and expanded their networks through CUF experience [...] There were co-benefits to the partner universities" (Doc8)

"[GOLS] *is the first project that is linked with a kind of Master degree,* [...] *it is another issue actually, nobody in CIFOR is able to manage students because it is not the way they function very often.* [...] *for instance, in this USAID funded program, linked to the GOLS project,* [it] *was expected that students would do things linked to the GOLS project, right? It was not the case, it was only I managed to* | **Realized, clear portfolio contribution**

Project partners across the portfolio (e.g., graduate students, local university collaborators, subnational government agencies, NGOs, and donors) benefited from their involvement in terms of new knowledge, skills, and relationships. |
| --- | --- | --- |

of the FKPB in East Kalimantan will continue to help foster mutual learning in the future.

GOLS

GOLS investigated opportunities for synergy with multi-stakeholder allies and potential partners like InPOP early in the project cycle (Doc50, TR23). In GOLS, the CUF partnership is one example where partners learned during the research process. As a result of their involvement in the CUF program, graduate students expanded their knowledge, skills, and networks through the international study exchange (Doc7, Doc8, IGO4, Res1, Res8, Res9, Res12). Partner universities in the US were also thought to have co-benefits. University supervisors built their research portfolios, advised diverse research projects, and expanded their networks within Indonesia (Doc7, Doc8). The receiving universities' cohorts also benefited from having the CUF students to diversify their student bodies and bring Indonesian perspectives and contextual insights to lecture discussions (Doc7, Doc8). Respondents aware of the CUF had mostly positive impressions of the program. The model was attractive to donors, as it targeted capacity development of the next generation of young Indonesians entering the workforce (IGO4). The CUF program was assessed to be good value for money, despite high average costs (Doc8, Res8). There are indications of interest for replication of the model in the future (Doc8). However, there is scope to improve the CUF in several areas to increase potential for mutual benefits. The selection of universities (Doc8) and candidates were noted (Doc8, Gov15, Res8). Regarding the latter, there were indications that government actors (e.g., FOERDIA) wished for the opportunity to be considered for the CUF to build the research capacities of Indonesia's public sector (Gov15, Res8). A researcher noted the decision-making for candidate selection prioritized young inexperienced students over researchers who had begun their careers (Res8). Other feedback included the need to increase the interaction between cohorts to strengthen students' networks (Doc8). Additional pre-academic training was also noted (Doc8). Some students received more active support from CIFOR scientists than others, such as field visits to check progress (Doc7, TR26). One respondent had the impression that generally CIFOR staff are not equipped to support graduate students unless they have prior supervisory experience (Res1). In addition, university supervisors were not formally required to visit the students in the field, which could have enhanced the students' experience (Doc8, Res1).

only get two or three that was more or less related to these kinds of activities we are doing, but there are so many other subjects it has nothing to do with, not even with forestry" (Res1)

"*I had some real tussles over selection of the students to go to the Masters program,* [government partners] *wanted* [to] *send their employees to the States, or wherever, and based on seniority and who had applied first and who is at the top of the line for sabbaticals and so on. Well my view was that the results would not be particularly strong for the country* [...] *it is a multi-sectoral society or sector now, wanted people coming up with strong experience and achievement as junior people in the NGO sector, the private sector, also in the public sector. Our selection process along with university faculty would achieve good outcome*[s] *in terms of talent and future contributions to the country*" (Res8)

"*The knowledge capacity of the P3SEKPI research team is increasing with regard to the issue of oil palm at the domestic and international level*" (Gov15)

"*Now we basically cut off a piece of the work for FOERDIA, but that really didn't do the kind of, meet the larger aim to helping them internalize findings holistically*" (Res8)

"*P3SEKPI researchers are only involved in one component out of the four existing components, so that the involvement of BLI researchers can be said to be minimal*" (Gov15)

"We held a meeting with the Dean of Agriculture Faculty of Panca Bhakti University and his staff and we discussed about GOLS, their familiarity with oil palm issues and networks, and a possibility [*sic*] to get involved in collecting data during the smallholder survey" (TR13)

"The purpose of meeting Bappeda was to further discuss and clarify a planned collaborative effort between CIFOR, LAPAN and Bappeda Kotawaringin Barat in developing a system for monitoring smallholder oil palm plantations" (TR36)

"*we are mapping using the high-resolution image and we don't have money to buy, so we collaborate with the district-level governments, with the LAPAN,* [...] *we have an MoU on that, on the use of high-resolution data, and from that we get these smallholders maps*" (Res11)

Similarly, coordination between CIFOR and university supervisors was low (Doc8, Res1); one respondent noted they had little interaction with the university supervisors and found them unresponsive (Res1). A final critique of the CUF relates to the lack of linkages between the students' research and GOLS research (Doc8, Res1). As the CUF was tied to the GOLS Project, this appears to be a significant missed opportunity. Some students did not pursue research topics related to forestry, and students' final theses were not shared with CIFOR (Res1). In addition, CIFOR researchers' time dedicated to supervising was not covered in the budget (Res1). For these reasons, one respondent felt CIFOR did not mutually benefit from the CUF partnership (Res1).

Other examples of learning from the research process happened within the GOLS research team, government partners, and local university partners. Individually, GOLS researchers gained more in-depth contextual understanding of their research foci and the processes at play within the oil palm sector (Res1, Res2, Res5, Res6, Res8, Res9, Res11, Res12, Res18, Res19, Res22, Res23). However, the team missed the opportunity to "*foster a lot of cross-learning*" (Res5) between the GOLS components in terms of knowledge, skillsets, networks, and contexts. This resulted in the siloization of the project (Res5, Res6).

GOLS partnered with government researchers from P3SEPKI, LAPAN, and BAPPEDA Kotawaringin Barat. Through their involvement in the project, P3SEPKI partners gained knowledge on domestic and international oil palm issues such as the CPO Fund and land tenure under Component 1, and have contributed to these respective debates (Doc7, Gov1, Gov15, Gov18, Res6, Res8, TR40). P3SEPKI researchers took advantage of learning opportunities to build linkages between GOLS components more than the core GOLS research team did. For example, P3SEPKI partners drew upon the smallholder heterogeneity, typologies, and spatial data from Component 3 (Blog9, Gov1, Luttrell et al., 2018a; Res6; Pacheco et al., 2018; Wibowo et al., 2019). Mutual learning also occurred for P3SEPKI researchers as they had the opportunity to work with international researchers and other system actors working on oil palm topics (Gov1). Other benefits from the partnership include co-authorship on a variety of outputs (Gov1, Res6, TR40; e.g., Blog9; Luttrell et al., 2018a, 2018b; Purnomo et al., 2020; Nurfatriani et al., 2019; Wibowo et al., 2019), developing English writing skills (Gov1), and conference attendance and presentations (Gov1, TR7, TR40). Not only did P3SEPKI

"*The Atlas from CIFOR is very beneficial for us, […] we exchange the data to update each other because that is quite important*" (NGO3)

"[In] *Component 3, where for example we're engaging an organization like SPKS, so they're actually supporting us in doing the research, but at the same time they're also stakeholders which are influential and which have a seat at the table in policy processes, especially at the local level*" (Res5)

"During the last few months of the GOLS project CIFOR collaborated with Tropical Forest Alliance (TFA) and major oil palm companies in a focus group discussion to understand the achievement of the zerodeforestation [*sic*] commitments and to identify opportunities, challenges, and responses around its implementation in the palm oil sector. The collaboration has not only enabled scientists and the private sector to share their crucial research messages and to demonstrate field and measurable actions toward realizing the sustainability commitments, but it has also provided a convenient forum or platform for relevant stakeholders to further identify synergies and initiatives and to explore options for collaboration" (Doc7)

"*We coordinate of course because our sample survey is also part of the INOBU field project […] So we coordinate, we do not want to make a mess INOBU that been done. […] we shared data and it means we need information from INOBU and sometimes INOBU also want [from us], ask [us] about what we knew so we discussed. We exchange*" (Res9)

"Private sector was an important stakeholder from the start as the goal of the project was to align policies and actions of public and private sector actors […] As IPOP was dissolved in June 2016 following critique from the Government of Indonesia, GOLS shifted its focus more directly to the companies that made zero deforestation commitments as well as organizations such as GAPKI and RSPO" (Doc7)

"*one of the beneficiaries of this research was USAID, […] I think it was useful for them, you know, to get some understanding about the underlying of what was going on the debate of sustainability*" (Res18)

researchers directly involved in GOLS benefit, but their superiors did as well, gaining knowledge of oil palm governance (Gov1, Gov15, Res6). This learning enabled senior P3SEPKI staff to confidently assist the Minister of KHLK on policy-making for oil palm (Gov15). Respondents gave an overall positive impression of the partnership. It was noted that there was flexibility in the collaboration (Gov1) and P3SEPKI's contributions were "*constructive and much appreciated*" (Res8). GOLS benefited from the knowledge brought in and produced by P3SEPKI researchers, as well as stronger links with P3SEPKI staff who now have greater influence in internal debates on oil palm within the KHLK (Res18). However, P3SEPKI's role in the project was minimal as they only worked on one component, and could have benefited more if they were given additional tasks and opportunities (Gov15, Res8). One project researcher interviewed described the partnership as burdensome as it was mandated by the donor rather than P3SEPKI being a self-selected partner (Res27). GOLS also collaborated with LAPAN and BAPPEDA Kotawaringin Barat in Component 3 for the spatial assessment of smallholder oil palm plantations (TR36, TR76). By collaborating with LAPAN, GOLS researchers had access to high resolution satellite imagery and LAPAN learned how to process radar data for their analysis (Gov3, Res11, SWD). In return, analyzed spatial data was shared with government partners (Gov8, TR36). This was beneficial for LAPAN, as they are tasked with the mapping of oil palm plantations across Indonesia (Res11). LAPAN also built upon their existing research capacities, expanded their networks, and were noted to have contributed to scientific publications (Gov3, SWD). The partnership between GOLS, LAPAN, and BAPPEDA Kotawaringin Barat were described positively (Gov3, Gov8, Res6, Res11). As a result, it was thought that these government agencies look upon CIFOR favourably (Res6, Res11, TR36). For the Atlas, GOLS researchers collaborated with district plantation agencies in Papua to exchange data (Gov12). Some government officials from the Plantation Agency in West Papua were taught how to use the Atlas, but it was noted that more formal training was needed in order for more officials to use the tool (Gov12). Overall, government partners felt their input was taken into consideration by the GOLS team, and appreciated the regularity of interactions, access to data, and opportunities to give feedback the project (Gov1, Gov3, Gov8).

"*We may have had an influence with some of the donors in terms of some of their understanding on oil palm, […] how is USAID positioned*" (Res21)

"*across CIFOR. I think it applies to GOLS in particular because you have, you know, four different components that are each doing their own thing, with each with their own teams […] I think you could foster a lot of cross-learning because, don't forget, if you have some of these staff spend a lot of time on the ground, collecting data, there's a lot of qualitative evidence which you're generating, if you have someone that's looking across components, it also makes it a lot easier to embed one in the other and to engage policy-makers in a more comprehensive way*" (Res5)

OPAL

"[The] *inter- and transdisciplinary approach, we made that decision, it has been very challenging, very difficult, we have learned a lot, we certainly have made mistakes, but we have also been able to learn from those mistakes and I think the work we are doing now is very good*" (Res10)

"*the proposal was made, the collaboration was fruitful and right now, I think. We are very happy with this collaboration. Very happy*" (Res14)

"*In the inception workshop of our project, our partners, so we are CIFOR, ETH, academics, we are scientists, but we also have boundary partners who are not academic, we have NGOs, […] So all around the room we have people with different assumptions, and we made a theory of change together*" (Res16)

"[As a graduate student,] I learned how to understand the stakeholder who has different interest and knowledge. As it turned out, the good answer to solve a wicked problem is not about 'true' or 'false', but about 'more' or 'less acceptable' from the stakeholder. The process is the answer" (Doc13)

"*that kind of mind of competitions* [did not happen]*, and now I felt that connections, connecting with people and then just active listening, getting more knowledge on the other perspectives, it's so helpful. So I don't see my supervisor as like, you know, someone that you are afraid of. This is somehow someone you are eager to listen*" (Res24)"

GOLS also partnered with local university researchers and graduate students to support data collection for different components of the project (e.g., UNTAMA) (Gov8, Res9, TR13, TR34, TR57, TR67). GOLS provided university partners with surveying and enumeration training to build research capacities (Res11, TR22, TR34, TR77). Through the experience, local university partners built on existing GIS, mapping, and surveying skills, and could use the data in their own work (Gov8, Res9, TR13). One government respondent believed local university partners enjoyed the collaboration and viewed the experiential learning within local university partnerships to be beneficial owing to the strong bonds developed (Gov8).

Various NGOs acted like partners or allies in the GOLS Project, such as INOBU, Greenpeace, Auriga, and SPKS, among others. NGOs see value in partnership with CIFOR, as each partner can bring their strengths together for greater influence; for example, NGOs' diverse perspectives, sector knowledge, and networks could supplement and channel CIFOR's "*deep data*" (NGO2). GOLS utilized opportunities to collaborate with allies during the fieldwork. For example, GOLS exchanged data and field insights with INOBU researchers, being mindful to not negatively affect allies' existing processes (Res9). The Atlas work has established several connections with local and international NGOs to share data. For example, GOLS researchers are active on a platform that compiles, refines, and shares oil palm concession datasets (NGO3, Res2, Res19). Greenpeace is one of the key allies sharing data for the Borneo Atlas, and have used data from the Atlas in return (Doc56, NGO3, Res2). Ongoing work on the Atlas in Sumatra has resulted in a partnership with Auriga to develop biomass and time series plantation maps, as Auriga are familiar with the Sumatran landscape. GOLS reported to be strategically coordinated with organizations like SPKS, as SPKS had an overlapping activity and timeline in West Kalimantan (TR13). SPKS supported GOLS researchers with access to the field and data collection, and in return SPKS was thought to have gained research skills during the process and also received findings which they could use in local policy processes where they are well-positioned (Res5).

To help the GOLS team forge connections with the private sector, the project collaborated with Daemeter Consulting (Doc4, Doc5, PS6, Res1). However, this partnership does not appear to be as fruitful as researchers were expecting (Res1). Nearing the end of the project, GOLS strategically engaged allies like TFA and private

"*maybe we can exchange experiences from* [the Companion Modelling games for] *its policies, so that this material more or less sharpens our policies, our programs, our activities going forward*" (Gov14)

"*Not* [run games] *with the donor, but yes with the auditors, at least one of them it was not, it was difficult and we have learned how not to fail debriefing after that workshop. So the point is, the auditor made some statements and all the participants look and say how is he not able to realize, how is he not aware of his own blindness. That was something very touchy and difficult to handle*" (Res16)

ERS

"*the huge incentive and the reason why I said 'Yes' right away to* [one of the researchers] *was that I felt that our research had uncovered some really serious problems with the social impacts of oil palm, gender, and others, and I was looking for a way to put our findings into a policy circuit,* […] *in which CIFOR was already operating. So whereas my normal publication venues are academic,* […] *so that was a good match, what they wanted and where I wanted this research to go, it kind of coincided, so I was pretty happy about that*" (Res4)

"*if CIFOR works with well-known scholars like me* […] *Their* [work] *also spreads not only into their policy networks, but also into my academic networks*" (Res4)

"[The] *work was especially relevant in the focus* [the researchers] *brought to the gender lens to the palm oil work. What we wanted to do was yes RSPO is important, but what needs to be done far exceeds what RSPO can and will do, so it was more the* […] *insights from a gender perspective within the sector*" (PS2)

"*even though we had confidence with the way* [the ERS team] *did research, but the writing part was not well done.* […] *it did play a role when we had to commission, again, research, and we did not opt for CIFOR because of that*" (NGO4)

companies in discussions on zero deforestation commitments, sharing knowledge and perspectives on "opportunities, challenges, and responses" (Doc7) in the oil palm sector. Documentation claims that this benefited private sector actors in recognizing shared goals, synergistic activities, and opportunities for further collaboration (Doc7). Yet, collaboration with the private sector was difficult. Initially, GOLS planned to engage private companies through IPOP, which collapsed early in the project lifespan (Doc7, IGO2, IGO4, NGO6, PS2, PS6, Res1, Res6, Res8, Res12, Res13, Res18). Accessing information was also challenging, as a government regulation prevents the private sector from releasing information to the public (Blog2, Res2, Res6, Res19, TR75). The private sector may also choose not to release data in concerns over public scrutiny. For example, while companies like Wilmar approached the GOLS team to query their concession data with the Atlas and request corrections, GOLS was not privy to the company's data to update their maps (Res2, Res6, Res19, Res33).

Donors are another key partner who are expected to learn from the project. Respondents identified potential influence on donors' understanding of the oil palm sector, particularly on the underlying processes and factors affecting the sustainability debate (IGO2, IGO3, Res18, Res21). GOLS participation at conferences, such as the World Bank's Land and Poverty Conference, was considered both an opportunity to share findings and "connect with donors and boundary partners, to strengthen relationships" (TR8).

Evidence suggests partners within the FTA CRP also learned from GOLS, such as the French Agricultural Research Centre for International Development (CIRAD) and Tropenbos (Res26, Res28, Res29). These types of partnerships are inherently mutually beneficial, especially when researchers are "*posted in different institutions*" (Res26) so both organizations can benefit from the research. In addition to the cross-pollination of information, this type of partnership also opens partners' access to other countries, landscapes, and value chains, as well as enables an integrated approach between institutions on a topic (Res26). There is likely scope for stronger embedding of CIFOR research within FTA partnerships.

Overall, the evidence suggests GOLS facilitated mutual learning amongst project partners; however, some respondents felt CIFOR could do better in terms of internal institutional learning for better coordination, alignment, engagement, and consistency across projects and activities (Res1, Res5, Res8, Res33, Res34).

Respondents suggested that CIFOR could be more collaborative in their working partnerships to ensure more mutual benefits (Gov1 Gov5, Gov11, Gov15, Gov18, IGO2, IGO6, PS5, Res12, Res27). Regardless, government, university, and private sector respondents conveyed interest in collaborating with CIFOR again in the future as a result of their experience in the GOLS Project (Gov1, Gov8, Gov12, PS3, PS6, TR36).

OPAL

Partnerships featured prominently within OPAL, both internally and externally. Members of the research team described the collaboration between ETHZ, IPB, and CIFOR positively (Res6, Res10, Res14, Res16, Res18, Res20, Res24). Mutual learning across institutional partners was intentionally built into the project design (Doc25). For example, while one partner led the proposal development, ideas for OPAL were co-generated with partners and allies, enabling experiences and insights from prior research experiences and former projects to inform the proposal (Res14, Res16, Res18). Moreover, the project's inter- and transdisciplinary approach is thought to have fostered mutual learning (Res10). OPAL team members noted learning from both the project process and each other (Res10, Res14, Res16, Res24). One respondent felt much of the project's success stemmed from partners' trust and faith in the process, despite not being familiar with Companion Modelling (Res16). Each partner brought their own strengths to the partnership: ETHZ brought the methodology and ecological foci; IPB brought contextual knowledge, Indonesia-based research experience, and natural scientific backgrounds; and CIFOR brought a social science lens and their extensive research network in Indonesia their (Doc25, Res10, Res14, Res18). One partner noted that OPAL missed an opportunity to leverage more of CIFOR's research capacities (Res16). The project provided Companion Modelling training to partners, recognizing the importance of developing capacity and self-sufficiency to carry out their responsibilities (Res10). Respondents expressed a strong team mentality within the project, between graduate students and the partner institutions (Res6, Res10, Res14, Res16, Res18, Res20, Res24). Graduate students were treated as genuine partners, with opportunities to participate in decision-making, organization, and presentations (Doc19, Res14). Relationships between graduate students and supervisors were reported to be both professional and personal, and one student commented that they did not feel the project created a competitive atmosphere (Res24). Hence, mutual

learning between OPAL students occurred, as each built on others' research and shared insights from both their coursework and fieldwork (Doc13, Res6, Res20, Res24). As a result, graduate students gained knowledge, skills, and new networks (Blog17, Blog21, Doc13, Doc18, Doc23, Doc24, Doc25, Res1, Res6, Res9, Res20, Res24, TR70, Web1). For other partners in the team, OPAL "*enrich*[ed]" (Res14) their knowledge which could be applied in other aspects of their work, such as teaching (Blog13, Res14).

Donors were important partners. The OPAL team involved donors in preliminary site visits to learn more about the Indonesian context and Companion Modelling (Blog18, Blog20, Doc13, TR15, TR17), and made efforts to keep donors and other audiences abreast of OPAL progress (e.g., Blog8, Blog11, Blog12, Blog15-Blog22, Doc10-Doc23, Vid4, Vid5, Web1). While donors have not yet participated in games directly, project auditors have; though the participant demonstrated lower levels of mutual understanding (Res16).

OPAL collaborated with many external partners. The project hosted scoping meetings to engage national and subnational governments and NGO allies for feedback to the project design (Blog18, Blog20, Doc13, TR17). The project also sought feedback following field visits and game sessions from national and subnational government, NGO, private sector, and smallholder participants (Blog20, Doc13, Doc14, Doc15, TR17). These groups were considered to be the "*immediate level of beneficiaries* […] [such as] *the producer organizations, particularly smallholder community organizations, as well as the municipalities*" (Res10). Rather than telling partners and target audiences what decisions to make, the project instead aimed to help support those actors to reflect on and make their decisions in an informed way (Res16). National and subnational government partners had positive impressions of their involvement in OPAL, and found the process beneficial as they could transfer their learning of different stakeholder perspectives into decision-making situations (Gov14, Vid2, Vid5). Moreover, the Companion Modelling game sessions were designed as a learning opportunity for both participants and the OPAL team; while participants learn about different system actors' perspectives, the OPAL team received nuanced feedback from players to adjust their models (Vid3). During the fieldwork period, OPAL encountered an opportunity to enter into an international research collaboration with external graduate students from the University of Edinburgh and the University of Tokyo

(Doc18). While an unexpected opportunity, both parties benefited. The external graduate students received site and permit advice, exchanged information, and were treated as OPAL counterparts (Doc18; Okita, 2019). OPAL likewise benefited from exchanged information, expanded their research networks, and have planned to co-author a paper together (Doc18).

ERS

Prior to the ERS Project, CIFOR collaborated with external researchers who had begun to investigate the social impacts of oil palm (Res3, Res4). When faced with opportunities for collaboration, remuneration is not always the deciding factor for researchers to pursue partnerships. For example, one of the collaborators on the gender research recognized that CIFOR operates within policy networks to which they did not have access, so they felt it was a mutually beneficial opportunity (Res4). In return, by working with high-profile researchers, it was thought that CIFOR would benefit from uptake through collaborating researchers' networks (Res4). Moreover, researchers see collaborations as growing opportunities where they are exposed to different disciplinary orientations as well as qualitative or quantitative approaches and synthesis (Res4).

As part of a commissioned consultancy with Oxfam Novib, the ERS team won the proposal bid to investigate the gendered aspects of oil palm in Indonesia (NGO4, Res3). While one of the commissioning partners was confident in the team's capacity to undertake the research, they were less so with how the findings were communicated in the draft report (Doc29, NGO4). While the issue was rectified in the final version this played a role in the partner's interest to collaborate with CIFOR again (NGO4).

ERS Project allies, such as RSPO and Forum for the Future, benefited from the findings and gendered perspectives of the oil palm sector in Indonesia (PS1, PS2). As a result, one of the private sector intermediaries expressed interest to work with CIFOR on the topic if the opportunity arose (PS1).

| Project partners & allies advocate for & pursue oil palm issues (using research)

[EoP outcome] | **EK**

Throughout the process, the EK Project collaborated with partners and allies like TNC, WWF, and GIZ to make headway on the PERDA (Doc1, PS6). The EK Project fostered partnerships during ongoing multi-stakeholder processes to attract further support for the PERDA (PS6, Res6). Some allies have since followed up on the PERDA process by developing web-based tools for mapping and registering HCV concessions in East Kalimantan in | **EK**

"*the* [PERDA] *regulation is there now, and it was completely supported by WWF, TNC, and GIZ* [...] *where they even sort of had already developed a web-based tool for people to register oil palm plantations, whether these are big concessions or individuals, and also produced an online map demonstrating, indicating all the six different high conservation value areas* [...] *in the whole of East* | **H**
Realized, clear portfolio contribution

It is common practice for portfolio partners |

anticipation of the implementation of the PERDA regulation (PS6, Res25).

GOLS

Many international NGO allies have made statements in support of sustainable oil palm, indicating widespread advocacy and commitment exist (e.g., Doc38). During the project, GOLS researchers participated in as well as organized multi-stakeholder dialogues on oil palm governance and sustainability, where they could engage with government, private sector, NGO, CSO, research, media, and development actors involved in these topics and foster potential allies or partnerships (TR1, TR6, TR13, TR18, TR22, TR23, TR30, TR31, TR35, TR41, TR43, TR46, TR48, TR50, TR52, TR57, TR64, TR67, TR77). The project also formed connections with allies to access dialogue spaces as another avenue of influence. For example, near the end of the project, GOLS interacted with TFA who is linked in public-private partnership processes focused on zero deforestation commitments (Res6). Encouraging partners and allies to utilize and promote GOLS findings for advocacy purposes were key goals of the project's partnerships (Doc5, Res5); however, one GOLS researcher felt the project could have been more strategic with their partnerships in this regard (Res18). The project also intended to generate knowledge for their donor to inform other or future work on oil palm in Indonesia or other contexts (IGO4, Res18). While there is evidence that the donor learned from the GOLS, the donor has since stepped away from the politically sensitive topic in Indonesia (Res18, Res29).

There is evidence supporting partner and ally uptake of research generally and GOLS outputs specifically. For example, Auriga, Daemeter Consulting, and Tropenbos generally use research to inform their respective work, typically drawing on research from CIFOR and other actors (e.g., governments, local universities, NGOs, etc.) (IGO5, PS6, NGO2, Res28). Several outputs from Component 1 have been used by partners. P3SEPKI is a prominent proponent of GOLS research within the KHLK and across the government more widely (e.g., Ministry of Foreign Affairs, Ministry of Trade) (Gov1). As P3SEPKI partners have become the resident oil palm experts within their ministry (Doc7, Gov1, Gov15, Res6), they have been tasked with conducting, disseminating, and sharing useful research to inform "*scientific and evidence-based policy in the oil palm sector*" (Gov15). P3SEPKI partners have applied learning and cited GOLS outputs in

Kalimantan. […] *So that's a really good start* […] [and] *follow up on that regulation*" (PS6)

"*the advantage* […] *in East Kalimantan* […] [is having] *a driving force* [like] *the partnership* […] *they are committed, actually continued to support the multi-stakeholder process*" (PS6)

GOLS

"*I would put more emphasis on my partnerships* […] *filtering the right messages for them to build their campaigns and probably that would be much more effective than spending all my time going to all these platforms, coming up with these policy briefs.* […] *So you can be part of wider partnerships, be much more strategic and spend less time and have impact that can be much higher*" (Res18)

"*I think beyond governments, it's also really about influencing these development institutions, because you know, a lot of the work really happens on the ground, and institutional change is happening there*" (Res5)

"*our thinking was, I think, one of the beneficiaries of this research was USAID, with the understanding that we thought they were going to have a more long-term engagement on the topic* […] *I think it was useful for them, you know, to get some understanding about the underlying of what was going on on the debate of sustainability*" (Res18)

"*oil palm is one of the major drivers of tropical forest degradation and deforestation, and so in countries that have oil palm, I think it's part of USAID's approach to addressing the issue* […] *in Africa and Asia, and* […] *Central America. Yeah, so I would say that oil palm is an issue that many of our missions design programs around*" (IGO4)

"*USAID supported the GOLS project, and now they dropped investment on oil palm. Of course, I don't think it's related to the fact that they didn't like the results, etcetera, it's just because it's too critical, too sensitive right now*" (Res29)

"*in the last six months, we engaged with* […] *Tropical Forest Alliance* […] *a public-private partnership that facilitate the interaction between the private sector and the public policies* […] *they have committed to realizing the*

and allies to draw on research in their projects or advocacy work. Evidence indicates that findings from across the portfolio have been used by NGO, IGO, government, researcher, and media allies to pursue pressing oil palm issues.

subsequent research on oil palm in the KHLK (Gov1, Gov15; e.g., Nurfatriani et al., 2018). Becoming more equipped through the GOLS experience, P3SEPKI partners now receive requests for information or are tasked to provide inputs to various international oil palm diplomacy and international trade issues (e.g., RED II, EU Green Deal, etc.) (Gov1). Partners at Tropenbos have drawn on the findings on governance arrangements (Doc53) and tenure (Doc52). Partners from the OPAL Project have also cited Component 1 outputs (e.g., Dharmawan et al., 2019; Hasanah et al., 2019a, 2019b). There is also evidence demonstrating that external researchers working on similar topics in Indonesia are drawing on Component 1 research in their own projects (e.g., Project LEOPALD (Low Emissions Oil Palm Development); see Mafira et al., 2019).

The Atlas work has attracted significant attention and use as a source for advocacy. Partners like OPAL researchers (e.g., Ocampo-Peñuela et al., 2018) and Tropenbos (e.g., Doc53) have referenced the Atlas in their own outputs. There is evidence that allies from the EcoNusa Foundation and WWF Indonesia have accessed the mills database, indicating potential for use in their advocacy or other work in the future (Doc6). GOLS researchers engaged subnational government allies from the Plantation Agency in East Kalimantan on opportunities to link the Atlas data to government geo-platforms (TR37). LAPAN continues to work on oil palm issues with support from WRI in Riau and South Sumatra (Gov3), likely bringing some of their learning from GOLS. LAPAN respondents also indicated that they have since applied the spatial analytical methods they learned from GOLS to other contexts (e.g., West Kalimantan, Sumatra) (SWD). Greenpeace is a major proponent of the Atlas. Greenpeace use the Atlas as a data source for their own online mapping platform (NGO3). In their investigation of the Bumitama company, Greenpeace used the Atlas in combination with RSPO procedures to estimate the financial liability of the company regarding its forest clearance (Doc36, Doc56). Greenpeace subsequently used their report to file a complaint to RSPO (Doc36). The Atlas was also referenced as one of the available "satellite-based deforestation online monitoring platforms" (Doc65, p.46) in a Greenpeace report, 'Burning Down the House', focused on private sector-driven fire in Indonesia (Doc65, NGO3). Similarly, IUCN has used the Atlas in a report promoting conservation of sun bear habitats (Doc57). Media outlets that write about social and environmental issues have drawn on the Atlas findings to engage in controversial debates and

New York Declaration on Zero Deforestation, […] *so through the TFA, they work through different companies, like Wilmar and Sinarmas*" (Res6)

"Building on the knowledge from GOLS research, our research partner from P3SEKPI has become the go-to research group for palm oil issues within the Ministry of Environment and Forestry" (Doc7)

"*P3SEKPI becomes one of the institution* [*sic*] *in the Ministry of Environment and Forestry which deals with oil palm issues, especially those related to international trade issues. P3SEKPI is often asked to provide notes and review paper to the Minister on various international oil palm issues, especially the most updated one is the issue of trade barriers on Indonesia's CPO trade to the EU and various restrictive policies due to environmental issues. This shows that P3SEKPI also plays a role in advocating for sustainable oil palm within the Ministry of Environment and Forestry as well as across ministries because it is often asked to attend meetings related to international oil palm diplomacy carried out by the Ministry of Foreign Affairs, the Ministry of Trade especially related to international trade issues such as RED II Issue, EU Green Deal, resolution European Union's Role in Protecting and Restoring the World's Forests*" (Gov1)

"QUANTIFYING BUMITAMA'S FOREST LOSS LIABILITY […] We estimate the minimum financial liability for these three areas alone at between US$35 million and US$50 million, depending on the quality of the forest that was cleared.70 Arguably, if for whatever reason the RSPO deems expulsion undesirable despite evidence of Bumitama's control of post-2014 clearance, the penalty for that portion of the total clearance should be set significantly higher. The maps and analysis used to produce the above estimate and elsewhere in this briefing are based on publicly available, peer-reviewed scientific data used in CIFOR's Borneo Atlas" (Doc56)

"*in some of our reports like* […] *'Burning Down the House' and because of the palm oil is in our website, some of our sources of the report is coming from the Atlas, I mean that, we are using the Atlas of Borneo, as a source on our report*" (NGO3)

inform public opinion, such as one article entitled 'No, Palm Oil Is Not Responsible For 40% Of Global Deforestation' (e.g., Doc34). Mongabay, an ally, has also promoted the Atlas in their advocacy work (e.g., Doc42, Doc46). According to respondents, GOLS and CIRAD researchers have fed into the EU-Government of Indonesia negotiations, drawing on the Atlas, smallholder work, and other CIFOR research on fire and haze (IGO5, Res18).

Component 3 outputs have been used by partners and allies in their work on oil palm issues. Both researchers and partners from GOLS (e.g., Cadman et al., 2019; Jelsma et al., 2019; Luttrell et al., 2018; Schoneveld et al., 2019a, 2019b; Wibowo et al., 2019) and OPAL (e.g., Dharmawan et al., 2019; Meijaard et al., 2018) have cited the research on smallholder heterogeneity and smallholder characteristics. Partners at Tropenbos have also drawn on the smallholder research in their work on sustainable and inclusive oil palm production (Doc53, Res28). GIZ has used the smallholder work to inform internal policy brief development, as well as the supply chain research (IGO1). Moreover, allies like the UNDP – who are facilitating the drafting of the RANKSB – have been informed about the smallholder findings and typology work (IGO7). As a result, UNDP allies brought GOLS researchers into the RANKSB process to facilitate a special session and present findings on smallholders in front of officials from the Ministry of Agriculture (IGO7). While uptake into the RANKSB has not yet occurred, there is potential for some of these findings to influence that process.

There is low evidence of use of the scenario work by partners or allies, apart from reference made by OPAL partners (e.g., Hasanah et al., 2019b).

OPAL

The OPAL Project aimed to produce relevant and useful knowledge that would support conservation NGO allies to use in their advocacy (Res16). During the project, the OPAL team sought opportunities for allies to support the fieldwork and games (TR61). The OPAL team also engaged NGOs like KEHATI during the research process to discuss topics such as sustainable oil palm (Res20), which may be a potential avenue of ally influence. Similarly, the project engaged with big international NGOs (e.g., TNC, GIZ, TFCA) in East Kalimantan, hoping that these allies would take interest in and adopt Companion Modelling in their own work with local communities and governments (Res24). It was

"A proliferation of satellite-based deforestation online monitoring platforms are now available – notably GFW, GFW-Pro, Starling and Cifor's Borneo/Papua Atlas" (Doc65)

"*besides being involved in the drafting of the National Action Plan, we facilitate the results of CIFOR's research on planter typology* […] *CIFOR often gives active input to what UNDP is doing, and facilitates wider impact if I can say tha*t" (IGO7)

"*it is pretty good, yes, as I said earlier, especially when* [GOLS researchers] *presented about* [the] *typology, we hope that the Ministry of Agriculture can do something, making it a consideration to better classify the level of the planters* [smallholders]" (IGO7)

"*it probably all depends on the timing. I think if you have all your evidence on hand, you can be much more influential over those debates, because they are asking questions and you are building your work into the debates. There are discussions about topical debates, you are coming up with your questions, building your evidence in order to feed back into those debates. But in order to get the evidence, it takes three years*" (Res18)

OPAL

"I also discussed with BIOMA about possibility [*sic*] to assist [*sic*] in the implementation PhD reseach [*sic*] […] in Kukar district" (TR61)

"*with the other BINGO* [big international NGO] *that* [OPAL has] *been playing in East Kalimantan* […] *what I hope is that the other BINGO can adopt actually our approach, and use their energy, use their power to help, you know, scale up or elevate the process. Not only elevating, but also scale that into the practical level into the communities*" (Res24)

"*So halfway through the project, the EU* […] *start*[ed] *engaging in strong discussions about banning oil palm for biofuels and that suddenly was very important for Indonesia and Malaysia* […] *our partners IPB and CIFOR who were talking with the government, we are part of the discussion what is going to happen, but so it appeared quite linked to the process like two or three years in the process. People from the OPAL Project would be part of the Indonesian delegation that was coming to meet the EU for the*

thought that this type of uptake could scale up the influence of the project (Res24).

Government partners who learned from the Companion Modelling games saw potential to transfer their learning to decision-making situations (Gov14, Vid2, Vid5). However, national and subnational government respondents noted the difficulty in scaling up individual learning to their colleagues and the wider institution (Gov2, Gov6, Gov19).

There is potential that OPAL has influenced allies in ISPO with the research, as the OPAL team and individual members of the team have been invited to provide inputs to ISPO (Doc13, Res6, Res14, Res20). While there is evidence supporting a clear link with the project, some individuals on the team were invited to ISPO for their professional expertise and affiliation outside of the OPAL Project (Res14). The OPAL team was also invited to support the Indonesian delegation in negotiations with the EU (Res14, Res16). The team saw this as an opportunity to present the games and encourage both parties to use the Companion Modelling approach as a means to "*reach an agreement*" (Res16), so there is potential for uptake among government and EU allies. This evidence and the degree of OPAL influence in the ISPO process have not been corroborated with other actors involved in ISPO.

ERS

Partners and allies of the ERS Project use research to inform their work (IGO1, PS2, NGO4). One partner believed research organizations play an important role in providing empirical grounding to inform advocacy work (NGO4). NGOs use a range of research sources in their campaigns on oil palm issues, such as UNICEF research on child labour, and gender research from the Rainforest Alliance and the ERS Project (NGO4). Some advocacy organizations commission research from local partners, NGOs, community-based organizations (CBO), or research organizations for their campaigns (NGO4). Apart from research, pilots were noted as an alternative source of information useful in advocacy work (NGO4).

The ERS Project partnered with Oxfam Novib to advocate for the inclusion of gender within the RSPO standards. Partners and allies of the project were well-situated to influence RSPO. For example, Oxfam Novib is a member of the task force reviewing the RSPO standards as well as involved in the Working Group on Human Rights (Doc54, NGO4). In addition, Forum for the Future brings private sector actors together to focus on human rights issues in the

negotiations. We are inviting the negotiators on both sides to use our methods and manage our games to reach an agreement" (Res16)

"*we can enter here and at several government institutions because we have the results of OPAL research, because at the micro-level at the community level, at the national level, at the provincial level we already have data from OPAL, we before enter the current 2017, we are also given the heart to trust to assess the readiness of farmers themselves to implement ISPO*" (Res20)

"*because by involving myself in the OPAL Project, I know the details of the oil palm because we are doing not only research in one site, in one place, but I have also in the meantime get some fund also from UKCCU from England to do the effective derivativeness of ISPO in five provincial level. So I know very well the readiness of the smallholders to get involved in the certification process, which is a very, very low, the readiness*" (Res14)

ERS

"*we have a variety of intervention strategies, so our role depends on what intervention we are at. So we combine various interventions. We have campaigns, we feel we are a global campaign force. So campaigns that we have done are Behind the Brands, Behind the Barcodes. So anything we do relates to these global campaigns. […] So we use the targets under campaigns, whether they are old or current campaigns, it doesn't matter, because we still monitor all those […] and we still continue influencing them*" (NGO4)

"*that's my own perception,* [research organizations] *play an important role. Also local universities, yeah, because we try to look for them as well, both national universities, leading research institutes, and local universities. But it's hard to say if they can play a role on their own. I think in combination with NGOs, with civil society, that's where change can really happen. That's what makes it perhaps stronger, the results of their research, because then there is a framing, as well. Because the research itself is academic and scientific and well elaborated, but you need the framing, the political framing, which the research institutions cannot bring because they are supposed to be neutral and not politically involved*" (NGO4)

	oil palm sector, and is active within RSPO (PS2). Within these spaces, there is evidence that project partners and allies have promoted the project findings. One partner amassed research from multiple sources, one being the outputs produced by the ERS Project, and used these to help put gender on the RSPO agenda (NGO4). There is evidence that specific findings of the ERS Project have been used to identify gaps within RSPO, such as childcare and maternity leave, health and safety, and training (Doc54). Evidence from the working group on human rights indicates use of the ERS findings to inform the working group's review of RSPO P&C indicators, guidance, and auditor checklists (Doc54, NGO4). GIZ partners noted use of Li's (2016) foundational research on the social impacts of oil palm (IGO1). One respondent thought advocacy organizations like Amnesty International and Greenpeace would benefit from the EK Project's findings in their campaigns (PS2).	"*in the case of CIFOR, a couple of years ago, we needed research on gender in the palm oil industry, and that's when, on the basis of the research, was able to put it on the agenda. Now it's been integrated and now we have a gender group in the RSPO. It's got traction now* […] *and research is an indispensable component of that* […] *I became a member of the Task Force for the review of the RSPO standards* […] *So I used all the findings and results, the two pieces of the research, and I also shared the research, so I became part and parcel of the whole documentation package underneath the process of the revision of the standards. So I used all the arguments that I could, and I negotiated in that process* […] *I thought it was also good to establish under the Human Rights Working Group,* […] *to establish a specific sub-group on gender to keep it on the agenda. Because this sector, palm oil, is very masculine, and nobody really cares about gender* […] *That sub-group has now been alive since almost two years*" (NGO4) "P&C indicators, guidance, auditor checklist – P&C Review - There are already recommendations from the Verite, Rainforest alliance and Cifor research. - This is an opportunity for the review to ensure it goes beyond indicators. The standards need to evolve" (Doc54)	
Partner organizations use project research to inform planning decisions and project development [high-level outcome]	**General** Planning for new research projects is not solely guided by information and learning from previous projects, but is also influenced by researchers, partner organizations, and funders. At times, differing agendas between these actor groups can present challenges, especially within a politically sensitive sector like oil palm (Res6, Res16). Funders are partly driven by internal policy directives, political pressures, and public opinion, among others, and seek to fund projects that are feasible, practical, and innovative (IGO4, Res6, Res29). Depending on external circumstances, funders can appear to change their minds in terms of the types of projects they support (PS6, Res1, Res32, Res33), or may be driven by the "*latest flavour of the day*" (PS6). Funders may also lack capacities to distinguish which projects can contribute to the outcomes they intend to support (NGO1), which makes funders an important target audience of project learning. One researcher found it disheartening that some funders are moving away from TDR, tending to favour traditional "*top-down academic research*" (Res16). An additional challenge for research funding on	**General** "[For funders,] *whatever is the latest flavour of the day, they're so fickle there, it's so problematic there at the heart*" (PS6) "*Well it's always a mixture of you know what is feasible in the Indonesian context, particularly the politics around palm oil, that's one factor that influences, the other main driver is* […] *what donors will fund, and then the other factor is what is a little new and innovative and hasn't been done one thousand times, but is still within the realm of practicality*" (IGO4) "*I am not sure we will find soon donors that are putting so much emphasis on transdisciplinarity, so much emphasis on science and policy interface, and it seems like they are reverting back to the old classic top-down academic research, I am a bit sad about that*" (Res16) "*If you want to provide research on these practices, you will find funders for two years, three years, four years, but the real impact can be measured on the whole cycle of the plant*	**H** **Realized, clear portfolio contribution** Evidence indicates partners from across the portfolio have either used or been influenced by project findings in decision-making and/or project development.

commodities like oil palm is the mismatch between funding and growing cycles, which typically range from one to five years for the former and twenty-five for the latter (Res6). Internally, learning from former projects could help inform CIFOR and partners to develop better ToCs in future project planning (Res29).

EK

Following official adoption of the PERDA, follow-up activities by EK Project partners and allies have been put in motion. For example, a pergub is currently under development outlining the technical regulations for the implementation of the PERDA (Gov14, Gov21, NGO7, Res6, Res25, Res31). Some results of the EK Project are informing that process, and project researchers continue to be involved (Gov14, Res6, Res25, Res31). In addition, a communication forum (i.e., FKPB) has been established as mandated in the PERDA to improve the decision-making over various plantation commodity issues, including oil palm (Gov21, NGO7, Res6). EK Project researchers are involved in the advisory board of the FKPB (Gov21, Res6).

GOLS

As a result of their involvement in the GOLS Project, P3SEPKI partners were well-prepared to inform decision-making and project development in the KHLK (Doc7, Gov1, Gov15, Res6). For example, P3SEPKI partners prepared options for oil palm smallholders, drawing on GOLS recommendations on land amnesty (Gov1). P3SEPKI also used project findings in the development of a research proposal submitted to FOERDIA to address the lack of official data on land cover change resulting from oil palm expansion (Doc7, Gov1); unfortunately, budget limitations currently prevent this proposal and research from being pursued. Other project findings have informed P3SEPKI partners' development of intra- and inter-ministry policy briefs, as well as ministry negotiations with the EU on ILUC (Gov1). In another example, P3SEPKI partners have drawn upon the work they carried out in GOLS to inform "*a handbook for palm oil diplomacy in the international area by the Ministry of Foreign Affairs*" (Gov15). One P3SEPKI partner claims to have brought project learning to their involvement in the BPDPKS's research commission (Doc7, Gov1).

GOLS research on the Borneo Atlas has also fed into planning decisions and project development. To expand upon the Atlas work in different regions of Indonesia, such as Papua and Sumatra, GOLS researchers have sought funding as well as partner

which is 25 years. So it's very tough to find funding for 25 years and […] discrepancies between the agenda of research, the agenda of the funders, and the agenda of the politicians" (Res6)

EK

"*later there will be several governor regulations derived from the PERDA, so the regulation actually has a sequel, […] that's now one of the priorities*" (Gov21)

"*So now Kukar, if I am not mistaken, is the first regency, which was assisted by CIFOR. We already have a map […] for the NKT/HCV area. Now it has reached the draft, for the preparation of the decree to the regent. As we go along, we are also waiting for the Governor Regulation […] regarding the management of NKT, […] because we were given the authority to follow up on the effect of the agreement. Earlier, the provincial government appointed one of the NGOs* [and] *CIFOR had a work activity here, to help facilitate*" (Gov14)

GOLS

"*GOLS team become a palm oil team in* [KHLK], *so everything about palm oil is delegated to us, […] so for me, the information that we collected from the GOLS project is very useful to counter or to do the tasks from our boss, for our minister*" (Gov1)

"*our ministry* [KHLK] *also. Palm oil issue is rising up, and we have to respond to it*" (Gov1)

"*UKCCU […] was talking about this kind of follow on for 2020 and taking this Atlas and making sure it's used. So I said, 'Great!', right? […] My project comes along, great timing. Our mandate is not to make sure that tool is used, our mandate is to assist spatial planning, assist local governments. We see a bunch of tools, so we like to help those local governments utilize existing tools rather than reinventing other tools*" (IGO2)

"(UKCCU) […] *is building the business case for DFID to fund CIFOR to expand the Borneo Atlas to Papua*" (TR45)

"*I don't think* [KPK] *have used* [the Atlas] *intensively, but I think they see that as a potential way to understand what is happening on the ground and also by seeing historical data,* [they] *can identify potential of corruption in the middle, for*

endorsement. For example, DFID UKCCU supported the development of a Papua Atlas (IGO2, Res2, TR49). Researchers working on the Atlas believed the tool would be valuable for KPK, as it could assist KPK in the identification of corruption when combined with an inspection of permit data (Res2, Res19). Reportedly, multiple one-on-one meetings with KPK staff were held to present the Atlas tool, demonstrate how the Atlas could produce compelling evidence to inform investigations of illegal plantations/concessions in Kalimantan, and provide training (Res19). While met with interest to send a KPK team to investigate – to which portfolio researchers responded through the provision of drone flight paths to support this activity – ultimately, it is unclear as to whether KPK followed through with these investigations (Res19). However, the Atlas would need government endorsement before KPK could officially use it (Gov5, Res2). According to one researcher, potential partners at BRG supported a funding proposal for a Sumatran Atlas by providing an endorsement letter because they are interested in the issue of oil palm expansion in peatland areas in Sumatra (Res2).

As part of the partnership with LAPAN and BAPPEDA Kotawaringin Barat, the relevance of GOLS results to inform spatial planning for Kotawaringin Barat was identified early and included in the MoU (TR76). Data from the collaborative mapping of smallholder plantations was noted to have potential use to guide policy-makers and local planners (TR36). In addition, a respondent from BAPPEDA Kalimantan Barat said the government will use the Component 4 findings on the future land use scenarios for oil palm plantations to inform the implementation of one of the tasks mandated in RPJMD 2018-2023, to control the use of licensed APL that have not been developed with oil palm (Gov22).

Other partners, like TFA, have referred to portfolio and other CIFOR research to inform new project design (PS5). GOLS findings did not inform the TNC's new project proposal, but it was said that TNC generally refer to CIFOR's research to inform decisions on where to focus their projects (NGO7); the interviewer felt the respondent may have given this response to satisfy what they thought the interviewer wanted to hear. According to a trip report detailing the launch of a WWF project on green economy in Borneo, there was an impression that GOLS could feed into the project as there are "significant overlaps of issues, objectives and activities between WWF and GOLS project" (TR23). WCMC approached GOLS researchers to fund a new project on oil palm,

example by checking their permit data that they have with when they are starting operating" (Res2)

"*We presented the Atlas several times and* [BRG] *are interested in basically the expansion of oil palm, especially in peat, and actually one of the reference that the endorsement letter that we got from the Norway project is from BRG, because they see that this* […] *can help their work but the main reason why they endorse the Atlas* [is] *because they are interested to see Sumatra, the part we are not yet working on, they feel that the historical data, something similar with what we already have in Borneo and Papua will also help understanding the complexity of the industry in Sumatra*" (Res2)

"We (CIFOR, LAPAN and Plantation Agency) met the secretary to the Head of Bappeda and his staff. […] We agreed the importance of including smallholder oil palm plantation in the spatial structure plans and need to find solution over those on forestland area […] CIFOR will share its mapping results with Bappeda for review and they will see if they are to be integrated into the existing spatial plan" (TR76)

"The purpose of meeting Bappeda was to further discuss and clarify a planned collaborative effort between CIFOR, LAPAN and Bappeda Kotawaringin Barat in developing a system for monitoring smallholder oil palm plantations. […] the Head of the agency was very pleased with the collaboration and he considered the results (i.e. spatial distribution of smallholder plantation) very useful in providing them with update information on how smallholders are expanding, and guiding the local planners and policy makers to take the right decision" (TR36)

"*CIFOR's* [scenario] *research is very helpful in determining the actual size of the optimal area that need to be controlled. This is to control the development of licensed areas for oil palm plantations*" (Gov22)

"*we* [TFA] *refer to several studies, including CIFOR's work, after that we design what are we going to do with this as a platform*" (PS5)

"*in my project,* […] *in the proposal, there is no working with people's palm oil unfortunately* [we did not use GOLS findings on smallholders, but generally] *we are looking for*

and it is likely that learning from the GOLS process and results would inform the direction and development of the new project (Res15).

Through GOLS, project researchers saw the possibility of influencing donors in terms of how they finance research on oil palm, how to allocate resources effectively, and how to identify the most pressing issues needing funding (Res12, Res18). For example, Component 1 on effective governance arrangements intended to inform donors and NGO partners on how to foster consensus between system actors that have different understandings of sustainable oil palm (Res12). GOLS donors have used CIFOR research on oil palm to inform proposal development (IGO4). Donors noted that they try to align current projects with subsequent research they fund, and did so with GOLS and USAID's LESTARI Project (IGO4).

OPAL

One researcher felt that the OPAL results may not be tangible, but the project has made contributions by "*feeding ideas and strategies and informing processes that help or support […] organizations in improving their practices*" (Res10). There is potential that OPAL's contributions to LTKL's South Sumatra Landscape Festival in 2018 could have inform LTKL's work to implement sustainable oil palm strategies at the district-level (TR44), but this could not be triangulated. OPAL researchers discussed OPAL's partnership with KEHATI on the SPOS Project, where learning and methods from OPAL have been used to support dialogues on oil palm with national actors (Res6, Res20). One OPAL partner is involved in a project funded by UKCCU and KEHATI focused on ISPO in five provinces, so there is potential that OPAL learning has informed the direction of that project (Res14). As a continuation of OPAL, partners have entered into new projects on oil palm with the University of Göttingen, Wageningen University, and University of Edinburgh where there is potential that OPAL learning informed the development and design of these projects (Doc20, Res14, Res20).

ERS

Outside of the oil palm debate, one partner has used the findings on gender and social auditing on other commodities faced with social issues, like seafood (NGO4). This partner also provides training with local partners and CSOs to encourage gender-awareness and responsiveness, drawing on the same research utilized in their campaigns; however, it is unclear as to whether

[CIFOR research] *to see, compare, to look for a decision as to where* [to do our work]" (NGO7)

"*One last thing of GOLS, we get new project design, because when WCMC ask to collaborate […] it's because they recognize the work out of GOLS on oil palm*" (Res15)

"*always there was an element of how we could better inform donors and those who were continuing to finance work in the palm oil sector and focused on sustainability, etcetera, like how they can target their resources, that was always a key part of it*" (Res12)

"*when I was designing projects […] I would use resources to back up my proposals for my program designs […] occasionally I cite a CIFOR paper when I am doing a proposal*" (IGO4)

"*I thought that* [GOLS] *was a nice complement to some of our other projects […] I can remember trying to build some linkages between CIFOR and our other main implementing partner or project called the LESTARI Project*" (IGO4)

OPAL

"*a lot of the work that we have produced is not so tangible, it is more feeding ideas and strategies and informing processes that help or support many of these organizations in improving their practices and improving the way they do things*" (Res10)

"*there was a plan […] by IPB team […] they secured some funding, SPOS Project, it was funded by UKCCU to KEHATI […] So the project was called Strengthening Sustainable Palm Oil (SPOS). This team, IPB team, they would like to make synergy between what they are going to do, and OPAL […] so they would like to use the same method […] because the target of this project is to have a dialogue about the national institutions and even involving a more larger actor like Ministry of Trade, Ministry of Foreign Affairs, more for diplomacy*" (Res6)

"*by involving myself in the OPAL Project, I know the details of the oil palm […] in the meantime,* [we] *get some fund*[ing] *also from UKCCU from England to do the effective derivativeness of ISPO in five provincial levels. So I know very well the readiness of the smallholders to get involved in the certification process, which is a very, very low, the readiness*" (Res14)

	ERS research has been used for this type of activity by partners (NGO4). The respondent also gave an example of a new oil palm pilot project in Sulawesi that has a human rights and gender focus where ERS findings did not inform its development (e.g., FAIR Company Community Partnership pilot) (NGO4).	**ERS** "*There are other platforms where we also use* [ERS findings] […] *But these are more general, not palm oil specific, but very Asia-specific commodities, very relevant. I have also used it for other commodities where we see similar social issues. So the seafood rights, I use it. A kind of extra preliminary basis*" (NGO4) "*We have local projects, and we are currently preparing for the implementation of a pilot project in the oil palm sector in Sulawesi together with also private sector. So local authorities and local private sector in the value chain, so it's* [a] […] *business model that we want to test in the palm oil sector, and it's called FAIR Gold, FAIR Company Community Partnership,* […] *also gender-focused.* […] *again, based on research – not CIFOR research, but aid or environmental research*" (NGO4)	
The oil palm sector (governments, private sector, NGOs, smallholders, CIFOR) develops more effective working arrangements [high-level outcome]	Several portfolio engagement processes (e.g., EK contribution to PERDA development; GOLS input to ISPO; OPAL games facilitation with policymakers and project input to RANKSB process; ERS contribution to the Human Rights Working Group's revisions of RSPO P&C) facilitated interactions with stakeholders and provided input to inform improvements in policy that imply more effective working arrangements both in process and in output. Portfolio partnerships and collaborations, which provided an avenue to test new and existing working arrangements between system actors, were appreciated by government, NGO, and private sector respondnents, and follow-up was encouraged (Gov2, Gov3, Gov4, Gov7, Gov12, IGO2, IGO3, IGO7, NGO3, NGO7, PS1, PS2, PS6). The increased capacity of P3SEPKI researchers to respond to issues related to oil palm implies better working arrangements within the KHLK, as the individuals in the ministry now have greater capacity to understand oil palm issues (Gov1, Gov15). If CIFOR continues to nurture relationships built with P3SEPKI researchers during GOLS, complies with KHLK's 'no surprises' policy, and treats the ministry as a genuine partner, working arrangements between CIFOR and KHLK could improve. One mandate within the PERDA pertains to the development of a multi-stakeholder communication forum (FKPB) to make decision-making processes more inclusive and better informed (Doc59, Doc60, Gov21). The concern for including multiple stakeholders and consideration of scientific evidence within this	"*I really want CIFOR to help in the sustainable palm oil action, what we have socialized together like that, in the formation of the team, in the future the technical assignment of work.* […] *Because we are* […] *overlapping like that, a lot of work, if there are partners or NGOs who are concerned to help, this helps us to feel really helped, by the mechanism to implement what should be done. Because our energy is limited, our work is very much not only oil palm, there are so many plantations* [and commodities] *and if there is anyone who helps, this is CIFOR helping for sustainable palm oil, yes we are very grateful like that* […] *Because it has been 5 years for the RANKSB, and it has already begun with the socialization of the workshop with CIFOR, we will continue to look forward to working together for that*" (Gov12) "*The national palm oil industry, so we together with the relevant ministry ministries and also several agencies including researchers, make what maps of the Indonesian palm oil development guide until 2045*" (Gov18) "*I have to say yes* [NGOs and research organizations are considered important in decision-making], *because we are in East Kalimantan, we are including the provincial government. That is very accommodating of NGO friends, establishing international cooperation, universities, other*	**L** **Partially realized, unclear portfolio contribution** Few respondents explicitly identified how the processes facilitated by the portfolio contributed to more effective working arrangements. Not all policy provisions that imply more effective working arrangements were informed by the portfolio.

mandate demonstrates recognition for and movement toward improving working arrangements; however, it is inclear whether the EK project made contributions to the FKPB.

RANKSB, developed in response to ISPO, and in which portfolio researchers and partners are participating, is a collective working arrangement that has the potential to stimulate change and sustainability in the oil palm sector (Doc61). However, portfolio researchers' and partners' contributions to ISPO cannot be confirmed based on the available evidence; only their participation in the process can be corroborated (Doc13, Doc16, Doc20, Doc23, Doc24, Gov13, Res6, Res14, Res15, Res20, TR21).

The portfolio's interaction with the private sector through participation at multi-stakeholder platforms and engagement of private sector convenors was noted to be valuable to reduce the polemic nature of oil palm discourse among actors, particularly between NGOs and the private sector. Sharing portfolio findings through these avenues offered a basis of knowledge and "*sane ground to work on*" (PS2) solutions development.

While the above-mentioned policies reflect more effective working arrangements, and many portfolio processes contributed to relationship development, collaboration, and collective action within the sector on the topics of HCV, smallholders, gender issues, and private sector accountability regarding sustainability commitments. Capacity for policy implementation, enforcement, and sectoral ego remain critical challenges for effective and functional working arrangements (Gov2, Gov16, PS2). Moreover, there are changes affecting system working arrangements that have occurred outside of the portfolio's sphere of influence. For example, a presidential regulation introduced this year, PerPres No.44/2020, has given more authority to the National Accreditation Body (KAN), which is considered by RANKSB to be a more effective arrangement for ISPO (Doc62). In addition, other organizations and initiatives have explicit objectives to stimulate collective action and improve working arrangements in the oil palm sector, such as INOBU, KEHATI, and WRI, among others (NGO7, Res5, Res7). The work of these actors imply continued progress on the realization of this outcome, and identify potential allies for future targeted engagement should CIFOR aim to make more progress on this outcome (NGO7, PS2, PS6).

friends, friends. Private also, so that in terms of compilation of decisions, compilation of regional regulations, we are usually invited to all laws, surely we are invited, so yes, in terms of participation it is very good in my opinion" (Res25)

"*Willing, we whoever invites us about oil palm, as long as the competence and authority of the oil palm are willing* [...] *even if one day we are invited as a resource at the CIFOR event to progress ISPO so that CIFOR friends from the forestry community will understand ISPO better, right*" (Gov17)

"Through this project, we have been successful in mobilizing various stakeholders concerned with oil palm development in East Kalimantan, the implementation of low carbon development plans, and in facilitating the incorporation of stakeholder aspirations into the PERDA. This was intended to ensure that environmental, social and economic perspectives and impacts are equally valued and considered, whenever the PERDA is to be implemented in the future. This project has facilitated the incorporation of various aspirations into the draft PERDA, including particularly some important articles governing HCVs and environmental protection. It also produced an interesting finding on HCVs areas on areas allocated to plantations under the 2016 East Kalimantan Spatial Structure Plan. The initiative for development of the PERDA has now been transferred from the Provincial Plantation Agency to the Parliament (DPRD)" (Doc3)

"*Essentially that involves working with companies to develop their sustainability strategies, or just raising their level of ambition in terms of application for sustainability, and so, then when we have had these one-to-one relationships for a few years, what tends to happen especially, for example in this case if we have identified major gaps in what is happening, one of our key partners will help convene a cross sectoral collaboration* […] *what became really evident from our research and focus was that we essentially needed to get people together across the sector to address labour rights in palm oil, what has been really evident is that they had been completely slammed by the likes of Greenpeace for a lot of the environmental issues around palm oil but increasingly it was becoming evident that the next peatland kind of issues, was going to be labour*

rights […] [In the absence of CIFOR] *I mean, it's still polarized, but I think there would have been even less content or opportunities to find middle grounds, they helped provide sane ground to talk on. I am not articulating right, but it helped depoliticize or you know if you didn't have an axe to grind you could just read what they wrote and then think about it and then leave the conversation, not thinking somebody needs to go down*" (PS2)

"*I think East Kalimantan we have lots of contenders, you know, we have lots of big international NGOs playing in this issue, and the OPAL team is only like part of it. We are very tiny and small in terms of visitations to villages, researchers have only got one visit because that is data collections. Rarely we have the opportunity to go back and having more in that discussions with communities – that's a different way of approach, with the other BINGO that they've been playing in East Kalimantan. So I guess the implications also different between OPAL and also the other NGOs. And what I hope is that the other BINGO can adopt actually our approach, and use their energy, use their power to help, you know, scale up or elevate the process. Not only elevating, but also scale that into the practical level into the communities. So I think for the project-scale of OPAL, it's very understandable that OPAL can deliver this much of implications, you know, which is doing the research, sharing the research, and then playing together the Companion Modelling games and getting more people involved. I think that's to the extent that we can with the limitations we face*" (Res24)

"*GOLS research collaboration have expanded networking with oil palm stakeholders from government, private sector, academia and associations. Thus we can gain access to data and information related to oil palm, although not all data can be shared by private stakeholders*" (Gov1)

"*That combines, because not only me that researched about the analysis, but the other institutions like NGO also did the same thing, so we have ideas how to combine it between them and me, and we already discussed and already facilitated about the process and now waiting for the publication*" (Gov1)

"*At that time, I suggested very good replication* […] *in other places, so that we together with the province and the region*

		can also be more together to better understand it, better understand it that way" (Gov19) "Collaboration with other institutions already working on this issue (i.e., CIFOR). Collaboration with conservation awareness groups to improve and extend messaging on the effects and scope of fires on sun bear habitat" (Doc57)	
Private sector actors learn from oil palm research [intermediate outcome]	**EK** No evidence beyond private sector attendance at meetings and workshops (Res25), but it is reasonable to expect these processes in conjunction with the ratification of the PERDA may have contributed to an increased awareness and recognition of the need to conserve high conservation areas among private sector participants (for instance, GAPKI). **GOLS** A respondent working with private companies stated that having up-to-date information about the status of deforestation was useful to ease communication guiding discussions with members at RSPO (PS1). In addition, CIFOR's research on smallholder typologies in combination with INOBU's supports for smallholder STDB registration has helped increase the momentum toward improved visibility and awareness of smallholders in the sector (PS3). In light of a focus by some on jurisdictional approaches (JA), it was noted that CIFOR's mapping (through REDD+) of provincial-level emissions and areas will be helpful, and that they will be engaged moving forward to support private sector learning (PS5). Private sector engagement was limited through the project owing to the collapse of IPOP, and the inability to secure contacts and entry points beyond multi-stakeholder fora; researcher learning about responsiveness, scope for mutual benefits for researchers and the private sector from the project was noted as a point of improvement to consider by developing a more comprehensive strategy to engage the private sector in future projects (IGO4, NGO6, PS6, Res1, Res5, Res8). However, the limited engagement between research project with the private sector particularly with companies has become a challenge for GOLS to provide evidence of the kind of private sector learning that resulted from research findings. Partners corroborated this challenge, noting that private sector actors often feel threatened by this type of research (Gov1); however, encouragingly there are increasingly more private sector actors who are willing to participate in and support oil palm research	**EK** "*From my experience* [most stakeholders] *are always invited, the important stakeholders must always be invited anyway, their business comes whether I don't know why, how to submit the wrong invitation maybe, or how I don't know, but if I see it from invitation news, I see enough* [...] [the companies] *always* [have representation] *there*" (Res25) **GOLS** "*respondents from the private sector consider oil palm research carried out by forestry and environmental research institutes might be a threat for them to get pressure on their oil palm products related to environmental issues. But there are still some private sector parties that support oil palm research and even provide the opportunity for the GOLS team to visit the site to see sustainable oil palm management practices*" (Gov1) "*I think if, well for TFA, JA* [jurisdictional approach]*, it's kind of a new strategy I would say, so the process we are mapping from the commodity perspective, we identify provincial levels where the supply chains are, and development partners are working on, during the review, we refer to several studies, including CIFOR's work, after that we design what are we going to do with this as a platform. It is a really new strategy we are looking at, but I believe because CIFOR has been working. I mean, quite early to map out the JA and translate into the provincial level emissions and mapping, for sure we will be referring to that, and involving CIFOR in the discussion*" (PS5) "*Yes, the development is much faster than before. Before there was CIFOR before there was INOBU too. For the industry, yes, he did, which we did not pay any attention to* [smallholder issues] *at all*" (PS3)	**L** **Insufficient evidence, preliminary results indicate partial realization with clear portfolio contribution** Oil palm company representatives were not reachable for interviews. This assessment relies on documents, researcher interviews and interviews with intermediaries who have direct access and influence over private sector practice.

activities. For example, under Component 1, the research team were able to carry out site visits to observe sustainable management practices by company plantations (Gov1). GOLS predominantly approached non-private actors, even to obtain company plantation data (NGO3). This can be observed through Papua Atlas that got the company plantation data from the Plantation Agency instead of the companies (Gov12). The Borneo Atlas has had some engagement with the private sector, when a representative from Wilmar came to office to clarify its plantations in the Borneo Atlas map (Doc7). However, the evidence base is limited to adequately assess this outcome, as Wilmar was not reachable for comments. The engagement with companies was observed during smallholder research in Kotwaringin Barat, when the researchers did their early fieldwork in the region to inform that they would collect smallholder data near Astra's plantation. However, the engagement is again limited to letting Astra know about the research activity would be conducted, they were not involved during the research, and not disseminated with the result. A smallholder was involved in the research (PS3). The findings on smallholder typology were disseminated at a seminar in Kotwaringin Barat in August 2019, which was attended by government, smallholder associations, providing an opportunity for the private sector actors to learn. One smallholder attended the seminar, and he suggested that the findings can be more effective if disseminated directly in the village, so other smallholders can attend (PS3).

OPAL

No evidence beyond private sector attendance at meetings and workshops. One farmer who had played the game noted to have gained an understanding and experience for the future, and seemed to consider a more holistic approach regarding the long-term consequences of their practices (e.g., the environmental impact) (Vid2). A project researcher conveyed deep engagement with farming communities through the games had the potential to help develop broader understanding of the issues within the sector and learn together constructively (Res24). Respondents suggested that smallholder association representatives who participated in the games potentially learned from the games (Gov2, Gov6, Gov21), but the evidence is too limited to be conclusive of the kind of learning that occurred.

ERS

The project worked through private sector convenors and RSPO to channel information to increase private sector awareness of the

"*For me I think CIFOR has produced many good research work, so I can think of a specific one, probably I can give you an example, for example I was looking at these, deforestation issues and all, so CIFOR has been active in deforestation work, and it is good because we didn't understand for example what are the trends of deforestation in Indonesia and Malaysia and so how, this helps us to engage for example, our communication and information to our members, you know this is the real status of this, so please do not go out, research has mentioned for example, deforestation has decreased in Indonesia and Malaysia, so we say this is sound information we can use to communicate, rather than have everyone having up in the air, some saying deforestation is rampant in Indonesia, that kind of thing*" (PS1)

"*the private sector, yes, I don't think should be forgotten, and I think we would have been more effective had we tackled it in a more comprehensive way. But again, for projects like this, this was super useful that we learned that, and we bring this to new projects. And hence the birth of the Wal-Mart project, which we have been able to institute much better*" (Res5)

"*right now, RSPO is more critical. This is the challenge. And you know with RSPO is driven by the buyers. RSPO is actually mandatory, and it will be implemented, but not […] present*[ly] *to all smallholders and companies in Indonesia. This is mandatory. It will be much stronger, the political voice if we implement the ISPO. But then the problem is the acceptance*" (Res14)

ERS

"*It was really helpful to tease out what are the layers, when we look at systems change we often think of look at things as an iceberg and so you know what are the layers under casual labour, you had Amnesty and Greenpeace going on about this is an issue […], but I could trust* [ERS researcher] *to like tease out the pieces, this is what connects to that, this is what's relevant or you know it's a little like you were doing acupuncture, [they] found the right nerves to go and dig into to help rebalance the system. If you're talking to the companies and it's not even that they have any bad faith, but they may not have an objective view of what is needed. I think the strength of her research has something to do with*

challenges faced by women in the oil palm sector (PS1, PS2, NGO4, Doc54, Doc63). There is evidence to suggest that the research contributed to RSPO's awareness of the implications of their tools and mechanisms being gender blind, where there is scope to improve them, and about the implications of the practices of companies and their impacts on women's working conditions and share of benefits (e.g., awarding casual contracts) by providing a better understanding of the experience of women workers and the implications (PS2, Doc47, Doc54, Doc63).

Portfolio

Private sector learning has variably occurred as a result of project engagements with private sector intermediaries, and smallholders through which the portfolio shared findings regarding smallholders, and challenges faced by women working in oil palm communities (PS5, PS3, PS1, PS2, Doc54, Doc47). The presence of credible oil palm research in discussions was noted to have diffused some of the interactions – particularly conflicts between the environmental NGOs and companies, as it gave a clear picture of the status of the industry and its problems, in such a way that the problems could be addressed (PS1, PS2, NGO4). Evidence suggests some learning has occurred from the smallholder typologies fieldwork, and from participation in OPAL games, but it was noted that the application of the learning is unclear (Vid2, PS3). The limited ability to specify private sector learning may be indicative of a need for more capacity building for the application of research knowledge and learning for target audiences, particularly smallholders. Based on the evidence available, private companies who would have the capacity to use the findings were not well informed of the findings in GOLS and OPAL, but interviews were not conducted.

Private sector attention to research on oil palm is said to be perpetuated by market signals, influenced by campaigns that amplify messaging around the negative consequences of oil palm expansion, providing a large problem for the private sector to resolve if they wish to remain competitive (NGO6, IGO4, PS2, PS6). Traceability in the supply chain and resistance (facilitated by legislative loopholes) to releasing and making certain information available poses a challenge for effective private sector learning in regards to identifying and qualifying problems, to form the basis for discussions around solutions, as some may dismiss analyses based on imperfect (though the best available) data (Blog2, IGO1, IGO2, Res6, Res19, Res14). Diversity in sustainability

the fact that both areas that it really ultimately landed on really focuses on gender. Even if contract innovation more generic in a sense, it will disproportionately benefit women in the end. […] [the research] still gave us really, a really good idea of the landscape, and there were some things that the company shot down, either because it wasn't practical at the moment or this or that. But if you go into a room with people at that level at Wilmar and whatever and you just present one idea, it is going to come across as though you don't know what you're talking about or coming in with your own agenda. So again I just feel the breadth of CIFOR's research helped us present a broader picture of a lot of relevant things which helped us to meaningfully land on the other bit [gender]" (PS2)

"RSPO and its tools are gender blind. Can be harmful and not conducive to women in the production cycle. More casual contracts then permanent contract. - Missing out on child care and maternity leaves - Health & safety issues - Land right issues. - Missing out on trainings" (Doc54)

"This step forward to comply to a more gender responsive standard is aimed at promoting more sustainable livelihoods and reducing poverty within the sector as well as encouraging human resource efficiency, productivity and profitability. The push in this area stems from research which has highlighted that women, in particular, have been marginalised and discriminated against. Other difficulties suffered by women in this sector are unrecognised land ownership and land use, lack of training, lack of equal job opportunities and the lack of protection both as workers and producers" (Doc47)

	standardization has led to the pursuit of JA with the intent to address these challenges (PS5). CIFOR's limited direct engagement with companies has limited the ability to assess their learning for the projects, with the exception of the ERS Project. The evaluation team was only provided with contacts with intermediary organizations, not companies as these were the actors who were predominantly engaged in the research. The evaluation team did not receive responses from invitations for interviews from company representatives. GOLS and OPAL had positive engagements with smallholders, providing an opportunity for these actors to learn through games (OPAL), direct participation in the fieldwork (GOLS Component 3) but the effects of this learning have not yet been observed based on the data collected to date (PS3, Vid2).		
Private sector responds to (research-informed) policy change [EoP outcome]	**EK** There is potential that the EK Project could indirectly contribute to private sector response through adherence to the PERDA, which obligates companies to protect high conservation areas (Gov2). However, private sector response to this policy change remains contingent on implementation and enforcement (Gov17, Res25). Although the response from the private sector has not been realized to date, respondents noted that the HCV maps that will be included in the pergub could result in complaints from private companies (Res25, Res31). This is because companies' plantations overlap with areas identified as HCV, and the government is in the process of discussing many considerations regarding the HCV maps (Res25, Res31). **GOLS** Initial plans for direct private sector engagement was challenged by the disbandment of IPOP (Doc7, IGO4, NGO6, Res5, Res8, Res18). However, the Borneo Atlas revealed some data and analyses that prompted NGO action that merited a private sector response from some RSPO certified companies (NGO3, Res6, Res19). RSPO monitoring systems have scope for improvement, and while steps have been taken since to make internal changes, the functioning of RSPO still relies on external monitoring activities (Doc36, PS1). For example, Greenpeace used the Atlas to allege Bumitama was acting in breach of RSPO P&C by engaging in concession laundering, and filed a complaint with RSPO in their report (Doc36, NGO3, Res19). Bumitama responded by offering to compensate for illegally deforested land, even if it had happened before it acquired the company responsible to rectify	**EK** "*there is an obligation by companies to protect the environment both ecosystems and environmental land safety*" (Gov2) **GOLS** "*Yes, the main role from us, is we would like to explain or bring the facts to the people, to the public, which is there are still palm oil industry doing deforestation, we would like to pressure the industry* […] *one is the adoption of the commitment of zero deforestation, NDPA. We are not only working to push* […] *not only* [the] *producer who is doing the deforestation* […] *but also we are pushing to the traders and also to the market and of course to the consumer companies as well.* […] *we are using the Atlas of Borneo, as a source on our report* […] *From my view, I think the contribution of the Atlas* […] *is showing the fact*[s]*, and you are not the campaign organization like us, so you give the public aware*[ness] […] *I can say that the contribution of CIFOR on the palm oil sector is showing how deforestation happens, how much the oil palm contribution is on carbon emissions*" (NGO3) "adopting no deforestation into the RSPO's standards is an important step towards breaking the links between certified palm oil and forest destruction. However, the new rules will take at least two years to come into effect and right now numerous RSPO members are destroying rainforests with	**L** **Partially realized, clear portfolio contribution** Oil palm company representatives were not reachable for interviews. This assessment relies on documents, researcher interviews and interviews with intermediaries who have direct access and influence over private sector practice.

the situation (Doc36). Wilmar responded to data put forward by the Atlas, claiming the concession boundary data was incorrect, but was not able to provide data that proved otherwise (Res6, Res19, Res33). There is an expectation that the private sector will respond to advocacy efforts to embrace transparency in supply chains, and accountability to sustainability commitments, but representatives of private oil palm companies were not reached for interviews, so there is insufficient evidence to qualify the extent of the project's contribution to private sector practice in this regard.

OPAL

No evidence. The project is still ongoing and contingent on policy influence. No private sector respondents who were aware of the project were interviewed.

ERS

As a result of the changes to the P&C to better reflect gender in RSPO, to which the research contributed, all member companies are required to establish a gender committee to include women in decision-making, and have committed to address contracting issues (Doc54, Doc47, NGO4). Working through private sector convenors and RSPO to leverage points for private sector action supported private sector competitors to collectively act on addressing the issue of women's rights in oil palm (PS2, Res3). Project researchers were invited by a private sector convenor to participate in an initiative (i.e., DRLI) which brought together major companies to discuss how they could address social sustainability, including gender (PS2, Res3). Guided by the objectives laid out in the DRLI (to which the research contributed as well), Sime Darby and Wilmar are currently implementing contract innovation pilots to improve support for women growers (Doc64).

Portfolio

The projects in the portfolio contributed information about the status and extent of deforestation as a result of oil palm expansion (to bring awareness, accountability, and transparency to the realities of expansion), the importance of preserving HCVareas (which has been reflected in policy in East Kalimantan), implications for biodiversity (vegetation maps), options for sustainable development of the sector (scenarios and companion modeling), the diversity of smallholder realities (which is expected to be reflected in more effective targeting of policies), and the challenges women and communities face in the wake of oil palm

impunity [1]. RSPO must address this immediately if it is to make a real difference on the ground" (Doc67)

"according to mapping analysis in the Dying for a cookie report, 11,100 hectares of forest was cleared in Bumitama concessions considered laundered since 2005 and 2,300 ha of this clearance took place 2014. [...] Bumitama said in a statement that the acquisition of third parties was not designed to conceal development without permits or to breach the RSPO rules. However, it admitted that there was "a period of time" before the company had a sustainability policy when its adherence to RSPO rules "displayed a gap." "Given that the process of licensing in Indonesia can be very long and tedious, Bumitama has at certain occasions preferred acquiring companies furnished with permits for planting," the company said, reiterating that it has always played by SGX listing rules. "None of the acquisitions were not (sic) intended to create any artificial value that would defraud our investors by skimming off something first and then selling to the listed company," the statement reads. Bumitama added that it would compensate for illegally deforested land, even if it had happened before it acquired the company responsible, according to RSPO rules." (Doc36)

ERS

"*The establishment of the gender committee in every* [RSPO certified] *palm oil company came out of the research*" (NGO4)

"The adoption of the revised RSPO standards in 2018 now requires RSPO Members to align their policies to recognise and integrate a gender equal view and best practices within their operations" (Doc47)

"*it was part of that mix about the private sector coming together to make those commitments, if they did, I don't really know what has happened, I don't follow the news but we would have been such a big catalyst, you know, and I remember in that forum they kept on saying, this guy from Cargill* [...] *said 'You know, never have all of our competitors come together to agree on common action'. In that common action there were only three points, one was the women's rights issue*" (Res3)

"[CIFOR] *are extremely well informed, and the level of rigour helped bring, as much as they are well-informed and*

expansion. Private sector responses to portfolio research are therefore slower to materialize, given the indirect manner of research influence (i.e., by informing policy and collective advocacy). Much of the research influence therefore relies on the assumption that policy and advocacy directed at the private sector will trickle down to practice at the production level, which is difficult to assess given poor supply chain traceability, which was noted by many as a key challenge in the sector (IGO3, NGO3, PS2, Res6, Res19, Res24). At this stage, some private sector response has occurred as a result of awareness gained on gender issues and subsequent collective action to rectify them. For example, the research was noted to have contributed to the adoption of gender responsive policies among RSPO companies to improve conditions for women workers as a result of revised P&C, and new commitments to collectively address challenges faced by women working in the sector (Doc47, Doc54, Doc64, NGO4, PS2). Stimulating collective action by working through private sector intermediaries with similar sustainability objectives for the sector was therefore a good strategy to bring objective research to the discourse and encourage constructive progress on what is typically a polemic issue (NGO4, PS2). CIFOR's work was perceived to bring an objective, well-informed, and credible voice to the debate (PS2). NGOs continue to work on increasing pressure for enforcement of sustainability standards to influence company practice (NGO3, PS2). It is hoped that increasing pressure on private companies to release concession boundary data will result in better transparency and accountability in the sector to ensure sustainability is realized in principle and in practice, but there is insufficient evidence to assess the degree to which the private sector has progressed on this issue (NGO3, Res19).

very close to the subject, they brought an objectivity to it, because they are not a campaigning organization, so like at a time where you've got supermarkets in the UK like Iceland calling for outright bans of palm oil and it being very polemic, they brought a very critical, sane voice to the discourse" (PS2)

"Suggestion to establish a fund – to promote initiatives at the company level – empowering women in the business. The pros and cons of this will be discussed later in the year" (Doc54)

"The [Decent Rural Living] initiative is now entering the implementation phase, where the Anchor Partners will develop pilots to test the most effective means of achieving the aforementioned objectives. As existing actors within the system, the work to strengthen gender committees constitutes an important systemic intervention. The purpose of these pilots is to change how individuals and gender committees perceive themselves, and to enhance their potential as change agents within the system, by supporting more meaningful engagement with relevant decision-making structures" (Doc64)

General

"*ISPO's main objective is to encourage plantation businesses in abiding by existing laws in Indonesia, which are related to oil palm […] first of all, we encourage that business actors who have been given rights managing our natural resources, he must be obedient in order to be sustainable in protecting the environment for our children and grandchildren, then also raising the awareness of palm oil entrepreneurs to improve the environment, the third is implementing sustainable oil palm development, there are 3 principles, they must meet social, economic and economic aspects. environment and finally to increase competitiveness, to the results of Indonesia in the national market*" (Gov17)

"[the companies] *were basically willing to* [make sustainability commitments]*, the big ones were. And the reasons they were willing to do it, I think, in my opinion, were because a) they didn't want the word 'palm oil' to become what happened to the word 'tobacco', where you just hear the word and everybody just turns off on it. So they were worried about that. And then they also had most of*

		their land, so they didn't really need to deforest in order to continue their business. And then they just, you know, I think some of them just thought it was a good idea, better for society and so forth" (IGO4)	
Private sector adopts more sustainable and inclusive business models [high-level outcome]	In response to the culmination of momentum toward improving working conditions for women, to which ERS research contributed, Wilmar has released a Women's Charter, which outlines commitments to respecting women's rights and ensuring their welfare. The charter also outlines new governance arrangements within the company to ensure key issues (i.e., protection and care of female health, care of family life and welfare, protection from sexual harassment and violence, non-discriminatory, fair, and equal opportunities at work and in workers' representation, and continuous education) are addressed (Doc63). In the face of high pressures in the market arising from increased consumer awareness of the negative consequences of oil palm, resulting from environmental NGO campaigns and consequentially resulting in buyer responses to ban palm oil (e.g., in Europe), companies are demonstrating willingness and openness to embracing sustainability in practice, which is reflected in their commitments (Doc35, Gov17, IGO4, PS2, PS5, Res2, Res19). The Atlas was perceived likely to contribute to increased exposure and private sector accountability to environmentally destructive practices (e.g., deforestation) and discourage the private sector from continuing (NGO3, Res2, Res19, Res21). Evidence-based solutions and guidance to improve private sector practice toward sustainability and inclusion were perceived to be welcome, as this gap in implementation (how to realize sustainability and inclusion in oil palm business practices) remains a key challenge (NGO4, PS2). While new private sector commitments and supporting mechanisms to address working conditions for women mark important steps in the direction toward more sustainable and inclusive practice in the private sector, challenges in both implementation and enforcement of policies governing private sector practice remain. For example, RSPO's monitoring and enforcement to hold its members accountable to their compliance with the P&C has been demonstrated weak, and other research has suggested RSPO certified plantations perform no better non-RSPO plantations (Doc66, NGO4). Increased attention to this issue has led to RSPO setting aside budget for impact evaluation studies and research to improve the functioning of the mechanism, which may	"*the companies are tired of being harpooned, and they are pretty open to listening to people who have good advice, on the how, on solutions*" (PS2) "*there is a commitment from the private sector to go beyond their supply chains and then collectively with growers and everything to work together and you know it is not easy […] business is looking at what benefit them, right, like what link to their supply chains and I think this is a very positive gesture, where initially they pledge with the government and then see how moving forward they can align missing bits and pieces, so I think there is a shift*" (PS5) "*by becoming more transparent through that, of course the company cannot do whatever they want and gain profit over something that they shouldn't do, in the perspective of the company and in the perspective of the market. […] the whole campaign that I heard is happening in Europe that they ban oil palm, but I don't think what's wrong is the oil palm itself is bad, it's the way they extract, […]it depends on the company you get the product from, so by boycotting the oil palm product without separating which, because there are some companies that try to practice sustainable way*" (Res2) "*I don't know whether that's encouraging people to stop clearing forests but surely, you know, if the company clears forest today, the Atlas knows it and is in a position, so that it can report that*" (Res19) "*some of them [companies] do really good, and they can be used as partners […] with which we can collaborate to test an alternative business model, that also happens. So you see that we move from campaigning to advocacy to collaboration, even. It's exceptional, but it does exist. […] Although we know it is not enough, and the proof is in the taste of the pudding, which is the implementation of the [RSPO] standard and the assurance, and that is still very, very weak*" (NGO4) "*there are arrangements for seed management, there are arrangements for […] the supply trade […] I still see it as good, for palm oil plantation management in East*	**L** **Partially realized, clear portfolio contribution** Oil palm company representatives were not interviewed. This assessment relies on documents, and impressions from researchers and private sector intermediaries who have direct access and influence over private sector practice.

	influence true adoption of sustainable and inclusive business models of its members and their suppliers (Doc66, PS1). At the subnational level, the pending issue of the pergub on HCV in East Kalimantan contains a clear obligation accompanied by a map locating HCV areas directing companies to conserve HCV areas inside their plantations. While this policy is still in preparation and rigorous analysis thereof is beyond the scope of the evaluation, there is a potential for private sector actors subject to this regulation to adopt more sustainable practices as required by law, but this is ultimately contingent on effective enforcement of the regulation to ensure compliance. Myriad factors influence companies' agenda for sustainability and inclusion. Respondents reported that the private sector has several reasons to adopt more sustainable and inclusive business practices, but also acknowledged that barriers remain to change practices. Actors promoting consumer awareness and operating in Indonesia's oil palm sector include advocacy organizations, mass media, and certification bodies that hold companies accountable to best practices for the environment and society. In some cases, the portfolio engaged and/or influenced these actors through the research (e.g., GOLS, ERS). The adoption of sustainable and inclusive business models will remain contingent on the private sector's perceived profitability of doing so (IGO4, NGO4, PS2, Res8).	*Kalimantan, one of them. The important point is, yes, for the environment earlier that the company is obliged to identify and manage high conservation value areas*" (Res25) "In order to get endorsement from high-level officials, I had a rare opportunity to meet the Acting Head of Kutai Kartanegara district, and discuss OPAL project and planned workshop. He fully supported the research and workshop and he expected that the workshop could come up with useful recommendations on how plantations in the district could be more sustainable and equitable. Particularly, he was concerned with the fact that most companies have not used optimally the land allocated to them (i.e. the planted areas are much less than those the licensed area under HGU). While recognizing that the operational permit is issued by the district government, he pointed out that to HGU licences were issued by the central government, making the local government less authority to control companies in order to make sure that no lands became idle or abandoned. He was also concerned with lack of attention and support given to smallholders who heavily dependent on resources for their livelihoods, expecting to see in the future that more smallholders play a significant role in the production of oil palm in the district. This will make them more prosperous" (TR72)	
Smallholders and women have improved oil palm market access and share of benefits [high-level outcome]	Impending and present changes in policy resulting from knowledge contributions from portfolio research on smallholders (e.g., GOLS), game simulations (e.g., OPAL), and challenges faced by women (e.g., ERS) in principle reflect that smallholders and women would gain improved market access and share of benefits. Smallholders and women were not interviewed for the evaluation, therefore the assessment relies on proxy indicators of the implications of policy changes (e.g., RSPO and PERDA) to which the projects contributed, all of which require effective implementation and enforcement to realize these benefits. Implications of the changes to RSPO P&C indicates improvements toward improving women's share of benefits from the oil palm industry, at least for RSPO certified companies. Gender-responsive policy direction includes: equal pay for same work, equal access to resources, child care, and maternity (Doc54, Doc63). Assuming RSPO implementation and enforcement upholds these principles, it is reasonable to expect that women will experience	"*What kind of PERDA* […] *the outcome will be to build a plantation that first meets good aspects, economic aspects* [that] *benefit*[s] *all parties, both companies and communities, and community involvement is* […] *non-exclusive,* […] *if this farmer also often participates in farming, besides he also supports other services, environmental aspects*" (Gov2) "Policy guidance; Equal remuneration; Child care & Maternity; Equal access to resources; Increased participation in decision making" (Doc54) "*the typology also has ownership of the garden, there is also what we use means we help to make that happen, which means what if the typologies say it is elite why we helped them if they are able to be independent, we can sort it out, meaning that they are not just looking for food but the orientation is already profitable, so we prioritize where people who are helpless means that they need* [extension services]" (Gov4)	**L** **Not realized, too early to assess** Realization of this outcome relies on the assumption that policies are effectively implemented and enforced.

	improvements in their working conditions, including better access to benefits and markets. Awareness and recognition of smallholder heterogeneity among government actors has the potential to ensure more targeted policy responses and extension services to realize policy objectives. The portfolio's data on smallholders have been used to target different types of smallholder interventions as per the provisions of ISPO, STDB, and land legality. Other organizations like INOBU are committed to supporting registration to improve smallholder access to government funds (e.g, for replanting). This awareness and recognition in conjunction with a better understanding of smallholder realities among government actors may lead to policy changes that reflect better supports to reduce the risk of smallholder disenfranchisement and improve market access and benefits. Barriers remain for the improvement of smallholder market access and benefits, including traceability in the supply chain, the unwillingness of the companies to share data, and regulations facilitating this lack of transparency. While the Borneo Atlas increases pressure for improved data availability, counter-pressures to transparency remain in the sector for those who do not want to bear the repercussions.	"[the research] *is pretty good, yes, as I said earlier, especially when it was presented about* [the] *typology, we hope that the Ministry of Agriculture can do something, making it a consideration to better classify the level of the planters* [smallholders] *so that when planning or mentoring is made* […] *possible. I don't know now that there are fertilizer subsidies or not, it might be more on target, right?*" (IGO7)	
Graduate students build their research capacities [intermediate outcome]	**EK** This outcome was not anticipated for the EK Project, but there is evidence that the partnership with UNMUL on the HCV assessment contributed to UNMUL researcher capacity development (Res25, TR10, TR12, TR13). The assignment exposed UNMUL researchers to the identification and mapping of HCV areas in East Kalimantan, building upon existing spatial analysis skills (Res25, TR10, TR12). The experience also provided the UNMUL team with the opportunity to present results to provincial government audiences (TR12, TR13). **GOLS** GOLS is the first CIFOR project in Indonesia with a graduate student capacity development model (Res1). Originally pitched by USAID, the CIFOR-USAID Fellowship (CUF) was a core objective of GOLS, which aimed to build graduate student knowledge, skills, and networks (Doc7, Doc8, IGO4, Res6, Res8). Partnering with four American universities (i.e., University of Florida, Northern Arizona University, University of Missouri, Yale), CUF sent young Indonesian graduate students to study biodiversity and sustainable landscapes in the United States (Doc7, Doc8, Gov15, IGO4, Res12, TR30). CUF constituted two cohorts,	**EK** "I discussed with [researchers from] Mulawarman University who are assigned by CIFOR (under LOA with CLUA funding) to work on the identification and mapping of HCVs on plantation (perkebunan) areas within the land classified as KBNK under the Provincial Land Use Plan (Tata Ruang) of East Kalimantan" (TR10) "*What is clear is that with the initial collaboration,* […] *we can show our performance that, oh, we can be able to identify HCV with friends and* […] *fend off other claims* […] [because] *those who compile* [mapping] *must be licensed,* [but we showed that] *we can do this too*" (Res25) **GOLS** "CIFOR-USAID Fellowship (CUF) is a capacity development program which aims to train Indonesian students in selected graduate programs in the United States. CUF was developed by CIFOR in response to a request from United States Agency for International Development (USAID) to design and manage a masters-degree graduate	**H** **Realized, clear portfolio contribution** GOLS and OPAL built in strong graduate student research capacity development components, and provided ample opportunities for students to gain knowledge (contextual, methodological, practical), skills (methodological, academic writing, presentation, project

sending a total of 26 graduate students; 24 of these students completed the program and graduated as of June 2019 (Apriani, 2019; Doc7, Doc8, Res8). Students learned methods and theory (Doc7, Doc8). Students received scientific training, building their proposal development, research design, field, and analytical skills (Doc7, Doc8, Res8, Res12). CUF also offered students the opportunity to attend and present at conferences (Res8), as well as publish their findings in peer-reviewed journals (Res1). Other presentation opportunities include an event hosted at the American embassy in Jakarta, where students presented their findings to IGO and Indonesian government representatives (Doc7). Overall, students noted that they gained confidence and developed their communication skills (Doc7, Doc8). Researcher respondents felt the CUF offered students a professional international research experience which would equip them for their future careers (Doc7, Doc8, Res8, Res9, Res12). Moreover, students would be able to cite CIFOR on their résumés, which was thought to position students well in terms of skills and experience gained to future employers (Res9). In addition, the program enabled students to expand their professional and academic networks (Doc7).

Apart from the CUF, GOLS partnered with local universities to support data collection for different components of the project, often hiring graduate students as enumerators and surveyors. For example, UNTAMA graduate students helped conduct field surveys, map plantations, and participate in meetings and discussions with district governments for the typology and value chains work (Gov8, Res9, TR34, TR57, TR67). GOLS provided students with three days of methodological training and field testing of the survey for refinement (Res11, TR22, TR34, TR77). UNTAMA students built on existing GIS, mapping, and surveying skills, and benefited by receiving technical support from GOLS researchers (Gov8). Initially, Component 3 also explored potential partners in West Kalimantan, such as UPB, to support some of the surveying work, but this did not proceed (Res9, TR13). Similarly, Component 2 identified an opportunity to train students from a local university in West Kalimantan to support GIS and remote sensing activities, but this did not happen (Res1, Res9). GOLS also considered a collaboration with UNMUL in East Kalimantan to provide student internships (TR3). There is also evidence of partnership with an external doctoral researcher from Wageningen University. This research collaboration both fed into the doctoral student's dissertation (Woittiez, 2019) and the co-authoring of a

training in U.S. universities in subjects related to biodiversity and sustainable landscapes" (Doc8)

"*it was a good investment by USAID,* […] *it was just a perfect program and it was generously – it enabled things to happen, I'll call it program enrichment*" (Res8)

"The participants said they have improved their skill, knowledge, and expanded their networks through CUF experience" (Doc8)

"Participants highlighted changes in personal development in term of self-actualization, understanding themselves, and better communication and social skills. Participants feel this skill set will equip them to make decisions and to be better professionals in their future careers" (Doc8)

"[GOLS] *is the first project that is linked with a kind of Master degree*" (Res1)

"As part of a research project with the theme 'Governance of Sustainable Palm Oil Landscapes for Sustainability', CIFOR in collaboration with the West Kotawaringin Regency Plantation Office and Antakusuma University conducted a mapping and surveying of oil palm planters in Kotawaringin Barat District" (TR57)

"*we involved* [students from UNTAMA] *in carrying out the research related to the mapping, we involved students* […] *in the implementation of the application in the field of survey activities, students also, then we also involve farmers in supporting the data, so it is not only related to the data, but they are also* [involved in] *the meetings, there are several meetings, so the field data, discussions*" (Gov8)

OPAL

"During the entire life of the project, CARDS-IPB [Center for Agriculture and Rural Development Studies] plans to produce at least three students with PhD degree and other students with MSc degree" (Doc21)

"*We put emphasis on developing some studies based on PhD students. One PhD student is concentrating on agrarian change and livelihood change on oil palm issues. And then the second PhD student is about landscape change and governance* […] *and the third is on the issues of value chains*" (Res14)

"[for those] *recruited to be a PhD student to OPAL, there was an obligation for each to develop games, even*

management), and relationships (academic, professional, personal). The portfolio also supports local Indonesian university researcher capacities.

peer-reviewed publication with GOLS researchers (Jelsma et al., 2019).

OPAL

The Masters and doctoral student research constituted a core component of the OPAL Project (Doc11, Doc21, Res6, Res14, Res16, Res18). Receiving a Swiss Overseas Scholarship, IPB graduate students attended ETHZ on exchange (Blog17, Res24, Web1). The OPAL model was designed for the doctoral research to feed into the applied context and mechanics of the Companion Modelling games, and also have the games feed into the doctoral research as a form of data collection (Blog8, Doc11, Doc13, Doc16, Doc23, Res6, Res16, Res24, TR44). Three games have been developed to date by the students: ComMoDO, LUCOPE, and ComMod ISPO (Doc23). Evidence indicates OPAL students gained knowledge, skills, and relationships as a result of the project. All Indonesian OPAL students have completed their respective Masters or doctoral degrees, save one student who is still in the process of writing their dissertation (Doc20, Doc23, Doc24, Gov6, Res6). Interviews indicate the students benefitted from their involvement in OPAL (Res14, Res20, Res24).

OPAL students benefited from the study exchange at ETHZ for a portion of their degree, where they attended lectures and received supervisory oversight from ETHZ partners (Blog17, Doc13, Doc16, Doc20, Res14, Res24, Web1). In addition to learning theory and its application in practice (Res24), students gained in-depth knowledge and understanding of the complexity of Indonesia's oil palm sector (Doc13), different stakeholder perspectives (Doc13, Res24), and their specific research foci (Res6, Res9). Research foci include: factors affecting community decision-making for land use and livelihoods (Blog17, Doc23, Res6, TR74); effects of oil palm expansion on forest-dependent community livelihoods (Doc23, Res6, Res14, Res24); effects on environmental services of smallholder oil palm plantation landscapes (Res6, Res24, TR74); the inter-relationship of landscape changes and oil palm governance (Doc23, Res14, Res24, TR74); the political economy and governance of oil palm (TR74); and smallholder value chains (Res14, Res24). OPAL students learned how to conduct interdisciplinary research and the Companion Modelling approach (Doc13, Res16, Res24).

OPAL students had ample opportunities for growth, as they were engaged in every aspect of the project (Doc19, Res14). The graduate students actively participated in inception meetings and

Companion Modeling was the like preferred method to be adopted by this project [it was] *decided not to oblige the student to use that but it is up to them, but then all the students I think took different roles, I mean one of them* […] *heavily developed this method, but the other is just* [using it to help] *them to collect data*" (Res6)

"*the opportunity to learn deeper on OPAL methodology of having this Companion Modelling as part of the research that we* [were] *co-creating with communities, using that model to even having more different perspective from the communities and using that as a way to, so to speak, bridging with the district-level government and then the provincial government. And so my role is much more on developing the right methodology, and using that methodology as an approach for that target of the project*" (Res24)

"*the two PhD students* […] *I think those two* […] *are very familiar because they developed the game, the mechanics the rules of the games and they play a number of* [them]. *They became* […] *like masters of the game*" (Res6)

"*every year we make an agenda* […] *workshop or local work* […] *to socialize the results of the OPAL team, so we ask PhD students who have conducted research in the field to be able to present at the district level, or at the provincial level*" (Res20)

"the OPAL Indonesia Team in collaboration with East Kalimantan Provincial Plantation Offices organized a workshop themed 'Strengthening sustainable and adaptive oil palm governance in East Kalimantan'. PhD Candidate […] and [IPB project leader] presented OPAL research findings on land use changes and livelihood impacts of oil palm expansion in Kutai Kartanegara, and smallholder readiness towards ISPO certification. During the workshop, they also engaged the heads of plantation division (Coordinating Minister for Economy and Directorate General of Plantations of the Ministry of Agriculture in a plenary discussion on how subnational (in East Kalimantan) and national initiatives and action plans for sustainable palm oil can be synergized" (Doc19)"

"*So for students and the university, I think our success is having published our knowledge*" (Res24)

site visits (TR15, TR74), organizing workshops (Blog21, TR70), game facilitation (Doc23, Res6, TR70), supporting video development (TR70), leading presentations (Blog21, Doc19, Doc25, Res20, Web1), and co-authoring publications (Doc23, Doc24, Res20, Res24, Web1). Hence, it is evident that OPAL students gained a variety of skills. Most notably, students developed capacities in Companion Modelling as a research approach (Res6, Res16, TR70). Prior to joining OPAL, none of the students were familiar with Companion Modelling (Res16). Students received training from ETHZ partners and further developed these skills during their facilitation of the games (Doc13, Doc23, Res1, Res6, TR70). Facilitation was diverse, as the games were played with different actors ranging from smallholders, NGOs, private sector, as well as district, national, and international government representatives (Res6). One project researcher described the students as "*masters of the game*" (Res6). Another OPAL researcher had the impression that the students gained confidence in their facilitation skills for the Companion Modelling methodology (Res16). Students also developed presentation skills for both academic and public sector audiences. OPAL students had the opportunity to attend academic conferences, as well as present their findings in workshops attended by Indonesian researchers (Blog21, Doc25, Web1). Many OPAL workshops were held to present the project and its results to government audiences (e.g., district-level plantation agency, ATR BPN), which were led the students (Blog21, Doc19, Doc25, Res20). OPAL students also were given the opportunity to participate in panels hosted by CIFOR, facilitating crossover with other portfolio projects like GOLS (TR77). Furthermore, OPAL students built upon their academic writing skills as part of their thesis or dissertation and via opportunities to publish in peer-reviewed journals (Doc23, Doc24, Res20, Res24, Web1; Hasanah et al., 2019; Yulian et al., 2018). Another indication of the graduate students' skill development relates to their contributions as resource people in governmental decision-making processes (e.g., LTKL, SPOI) (Doc18, Doc19, Res14).

OPAL students also experienced changes in relationships as part of their research capacity development. The project facilitated the building of professional academic networks through the study exchange at ETHZ, with other OPAL students, fieldwork with graduate students outside the OPAL Project, and attendance at conferences (Blog17, Blog21, Doc18, Doc25, Res24, Web1; Okita, 2019). Moreover, students were able to develop personal

"International Research Collaboration Two students conducted research in East Kalimantan, Kutai Kartanegara district, after receiving advice on research locations and assistance (research permits) from the IPB OPAL team in Indonesia. PhD Student […] (University of Edinburgh, Scottland [*sic*], UK) spent 4 months (April-July 2018) in the districts of Kutai Kartanegara and Berau. [The] study is entitled: 'Procedural justice in environmental decisionmaking: The social implications of Environmental Impact Assessment (AMDAL) on Indonesia's deforestation'. Master student […] (University of Tokyo, Japan) conducted research from early July to mid-September 2018 in Pulau Pinang Village, Kutai Kartanegara District. [The] research is entitled: 'Modernization process by indigenizing oil palm: The case of the tribe study of Dayak in East Kalimantan, Indonesia'. The collaboration and exchanges of information is continuing and both students will write a paper together with the Indonesian OPAL Team. We are hopeful that through this type of collaborative research, more and more data and information from the field will be obtained to strengthen the OPAL study in Indonesia" (Doc18)

relationships with individuals from ETHZ, IPB, and CIFOR (Res24). The game workshops also enabled relationship-building between the students and governmental actors (Gov6, Res6). Seemingly this was one avenue which led to the students being invited to be resource people (Res14). Students also built relationships with communities as part of their fieldwork (Res24) and through the games (Blog21). CIFOR partners connected some of the OPAL students to engage in a program led by the EU that sought young Indonesians' perspectives on the future of oil palm and sustainability (Res20).

OPAL also supported an international research collaboration with an external doctoral student from the University of Edinburgh and a Masters student from the University of Tokyo (Doc18; Okita, 2019). This collaboration was an unexpected opportunity to support external graduate students' capacity development with OPAL students as "counterpart[s]" (Okita, 2019, p.85), build research networks, and facilitate mutual learning. OPAL staff provided advice regarding site selection and research permits, exchanged information during the fieldwork period, and planned to co-author a paper together (Doc18; Okita, 2019). OPAL also hired graduate students from local universities (e.g., UNMUL, UNIKARTA) to support the facilitation of the games, which would have been an opportunity to build their research experience (TR73).

Graduate students continue careers in oil palm research to build on knowledge base [EoP outcome]	**GOLS** The CUF program was designed to prepare the next generation of Indonesians to enter the workforce (Doc8, Res8, Res9, Res12). This is clearly reflected in the decision-making for CUF candidate selection, as young individuals were prioritized over those already in established careers (Res8). Evidence from an assessment of the CUF program indicates students felt the experience equipped them well with knowledge, skills, and networks needed to pursue careers in research or natural resource management (Doc7, Doc8). One project researcher had the impression that CUF students who worked on topics related to oil palm and zero deforestation issues would be well-positioned to engaged in those debates following the program (Res8). Future career aspirations of CUF students include working as researchers at research organizations, thinktanks, and NGOs; as university professors; and as practitioners in conservation or natural resource management (Doc8). Ten CUF students indicated interest in pursuing a doctorate (Doc8). Ten students from the first CUF cohort acquired jobs in relevant	**GOLS** "*in the GOLS project* […] *there was of course the students who went off and did their master's in the US and I think there was training young Indonesians who would potentially be going to positions of research or policymaking in the future, and facilitate improving their chances and* […] *capacity-building*" (Res12) "*Our selection process* [of CUF students] *along with university faculty would achieve good outcome*[s] *in terms of talent and future contributions to the country*" (Res8) "[CUF] Participants feel this skill set will equip them to make decisions and to be better professionals in their future careers" (Doc8) "All of the first cohort (13 students) returned to Indonesia and ten of them now work in sectors related to natural resources management" (Doc8)	**H Realized, clear portfolio contribution** Projects prepared graduate students well to pursue a career in research or natural resource management. Some CUF graduate students have acquired a job in Indonesia related to the sector.

Indonesian NGO, government, research, or private sector organizations (Doc7, Doc8, Res1, Res8). For example, some students work at WCS (Doc7), WRI (Doc7, Res8), CIFOR (Res8), LIPI (Doc7), Komodo National Park (Doc7), and Sinarmas (Res1). Following their CUF experience, some students were promoted from their former positions (e.g., research assistant to researcher, junior researcher to coordinator, researchers to research manager, project coordinator to program manager, etc.).

OPAL

OPAL provided its graduate students many opportunities for personal and professional growth. Evidence demonstrates that OPAL students experienced growth as both researchers and global citizens. While research features as a core capacity component of the OPAL model, the project also trained students in trust-building, communication, and navigating conflict-ridden systems (Blog15). One respondent reflected on the importance of research that empowers participants and gives participants ownership over the findings (Res24). Interviews with the graduate students indicate values have been instilled within the OPAL students as they continue in their future careers. Following graduation, some OPAL students now work at IPB full-time, working with Kementan to formulate policies on plasma and smallholders (SWD). Another student now works for the Indonesian Embassy in Bern and is responsible for answering questions related to the palm oil ban (SWD). One OPAL student plans to return to Indonesia following their degree to work as a social planner in forest-dependent communities (Res24). There are indications that students have developed strong networks with scholars and practitioners as a result of OPAL, which they can draw upon in their future career (Res24).

During OPAL, graduate students were invited to support various processes as resource people (Doc18, Doc19, Res14). One student received an invitation from provincial government actors to participate in the development of a local regulation (Res14). One student was hired as an expert advised in the Kementan and UNDP's SPOI (Doc18). Two of the students were actively involved in LTKL's platform for district sustainable landscapes, where they showcased the Companion Modelling games, shared lessons of the games, and facilitated a discussion around the complexities of sustainable oil palm landscapes (Doc19). These invitations indicate OPAL students are well positioned to have influence in oil palm debates.

"Through their current jobs the graduates are now in a position to influence [oil palm] debates, be it through advocacy with NGOs such as WRI or WCS or through work with government at LIPI or Komodo National Park" (Doc7)

OPAL

"*for example,* [one OPAL student] *was in East Kalimantan to not only to present but to accommodate people in constructing local regulation and so on. So [the student] takes more and more benefit than not just because of a scientist, but also as a resource person invited by provincial government*" (Res14)

"In the framework of a collaboration between the Ministry of Agriculture of Indonesia and UNDP's Sustainable Palm Oil Initiative (SPOI), our OPAL researcher […] (PhD Student at IPB) has been called as expert advisor to help draft Technical Guidelines on Company's Responsibilities to Facilitate the Development of Smallholder Plantation. The assignment ran from June to October 2018. [The student's] main responsibilities have been: • Developing collaborations at all levels (government, industry, civil society organizations, scholars). • Gathering input from stakeholders (experts, policy makers, professionals, governance unit). • Drafting and finalizing the Guidelines, by synchronizing policies from several existing regulations" (Doc18)

"The OPAL Indonesia Team contributed to the development of sustainable production of agriculture commodities and sustainable landscapes by attending two series of events by LTKL, an increasingly popular platform that promotes district sustainable landscapes. The events were organized to help districts improve their regional competitiveness by equipping them with a portfolio of programs that offer investment opportunities to support the achievement of the Sustainable Development Goals (SDGs) and reduce emissions. The team was invited to share District lessons on the use of an innovative tool, the ComMod game, to facilitate dialogues among stakeholders and help them learn about the complexities around the oil palm sectors and sustainable landscape. To further increase the visibility of the OPAL project and the ComMod game approach, [two graduate students] (IPB) showcased their games and had productive discussions with participants" (Doc19)

| CIFOR & partners are recognized for expertise in oil palm research [intermediate outcome] | **General**
CIFOR is internationally recognized as an expert in forest sustainability research and thought to have a far-reaching reputation (Gov17, IGO2, NGO1, PS5, Res5, Res13, Res14, Res20, Res26, Res31). One project researcher had the impression that CIFOR's participation in international fora raises its visibility to government actors, researchers, and donors (Res5). Another project researcher contested this idea, believing that some government actors in Indonesia do not view CIFOR as an important actor because of their international status (Res22). Other respondents felt CIFOR had more credibility as an international organization (Res14, Res32), whose "*strength is a research agenda which is rooted in Indonesia*" (IGO5) and enhanced by having Indonesian researchers on staff (NGO4). A government respondent noted that CIFOR's formal relationship with KHLK enhances its reputation among governments as an "*authorized institution*" (Gov11).
Evidence indicates that perceptions of CIFOR's expertise is related to the breadth and diversity of topics within CIFOR's research profile (Gov3, IGO2, PS2). For example, CIFOR's engagement in the fire and haze debate has extended its reputation to other forestry-related issues like oil palm (Doc57, Gov20, Res7, Res15, TR40). Overall, respondents felt CIFOR engages in relevant issues (IGO4), brings international research experience to the Indonesian context (Gov14, Gov20), and conducts research that others have not done (Res25). Many respondents also referred to CIFOR's longstanding history of research in Indonesia (IGO6, PS1, Res3, Res5) and on oil palm topics (PS1, Res3, Res28). One respondent described CIFOR as one of the "*pioneers*" (PS1) on oil palm research. Other respondents described CIFOR's research contributions as rich, sophisticated, and comprehensive in terms of understanding the complexity of the sectors in which they work (IGO1, Res7). Government respondents conveyed that policy-makers need support from organizations like CIFOR for decision-making on oil palm (Gov13, Gov19, Gov20). It was thought that CIFOR has both the reputation and expertise needed to inform evidence-based policy-making (NGO1). One researcher noted that CIFOR is one of the most qualified organizations to do research on oil palm, as many Indonesian universities or research institutes cannot match the scientific quality because of resource differentials (Res28). A respondent from the private sector believed that | **General**
"*who doesn't know CIFOR in the forestry sector?*" (PS5)
"*CIFOR is one of the international research institutes that still maintains stringent values of scientific study procedures, both in terms of methodology and theory, which makes it still credible to influence (influencers) not only in the discourse of world scientific knowledge but also in terms of public policy*" (Gov15)
"*I think CIFOR is the most qualified for research in Indonesia, if CIFOR is not there, I think we are, we can only rely on the domestic product, what is the domestic product is depend on the project, the funding is quite small, the research is not as qualified as CIFOR, I think CIFOR is quite important for forest research*" (Res28)
"*they have a lot of […] local Indonesian researchers, so I would say I have confidence in their network of researchers that CIFOR is working with*" (NGO4)
"*CIFOR has the rank to basically advocate for best policies or scientifically-based policies. I think CIFOR has the brand name to talk with the Ministry of Agriculture or other organizations, government organizations*" (NGO1)
"*I think it has been great that CIFOR that has been there for a relatively long period of time and that it has built the oil palm research and knowledge on oil palm in the region, so CIFOR has been one of the well-known research organizations working on oil palm*" (PS1)
"*To us the value of CIFOR is the way trust works on both sides; their strength is a research agenda which is rooted in Indonesia and multi-country and has best researchers, and that governments value it*" (IGO5)
"*it's this continuous flow of information of quality data, peer reviewed publications, this good science is the primary contribution of CIFOR*" (Res26)
"*CIFOR helps to approach it more scientifically*" (Gov12)
"*CIFOR is quite good to provide evidence from the field, I think it is a good organization who can support variable, verified evidence from the field*" (Res28)
"*there are quite a lot of results of CIFOR's research that apparently other people haven't done it yet*" (Res25) | **H**
Realized, clear portfolio contribution
Government, IGO, NGO, researcher, and private sector actors view CIFOR and partners as experts for their research in oil palm and other related topics. |

CIFOR's research has attracted greater interest in oil palm research in the region (PS1).

It is evident that many respondents view CIFOR as a credible knowledge producer that has influence in both academic and public policy circles (Gov15, Gov17, IGO1, NGO1, PS5, Res13). One CIFOR researcher had the impression that CIFOR's reputation plays a significant role in building links with university partners and influencing governmental policies (Res13). A few respondents emphasized that CIFOR's role is in knowledge production, rather than as a "*facilitator of change*" (IGO1) or as an advocacy organization (IGO4, PS2); however, some respondents felt CIFOR would have greater reach as a thinktank organization (NGO2) or as a development partner (Res31). Regardless, it is clear from respondents that CIFOR's strengths lie in the quality of its data and science (Gov5, Gov8, Gov12, Gov15, Gov16, IGO1, IGO4, IGO6, NGO2, NGO3, PS2, PS5, Res2, Res13, Res22, Res26). Impressions of expertise can be extrapolated from respondents' attribution of CIFOR's credibility in their data-driven (PS5, Res13, Res26), empirical research (PS2, Res28) that offers accurate representations of what is happening in Indonesia's oil palm sector (NGO1). Respondents generally attested to the practicality of CIFOR's science, in that the findings are relevant and based on what system actors need (PS5). One respondent commented that CIFOR has found the necessary balance between academic rigour and empirical grounding (PS2). Owing to their reputation, CIFOR was thought to be an attractive employer for young researchers in Indonesia to get experience (NGO1). The credibility and reliability of data were thought to facilitate stakeholder buy-in and uptake of the research (NGO3, Res22). One government actor believed other actors in the system would be well-positioned if they used CIFOR's research as a basis to make decisions on action around oil palm (Gov12).

It was noted that there is a risk to any actor's reputation because of the sensitivity present in Indonesia's oil palm sector (NGO4). Many respondents felt CIFOR is able to avert this risk because they are perceived as an independent organization that produces objective research (Gov13, Gov17, IGO6, PS2, PS6, Res2, Res3). A common impression among respondents related to CIFOR's research being more reliable than information from NGOs (IGO2, PS2, NGO2, Res3, Res6), owing to the former's neutrality. It is for this same reason that donors were thought to be attracted to CIFOR, enabling them to fund unbiased projects that made both academic

"*from CIFOR […] they did a study of oil palm which I considered quite objective, yes, not negative*" (Gov17)

"*I think CIFOR is doing quite okay, sort of trying to be balanced, and also as a research organization, tries to maintain relations with a broad group of stakeholders, which isn't always* [easy]. *And it depends a little on the people within CIFOR who are instrumental in maintaining those networks*" (PS6)

"*the government needs CIFOR as a partner*" (Gov13)

"*I see that CIFOR sometimes takes on the role of facilitator of change, in my opinion, it is not the strength of CIFOR. The strength of CIFOR is to provide input […] truth, data, knowledge*" (IGO1)

"[CIFOR is] *well-informed and very close to the subject, they brought an objectivity to it, because they are not a campaigning organization, so like at a time where you've got supermarkets in the UK like Iceland calling for outright bans of palm oil and it being very polemic, they brought a very critical, sane voice to the discourse. It was a much-needed contribution*" (PS2)

"*I think CIFOR is the same, we survived all this because we have our networks of people who trust us mainly because most of them are alumni, they are partners, they know our work, they know how we are transparent, and I think it is a very good asset*" (Res26)

"*I would imagine many young great scientists would want to work for CIFOR*" (NGO1)

EK

"*The speed of decision-making, in getting involved in supporting. Like, for example, TNC is not easy* [but] *I see the speed of CIFOR there* [to] *take a decision. 'OK, OK, we help.' 'OK, we have our data prepared.' 'Oh, we have this criticism, sir'. Right away […] I feel the totality, including the speed in making decisions*" (Res31)

"*I think that's a very important role there of CIFOR, making the process stronger and supporting the key stakeholders. Don't rush it, but support them in how do you conduct a public consultation process. Normally that is a tick the box exercise*" (PS6)

GOLS

and societal contributions (IGO4, Res29). Moreover, CIFOR's neutral role enables the organization and its scientists to work with different actors, particularly government (IGO5, Res31). Hence, an Indonesian researcher thought CIFOR is an attractive collaborator, particularly as other organizations are "*allergic to the government*" (Res31). Other respondents believed CIFOR and its partners have "*survived*" (Res26) the political tensions because they have long-standing relationships based on trust, positive past experiences, and transparency with government actors (Gov17, PS6, Res22, Res26). Respondents had contrasting impressions; one being that quality research in projects like GOLS and OPAL have influenced CIFOR-government relationships (Res22), while the other being that pre-existing individual or personal relationships have been more influential than the actual research (PS6). However, there have been some instances of damage to CIFOR's reputation and their relationships with government as a result of poor journalism, which required CIFOR researchers to resolve the issue and make amends (Res15). One respondent had the impression that other system actors may not trust CIFOR's oil palm research because the organization is "*considered an enemy*" (Gov16) or a defender of forests.

While many respondents believed CIFOR has produced interesting research, some questioned the organization's influence and extent of penetration (IGO2). A few respondents had the impression that key system actors are not aware of CIFOR or the fact that CIFOR is involved in research on oil palm (Gov9, Res21). It was thought that other organizations and researchers do not actively promote CIFOR as a source of information on oil palm (IGO2). Instead, CIFOR has a stronger presence or reputation in other issues apart from oil palm, such as FLEGT or REDD+ (Res21). Moreover, part of CIFOR's reputation is attached to the reputation of its scientists, many of whom have built their standing over the course of their career, including prior to their joining CIFOR. Furthermore, there are many research organizations working on oil palm issues in Indonesia who are producing similar messages and findings to CIFOR (Gov13, IGO4, IGO5, IGO7, NGO2, PS5, Res7). Only one respondent thought CIFOR was an irrelevant actor in the Indonesian context (i.e., low influence), feeling that CIFOR had greater reach in global fora (NGO6).

EK

Respondents familiar with the EK Project acknowledged the expertise of CIFOR and its partners (PS1, Res6, Res31). UNMUL

"*CIFOR is KLHK's partner in conducting research activities in the forestry sector, several collaborations between KLHK and CIFOR have helped to raise Indonesia's profile in the international world*" (Gov15)

"Building on the knowledge from GOLS research, our research partner from P3SEKPI has become the go-to research group for palm oil issues within the Ministry of Environment and Forestry" (Doc7)

"*One of the impacts of the GOLS project* [is a P3SPEKI team member] *was selected as the member of research commission on the CPO Fund Management Agency*" (Gov1)

"*I think CIFOR could at that time play a role of an unbiased science provider, better than most other organizations out there*" (IGO4)

"*it is the reputation of CIFOR, it has helped us to say to the public from the credibility organization like CIFOR we can see how much the deforestation has happened especially in Borneo, it has helped us to say this report is sourcing from credible resources, not from the fake news, or something like that*" (NGO3)

"*One last thing of GOLS, we get new project design, because when WCMC ask to collaborate […], it's because they recognize the work out of GOLS on oil palm. It's a huge project. It's 20 million GBP*" (Res15)

"*with CIFOR, we will continue to look forward to working together for* [sustainable oil palm]" (Gov12)

OPAL

"The workshop was opened by a high-level official from the district of Kutai Kartanegara, i.e. the Secretary to Head of the district, who has also been present in a meeting during a field visit by OPAL team leader and Steering Committee members in September 2016. This indicates that the local authority highly supports and provides constant endorsement on OPAL project and values the contribution the project made thus far" (Blog21)

"*so far it* [OPAL research] *has been well informed, related to the readiness to go to the ISPO sustainable palm oil to the community*" (Gov2)

"*I think it helped that there was a lot of enthusiasm particularly from IPB who ran with this, CIFOR played*

partners were brought into the project to conduct the spatial analyses, and gained expertise in HCV identification during the process (Res6, Res25, Res31, TR10, TR12). Based on their experience in the EK project, respondents appreciated CIFOR's expertise in preparation, strategy, engagement, and efficiency in decision-making (PS1, Res31). Moreover, CIFOR's involvement gave "*colour to the results of the policy*" (Res31). It is evident that engagement through the project reinforced CIFOR's reputation as a committed "*development partner*" (Res31) as partners were interested to collaborate with CIFOR again in the future (PS6, Res31). Indicators of other actors' recognition of CIFOR's expertise through the EK Project include invitations to be a scientific advisor in the FKPB (Res6) and CIFOR's appointment by East Kalimantan provincial government to prepare an HCV map (Gov14). UNMUL partners have also since gained recognition from their involvement in the project to develop the provincial-level HCV maps. GIZ invited UNMUL partners to join a new project focused on district-level HCV map development in East Kutai (Res6).

GOLS

Government collaborations through the GOLS Project was thought to have raised Indonesia's research profile internationally (Gov15). P3SEPKI researchers, for example, have become the resident oil palm research experts in the KHLK, despite there being already a dedicated team in the Ministry (Doc7, Gov1, Res6). Through GOLS, P3SEPKI partners were given the opportunity to publish and attend international conferences (Gov1, Res6, TR40). With newfound expertise on oil palm, P3SEPKI partners have become the recipients of any Ministry-delegated tasks on oil palm following the project, indicating Ministry-wide recognition (Doc7, Gov1, Res6). For example, P3SEPKI partners have been invited to work on other oil palm projects, produce proposals, position papers, and reports, and co-author a book chapter with international researchers (Gov1). In addition, one member of the P3SEPKI team was selected to contribute to the BPDPKS's research commission, being the first representative from their ministry to join (Gov1). LAPAN and BAPPEDA partners were also thought to have had positive experiences through GOLS, such that these government agencies look upon CIFOR favourably (Res6, Res11, TR36). Requests to share GOLS data with BAPPEDA are indicative of expert recognition (TR51).

more of a supporting role to IPB which took the lead on the implementation of the games, but CIFOR's role is very crucial in terms of providing the recognition and reputational support and contacts to enable IPB and the project as a whole to implement a lot of the methodology" (Res10)

"*Let me say, if we had been so successful in the project, it is in a big way thanks for the credibility, networks, and partnership of the colleagues from CIFOR. I think we would have significantly underperformed had we done the project without CIFOR*" (Res16)

"*right after the game the ISPO game that we played with the Ministry of Agriculture in August 2019, there was maybe a request from the one directorate general of plantation and the ministry of forestry to CIFOR and IPB because we worked together in playing this game to provide input to what they called white paper* [for] *ISPO*" (Res6)

"*halfway through the project, the EU to start engaging in strong discussions about banning oil palm for biofuels and that suddenly was very important for Indonesia and Malaysia* […] *our partners IPB and CIFOR* […] *from the OPAL project would be part of the Indonesian delegation that was coming to meet the EU for the negotiations* […] [using] *our methods and manage our games to reach an agreement*" (Res16)

"*these PhD students are now working not only inside the university,* […] *but to accommodate people in constructing local regulation and so on. So* [students take] *more and more benefit than not just because of a scientist, but also as a resource person invited by provincial government and so on*" (Res14)

"the request from local authority to OPAL project team to provide input to two major district policies governing oil palm development currently under review, namely on the governance of plantations (Peraturan Daerah No.6/2014) and partnership between local communities and oil palm companies (Peraturan Bupati No. 1/2016)" (Blog21)

"CIFOR received a lot request for playing Companion Modelling games developed by OPAL project by PhD students of ETH Zurich and IPB. One of the requests come from Lingkar Temu Kabupaten Lestari – a coalition that

Several respondents recognized that GOLS has produced useful and applicable evidence-based research on oil palm (Gov5, Gov16, NGO3, Res13, Res28), and these efforts to support sustainable oil palm were appreciated (Gov12). In addition, GOLS dedicated time and resources to train local university partners to ensure quality of the data collection, indicating efforts to build expertise as well as maintain CIFOR's level of expected expertise (TR22, TR77). There are documented impressions that project stakeholders take GOLS research seriously into consideration (TR47). However, one respondent questioned the non-research implementation work in GOLS, suggesting that it could be done better by other organizations like INOBU or SPKS (NGO1).

There are multiple indicators demonstrating recognition of the GOLS team's expertise from different system actors. In terms of governments, GOLS received official project endorsement from provincial governments (TR77) and succeeded in bringing influential governmental representatives to join panels, workshops, and other events hosted by the project or CIFOR (Res12, TR43, TR77). The inverse has also happened, where the GOLS team has been invited by governments to join public dialogues (TR38), support ISPO design processes (Res15), and received requests to organize meetings to share GOLS findings with local governments (TR43). GOLS researchers were invited to lead panel session at the World Bank land and Poverty Conference, indicating IGO recognition of oil palm expertise (Res12, TR8). Research outputs like the Borneo Atlas have also attracted private sector interest; Wilmar's followed-up engagement with GOLS researchers to verify Atlas data is a prime example (Res2, Res6, Res19, Res33). NGOs are also attracted to the Atlas. One researcher from GOLS was invited to join a Greenpeace expedition in Papua because of the Atlas (NGO3). In addition, the EU invited CIFOR to join a new project on oil palm, providing evidence on oil palm-related issues in Indonesia and Malaysia to support the incoming renewable energy directive (Res13). GOLS has also captured public recognition, receiving requests to feature on Indonesian and international news broadcasts to discuss oil palm and related forestry topics (Res15).

Many respondents reflected on their decisions to partner with CIFOR on GOLS. Donors seek to support "*unbiased*" (IGO4) research organizations; CIFOR's neutrality was as a key factor in USAID's decision-making to fund GOLS as advocacy organizations can incite political tensions with the Indonesian

brings together district govermments [*sic*] committed to implementing sustainability in their districts" (TR44)

ERS

"*I appreciate the research CIFOR has done and I look forward to more research from them. I also hope to engage more with them*" (PS1)

"*I could not speak highly enough of CIFOR and* [the PI] *in particular. I just feel the quality of their research is excellent. I feel that they have a really good balance between the academic rigour and then also you know it is something really formed by boots on the ground, so for us they've actually been imperative to our research*" (PS2)

"*CIFOR got invited to this five-company initiative on palm oil and on sustainable palm oil so the largest producers*" (Res3)

"*even though we had confidence with the way* [the ERS team] *did research, but the writing part was not well done.* […] *it did play a role when we had to commission, again, research, and we did not opt for CIFOR because of that*" (NGO4)

government. Similarly, one GOLS researcher had the impression that private sector partners like TFA view CIFOR as an independent and objective oil palm expert, making them an ideal partner (Res6). For this reason, CIFOR was thought to be able to work in collaboration with governments to support science-based policy-making (IGO6). A subnational government partner felt CIFOR was a relevant partner to help engage in and solve pressing issues identified by GOLS (Gov8). Some partners believed GOLS could leverage CIFOR's existing reputation in the project (IGO7), and that they as partners would have stronger messaging because of their association to CIFOR through the GOLS Project (NGO3). Government, private sector, and researcher respondents conveyed interest in collaborating with CIFOR again in the future (Gov1, Gov12, PS3, PS6, TR36). Already, CIFOR held meetings with UNTAN researchers (TR55), Wal-Mart (Res5), United Nations Environment Programme World Conservation Monitoring Centre (UNEP WCMC) (Res15, Web4), RSPO (Res23), the EU delegation (IGO5, Res13), and IUCN (Doc57) to collaborate on new oil palm or forestry-related projects as a result of GOLS.

OPAL

ETHZ, IPB, and CIFOR – the core OPAL partners – were thought to have "*world class reputation*[s]" (Res14). Each of the three partners brought complementary expertise to the collaboration. ETHZ contributed their methodological and theoretical strengths (Res6, Res10, Res16), IPB their research experience on oil palm in the Indonesian context (Res6, Res14), and CIFOR their policy engagement skills (Res10, Res14, Res20). Partners believed that OPAL's success in Indonesia is partly a result of CIFOR's credentials, networks, and involvement in the project (Res10, Res16). One researcher described the OPAL partners as knowledge "*giants*" (Res24). An external collaborating graduate student recognized the OPAL team in their thesis acknowledgements, writing that OPAL graduate students "pav[ed] the way for the field" (p.85). OPAL partners expressed interest to collaborate with each other in the future (Res14, Res16).

Some government actors did not previously know about CIFOR or other OPAL partners prior to the project, but came to know them as a result of their participation in the Companion Modelling games (Gov7, Gov19). Government participants were impressed with the OPAL team and their knowledge-sharing approach via the role-playing medium (Gov2, Gov19, Res6). For one government representative, they recognized that OPAL partners share similar

goals as Indonesian government actors do for Indonesia's oil palm sector (Gov19). This is indicative that government actors view OPAL as a viable partner (Gov7, Gov19). One government respondent believed OPAL research was well-informed and responsive to the gaps in ISPO (Gov2). Other indicators of government recognition of OPAL expertise include: government endorsement for the project (Blog21, TR70); follow-up engagements with and press releases from the Indonesian embassy in Switzerland (Doc18); invitations to join LTKL's South Sumatra Landscape Festival in 2018 (Doc18, TR44); an IPB partner's joining a Kemenko-led forum of experts to provide input to inform the strengthening of ISPO (Doc13, Res14, Res20); an invitation from the Kementan for the OPAL team to provide inputs to ISPO (Res6, Res20); an invitation for the OPAL team to support the Indonesian delegation in EU negotiations (Doc20, Res16); and invitations for OPAL students to join government policy development processes as resource people (Blog21, Doc18, Doc19, Res14).

Indicators of academic recognition of OPAL expertise included: an OPAL partner receiving a chair appointment at a European university (Doc11); donors' approval for an extension of the project until 2021 (Doc16); successful submissions to peer-reviewed journals (Dco25, Res14); OPAL students passing their defense and graduating (Doc20, Doc23, Doc24, Gov6, Res6); and invitations to join new research collaborations with international universities in future projects (e.g., University of Göttingen, University of Edinburgh) (Doc20, Res14, Res20).

The OPAL Project also received recognition for their expertise from the public. For example, OPAL students were interviewed by Indonesian media (Doc17), and the project was featured in a Swiss magazine (Doc31, Res16). Following the fieldwork, one OPAL researcher was invited to return to one of the participating communities to facilitate a dialogue on spatial planning for their village (Res24). The community clearly values the expertise of the researcher, as they also committed to funding the researcher's trip (Res24).

A final indicator pertains to the demand OPAL partners have received for continuation of the project and Companion Modelling games (Doc16, Doc18, Res16, TR44). For example, OPAL has garnered attention from actors like LTKL and RSPO for game sessions and collaboration (Doc16, TR44). One government

	respondent hoped the OPAL team and its partners would continue to work on sustainable oil palm in the future (Gov2). **ERS** The ERS team won Oxfam Novib's proposal bid to conduct the research on the gendered aspects of oil palm in Indonesia (NGO4, Res3). The project's research has been referenced by UN Women (Res3) and RSPO's working group on human rights (NGO4). A partner perceived the project's findings to be relevant, and a credible information source (NGO4). Private sector intermediaries appreciated the research as it provided in-depth understanding of Indonesia's gendered oil palm landscape (PS1, PS2), and as a result had a positive impression of CIFOR and the ERS team (PS2). There are several indicators of system actor recognition of ERS expertise. ERS researchers have been invited to present at conferences and workshops focused on socio-ecological challenges. For example, ERS researchers presented a panel at a Swedish development agency (SIDA) workshop, sharing project findings from the oil palm context (TR24). At the World Bank's Land and Poverty Conference, ERS researchers were also invited to chair a session (Res3, Res12). As a result of the Land and Poverty Conference, CIFOR was invited to join Forum for the Future – an initiative led by five of the prominent oil palm companies focused on sustainable oil palm (Res3). One ERS researcher had the impression that the private sector perceives CIFOR's research to be more credible than information from NGOs, hence their interest to engage with CIFOR through the Forum (Res3). Interest to collaborate with CIFOR in the future was another key indicator. CIFOR was invited to collaborate on a study with RRI, UI, and the University of Brighton (Res3). Private sector intermediaries expressed interest to work with CIFOR if the opportunity arose (PS1). While one of the partners was confident in CIFOR's capacity to undertake the research, they were less so with the communication of findings in the draft report (NGO4). In the end, this affected one partner's interest to collaborate with CIFOR again (NGO4). Moreover, it is unclear as to whether CIFOR's expertise in oil palm and gender remains as some of the ERS researchers have since left CIFOR (Res3).		
Researchers use projects' findings and methods [EoP outcome]	**EK** The EK Project is a continuation of research started in a CCAFS project (Res6, TR29, TR60, TR65, Web5). In drafting the academic script, project partners drew upon oil palm research produced by CIFOR (Res25, Res31). As a result of exposure to	**EK** "*Usually* [I use] […] *the results of research from friends, both from universities and development partners, such as CIFOR, there are a lot of them.* […] *for the case related to the regional regulation policy* [PERDA], *CIFOR helped a*	**H** **Realized, clear portfolio contribution**

HCV research and other learning on oil palm via the EK Project's engagement, it is possible that project partners and allies who do research have internalized and draw on project knowledge (TR12). However, the EK team did not publish project findings to bring it into the wider academic debate; though this postponement was at the request of government partners to wait until the PERDA passed legislation (Doc3). One research partner shared that they often use findings produced by CIFOR, and had referenced their work during their graduate work (Res31). Building on the provincial-level HCV mapping developed through the EK Project, an UNMUL partner has become involved in a new GIZ project focused on district-level HCV map development in East Kutai (Res6).

GOLS

GOLS is another project built on previous oil palm research (i.e., LIFFE Options, Corporate Commitments on Sustainability) (Res5). GOLS was designed for findings from the first three components to feed into Component 4 (Doc4, Res6, Res18, Res23). There is evidence that Component 1 drew upon the smallholder heterogeneity, typologies, and spatial data from Component 3 in the governance arrangements and tenure work (Blog9, Gov1, Luttrell et al., 2018a; Res6; Pacheco et al., 2018; Wibowo et al., 2019). Component 3 used spatial data from the Atlas work in Component 2 to separate out large-scale and smallholder plantations (Res6, Res11; Schoneveld et al., 2019a). The Atlas was also used as a secondary source for Component 4 (Res23). While Component 4 was supposed to build on findings from all the components, publicly available data was used in the end because of delays in other components (Res6, Res18, Res23). Despite intentions to be an integrated project, some GOLS researchers were able to leverage findings from other components while others worked in isolation, leading to siloization of the project (Res5, Res6).

Project researchers, portfolio partners, and other CIFOR researchers have used GOLS findings in other research on oil palm. P3SEPKI partners have used the land tenure results from Component 1 in the KHLK's engagements with the EU on ILUC (Gov1). GOLS research has also been drawn upon in FOERDIA's collaborations with international researchers (Gov1). CIRAD researchers claimed use of GOLS research because of their reciprocal relationship, but did not specify which knowledge has been used (Res26). Partners from OPAL have drawn on the smallholder typology work from Component 3 (Res20) and the

lot on the conceptual side, in addition to the academic arguments they built by sharing data, so that it became the basis of the academic paper" (Res31)

GOLS

"[GOLS is] *a continuity of previous work that we started under [...] KNOWFOR Phase I and II [...] a project called LIFFE, Large-scale investments in Food, Fiber, and Energy. And then sort of a follow up on that one was the Corporate Commitments on Sustainability*" (Res5)

"*I used* [Atlas data] *to separate one of our inputs, to separate the large-scale and smallholders. We used that in GOLS*" (Res11)

"*the methods that we have been trying to apply them, or at least developing new research projects inspired by them, [...] one example is the IFAT Green Life Project*" (Res5)

"*Researchers, and PHD students from around the world, are also using the Atlas, often to download the data on deforestation and plantations for their own research*" (Doc7)

"*the data on the Atlas has been published in peer reviewed publications*" (Res19)

Pacheco et al.'s (2018) article has been cited 22 times (Andrianto et al., 2019; Astari, 2019; Astari & Lovett, 2019; Carmenta et al., 2020; da Silva Medina, 2019; Dermawan & Hospes, 2018; Dharmawan et al., 2019; Haines & Macdonald, 2019; Hasanah et al., 2019a, 2019b; Hoekman & Sabel, 2019; Jelsma, 2019; Macdonald, 2020; Nesadurai, 2018; Russychaert et al., 2019; Sabel et al., 2015; Schleifer et al., 2019; Schoneveld et al., 2019a, 2019b; Schouten & Hospes, 2018; Schröder et al., 2019; van Noordwijk, 2020).

Luttrell et al. (2018a) has been cited 6 times (Jelsma, 2019; Mafira et al., 2019; Nurfatriani et al., 2018; Pacheco et al., 2018; Schoneveld et al., 2019b; Schröder et al., 2019).

As of April 2020, Gaveau et al.'s (2016) article had been cited 205 times (n.b., only 60 of the citing articles are listed here; Agrawal et al., 2018; Alamgir et al., 2019; Alisjahbana & Busch, 2017; Asner et al., 2018; Austin et al., 2017, 2019; Budiharta et al., 2018; Carlson et al., 2018; Cederberg et al., 2019; Cerullo & Edwards, 2019; Cheng et al., 2017, 2018; Collins & Mitchard, 2017; Davidson et al., 2019; Enrici & Hubacek, 2018; Evans et al., 2017; Fleiss, 2019; Gaveau et al., 2019; Hearn et al., 2018, 2019; Hughes, 2018;

Bibliometric, altmetric, and interview analyses provide clear evidence that external researchers, project researchers, and research partners are using outputs produced by the portfolio.

scenario work from Component 4 (Hasanah et al., 2019b). CIFOR researchers have used GOLS findings to support research on reconciling development of the oil palm sector with forest conservation and the fire and haze debates (Res15). In addition, similar methods and approaches used in GOLS have been applied in new CIFOR projects on oil palm, such as the International Federation for Alternative Trade (IFAT) Green Life Project, the collaboration with Wal-Mart, and RSPO Certification in Ghana (Res5). Other CIFOR researchers were observed to have drawn on GOLS research (Res33). In general, CIFOR researchers appear to reference their own and colleagues' work frequently; this appears to be one of the strategies used to promote the smallholder heterogeneity work and Borneo Atlas. However, one researcher noted that CIFOR researchers tend to have a superficial understanding of each others' work (Res33).

One private sector intermediary had the impression that no other research institutions produce findings on the same level as GOLS, and hence had high expectations for uptake by external researchers (PS5). By assessing the citations and altmetrics of a sample of outputs produced by GOLS, there is evidence that each has been used by researchers to varying degrees. From Component 1, Pacheco et al.'s (2018) article on the paradoxes within sustainable oil palm governance has been cited 22 times and is only used to establish the background context. For example, researchers reference the sector's regulatory challenges (Dharmawan et al., 2019; Hasanah et al., 2019b; Jelsma, 2019; Schoneveld et al., 2019b); provide descriptions of the political landscape of oil palm governance (Dharmawan et al., 2019; Haines & Macdonald, 2019; Jelsma, 2019; Macdonald, 2020; Schoneveld et al., 2019b); review existing sustainability commitment mechanisms (Astari, 2019; Astari & Lovett, 2019; Carmenta et al., 2020; Hoekman & Sabel, 2019; Nesadurai, 2018; Russychaert et al., 2019); and present the state's role in sustainability commitments (Astari, 2019; Astari & Lovett, 2019; Dermawan & Hospes, 2018; Hasanah et al., 2019b; Jelsma, 2019; Macdonald, 2020; Schoneveld et al., 2019b; Schouten & Hospes, 2018; van Noordwijk, 2020). Luttrell et al. (2018a) is one of the outputs produced from the collaboration with P3SEPKI researchers in Component 1, and has been cited 6 times. The findings are mostly used to describe the background context, such as observations of increasing government engagement in multi-stakeholder processes (Jelsma, 2019; Schoneveld et al., 2019b); existing governance arrangements (Schröder et al., 2019); and growing stakeholder focus on smallholder compliance

Ibragimov et al., 2019; Jucker et al., 2018; Khatiwada et al., 2018; Langston et al., 2017; Laurance, 2016; Lebois et al., 2017; Luke et al., 2019; Macdonald et al., 2018; Manoli et al., 2018; McAlpine et al., 2018; Meijaard et al., 2017, 2018; Miettinen et al., 2019; Morgans et al., 2018; Mosnier et al., 2017; Naylor et al., 2019; Noojipady et al., 2017; Ocampo-Peñuela et al., 2018; Ordway et al., 2017; Ostfeld et al., 2019; Pendrill & Persson, 2017; Pendrill et al., 2019; Pfeifer et al., 2017; Pirker et al., 2017; Purnomo et al., 2017, 2018; Romero & Putz, 2018; Rulli et al., 2019; Santika et al., 2017a, 2017b, 2019a, 2019b; Saragi-Sasmito et al., 2019; Schoneveld et al., 2019a; Shattuck, 2017; Shevade et al., 2017; Sloan et al., 2017; Sofiah et al., 2018; Voigt et al., 2018; West et al., 2018; Woittiez et al., 2018; Wolff et al., 2018; Wright et al., 2018).

Jelsma et al. (2017) has been cited 40 times (Andrianto et al., 2019; Astari, 2019; Astari & Lovett, 2019; Apriani, 2019; Balchin et al., 2018; Bennett et al., 2019; Cadman et al., 2019; Castellanos-Navarrete et al., 2019; de Vos, 2019; Dharmawan et al., 2019; Faust, 2018; Grass et al., 2020; Hamilton-Hart, 2019; Hutabarat et al., 2019; Jefferson et al., 2020; Jelsma et al., 2019; Khair et al., 2020; Khatun et al., 2020; Liu & Bona, 2019; Luttrell et al., 2018a; Meijaard et al., 2018; Moreno-Peñaranda et al., 2018; Naylor et al., 2019; Nesti et al., 2018; Nilan, 2018; Ngan et al., 2019; Österberg, 2019; Pacheco et al., 2018; Purnomo et al., 2019; Santika et al., 2019a, 2020; Schoneveld et al., 2019a, 2019b; Sokoastri et al., 2019; Suratin et al., 2018; Tey et al., 2020; Watts & Irawan, 2018; Wibowo et al., 2019; Woittiez, 2019; Yanita et al, 2019).

Sharma et al. (2018a) has been cited once (Hasanah et al., 2019b).

OPAL

"The expected output on the use of companion modelling in generating knowledge and facilitating stakeholder dialogues on the major issues confronting the development of more equitable and sustainable oil palm production through this research will also contribute to current international scientific literature on participatory methods" (Doc21)

"*we could have done better.* […] *there were scientists within CIFOR who were producing extremely useful data and*

(Schoneveld et al., 2019b). One citing article claims use of the findings in their analysis (Pacheco et al., 2018), but this is not explicitly evident as the article is not referenced again. Other relevant outputs from Component 1, such as Luttrell et al.'s (2018b) infobrief and Wibowo et al.'s (2019) working paper have not yet been cited, but have had 258 and 1015 downloads, respectively. Nurfatriani et al.'s (2019) peer-reviewed article has been downloaded 936 times and mentioned once on Twitter by an academic. There has been documented use of data from the Atlas on deforestation and plantations by international researchers and graduate students (Doc7, Doc44), and the results of the research metrics corroborate these results. It was thought that the high rates of academic engagement with the Atlas and its data are attributable to its availability in peer-reviewed publications (Res19). Gaveau et al. (2016) has been cited 205 times, and is among the top five cited articles in Scopus on the topic of oil palm plantation-related deforestation and land-use change in Borneo, demonstrating significant academic reach. Sampling 60 of the citing articles, most use the findings to describe the background context, such as the landscape changes in Borneo (Budiharta et al., 2018; Enrici & Hubacek, 2018; Jucker et al. 2018; Manoli et al., 2018; Romero & Putz, 2018; Santika et al., 2019b; Sloan et al., 2017; West et al., 2018) and the multiplicity of drivers of deforestation in Borneo (Agrawal et al., 2018; Austin et al., 2019; Budiharta et al., 2018; Collins & Mitchard, 2017; Davidson et al., 2019; Enrici & Hubacek, 2018; Evans et al., 2017; Jucker et al., 2018; Laurance, 2016; Leblois et al., 2017; Luke et al., 2019; Meijaard et al., 2018; Purnomo et al., 2018; Santika et al., 2019b; Saragi-Sasmito et al., 2019; Shattuck, 2017; Woittiez et al., 2018; Wolff et al., 2018). Others refer to statistics quantifying the number (Ibragimov et al., 2019; Meijaard et al., 2017; Rulli et al., 2019) and area of oil palm concessions (Evans et al., 2017; Langston et al., 2017; McAlpine et al., 2018; Ostfeld et al., 2019), as well as the paper's quantification of forest loss (Asner et al., 2018; Davidson et al., 2019; Langston et al., 2017; McAlpine et al., 2018; Meijaard et al., 2017, 2018). Many also replicate the methods to delineate plantations from satellite imagery (Austin et al., 2017; Gaveau et al., 2019; Sloan et al., 2017); and use similar proxies (Sloan et al., 2017), variable definitions (Santika et al., 2017a), and land cover classifications (Alamgir et al., 2019; Asner et al., 2018; Budiharta et al., 2018). Several researchers have used Gaveau et al.'s (2016) estate boundary maps (Meijaard et al., 2017, 2018; Miettinen et al., 2019; Sloan et al., 2017) and land conversion maps, either to

information on the issues of oil palm that were not connected to OPAL and that's a shame because they could have benefited from us and we could have benefited from them" (Res16)

"*the very disciplinary research that feeds information into the game modeling approaches, that, the tangible outcomes of that are the publications, and there are lots of publications out there*" (Res10)

Yulian et al. (2017) has been cited twice (Langston et al., 2019; Okita, 2019).

ERS

"*there is a lot of discussion right now on* [gender and] *palm oil,* [CIFOR is not] *quoted,* […] *referenced*" (Res3)

Sijapati Basnett et al. (2016) has been cited twice (de Vos, 2019; Dewi et al., n.d.).

Alternative Explanations

"*independent researchers or people who are consultants working on policies, you know,* [lots of research] *is being done by consultants around the country who could absolutely use a lot of CIFOR research, and I don't see that happening at all*" (IGO2)

identify study locations for their own research (Fleiss, 2018); overlay with habitat suitability maps to calculate habitat loss over time (Budiharta et al., 2018); or for interpretation (Miettinen et al., 2019). Other researchers use Gaveau et al.'s (2016) results to compare with their findings to discern consistency (Austin et al., 2017, 2019; Gaveau et al., 2019; Mosnier et al., 2017); extract data to quantify carbon emissions (Budiharta et al., 2018); and assess effects of past deforestation (Asner et al., 2018). Altmetrics for Gaveau et al. (2016) indicate researchers are aware of the research; from the total of 75 tweets about the article, 19 tweets are from researchers (only three of the 19 are GOLS researchers). Another publication, Gaveau et al. (2018), has also had high engagement on Twitter; from the total of 174 tweets, 27 are from researchers including WRI and INOBU. Evidence from interviews and documents also indicate wide use of the Atlas and its data. GOLS published their mills database online and is open access (Res11). Researchers – ranging from graduate students to mid-career researchers – from universities or research institutes in Indonesia (IPB), Malaysia (Universiti Teknologi Malaysia, Universiti Putra Malaysia), Australia (University of Queensland), Europe (University of Geneva, Mercator Research Institute on Global Commons and Climate Change, University of Leeds), and North America (MIT, Harvard University, Pasadena City College), have downloaded and likely used the mills data (Doc6). WRI researchers have also used the mills data to compare with WRI's Global Forest Watch data (Res7, Res30). From Component 3, one of the aims of the findings was to bring smallholder heterogeneity into academic and sector-wide discussions in Indonesia (Res18). While one researcher had the impression that the smallholder typology has not been used much to date by policy actors or practitioners (Res22), there is abundant evidence of use by researchers. Jelsma et al.'s (2017) article on the challenges faced by independent oil palm smallholders in Indonesia has been cited 40 times. Most researchers reference the article to preface the background context for their own research, noting discrepancies in smallholder definitions (Bennett et al., 2019; Pacheco et al., 2018; Watts & Irawan, 2018; Wibowo et al., 2019; Woittiez, 2019); acknowledging smallholder heterogeneity (Andrianto et al., 2019; Astari, 2019; Astari & Lovett, 2019; Hamilton-Hart, 2019; Hutabarat et al., 2019; Jelsma et al., 2019; Meijaard et al., 2018; Tey et al., 2020; Watts & Irawan, 2018; Woittiez, 2019); describing smallholder characteristics (Andrianto et al., 2019; de Vos, 2019; Dharmawan et al., 2019; Jefferson et al., 2020; Liu & Bona, 2019;

Luttrell et al., 2018a; Schoneveld et al., 2019a, 2019b; Sokoastri et al., 2019; Suratin et al., 2018; Wibowo et al., 2019; Woittiez, 2019); listing smallholder compliance barriers (Apriani, 2019; Astari, 2019; Astari & Lovett, 2019; Balchin et al., 2018; Bennett et al., 2019; Moreno-Peñaranda et al., 2018; Nilan, 2018; Österberg, 2019; Pacheco et al., 2018; Schoneveld et al., 2019b; Tey et al., 2020; Wibowo et al., 2019); and reflecting on the need for solutions to accommodate smallholder diversity in policy (Jefferson et al., 2020; Jelsma et al., 2019; Pacheco et al., 2018; Schoneveld et al., 2019b). Some researchers use Jelsma et al.'s (2017) statistics on average plantation size (Grass et al., 2020; Hamilton-Hart, 2019; Meijaard et al., 2018); share of oil palm cultivation by group (Andrianto et al., 2019; Grass et al., 2020; Hutabarat et al., 2019; Schoneveld et al., 2019b; Suratin et al., 2018; Wibowo et al., 2019); and the proportion of new smallholder plantations in APL and forest areas (Wibowo et al., 2019). A few researchers use similar sampling methods, tools, and proxy indicators (Jelsma et al., 2019; Schoneveld et al., 2019b; Woittiez, 2019). These researchers also use the findings in their analyses, such as application of the seven smallholder typologies (Jelsma et al., 2019; Woittiez, 2019), or to corroborate their findings for different regions in Indonesia (Schoneveld et al., 2019a, 2019b). While Jelsma et al.'s (2017) article has not had much social media engagement from researchers, other project outputs from Component 3 have: Jelsma & Schoneveld's (2016) working paper and Schonevled et al.'s (2019b) peer-reviewed article have each been tweeted by one researcher, and Schoneveld et al.'s (2017) infobrief has been tweeted by three. Researcher respondents from academia and government agencies like LAPAN noted that they have used some of GOLS findings on smallholders (Res4) and spatial data (Gov3). From Component 4, Sharma et al.'s (2018a) research has been cited only once, referencing the different scenarios to situate the context of their own study (Hasanah et al, 2019b). Despite low its low citation count, indications from Twitter show researchers are aware of the scenario work as seven of the 27 tweets about the article have been made by researchers. Other outputs from Component 4 have indicators of academic engagement, such as Sharma et al.'s (2017) infobrief – half of whose 18 tweets have been made by researchers – and Sharma et al.'s (2018b) poster which has been downloaded 250 times.

The evidence indicates substantial use of GOLS research by researchers. GOLS leveraged several different modes of dissemination to reach academic audiences. The project shared and

presented findings widely at academic conferences and in meetings, dialogues, and workshops attended by researchers (Doc5, Res22, TR35, TR50, TR58). Two notable pieces of evidence of researcher interest in GOLS findings were documented in trip reports: the first being a researcher from Leicester University interested in the findings on smallholder heterogeneity and methods at a conference hosted by the University of Palangkaraya (TR58), and the second being follow-up from a researcher from the University of Utrecht following project participation in the LANDac Conference (TR35). Support from CIFOR's communications department was noted as a facilitating factor in packaging and sharing the findings widely (Res5). GOLS researcher has also been promoted through CIFOR Forests News, CIFOR's Twitter account, and tweets by project researchers. Moreover, some of GOLS data is open access, which can facilitate researcher uptake and use (Res11). Wider academic engagement with GOLS research may occur as other high-profile researchers use the findings. For example, one of the most active researchers on oil palm in Indonesia has downloaded the mills data (Doc6) and cited Gaveau et al. (2016) in several of their publications (Morgans et al., 2018; Santika et al., 2017a, 2017b, 2019a, 2019b; Voigt et al., 2018). In another example, as the Atlas uses the Hansen dataset, this opens the opportunity for researchers to interact and respond to how data are used (TR19). While evident that many of GOLS outputs have been used by researchers, some have not been widely cited – notably outputs published in Bahasa, like some of the contributions from P3SEPKI researchers (Res6, Res7). Decisions on which language is most appropriate depends on the main target audiences of the output; while documents published in Bahasa can increase government and Indonesian researcher access to GOLS information, this may limit wider researcher use as academia's lingua franca is English.

OPAL

OPAL also builds on prior research for continuity (e.g., Sentinel Landscapes, the EK Project, GOLS) (Res5, Res6, Res18). However, one researcher believed the project missed an opportunity to leverage some of CIFOR's inhouse data as CIFOR largely played an engagement and networking role (Res16). Making contributions to the literature on methodology was part of OPAL's aim (Doc21), and the project tested engagement and Companion Modelling methods across many contexts to

demonstrate value as research tools and encourage researcher uptake (Res10, Res18).

There is evidence of partner use of OPAL research. One partner has used and built off one of the OPAL student's findings to investigate how district-level oil palm landscapes can be adapted for both development and conservation (Doc23). One partner has drawn on OPAL findings in their teaching (Blog13, Res14). Partners have also begun new collaborations with researchers from the University of Göttingen, Wageningen University, and the University of Edinburgh with plans to build upon research started in OPAL (Doc20, Res14, Res20).

External researchers have also used OPAL outputs. Using one of the OPAL publications as an example to demonstrate academic use, Yulian et al. (2017) has been cited twice. One cites the article to refer to Indonesian scholar perspectives on oil palm production (Langston et al., 2019), while the other references common methodological limitations, noting that most community surveys are short-term (Okita, 2019). Researchers have engaged with other OPAL outputs on Twitter; for example, Hasanah et al.'s (2019) article has been tweeted 14 times by researchers, with the majority by researchers external to the project (two tweets from OPAL researchers, two from CIFOR researchers).

Like GOLS, OPAL has taken advantage of several different modes of transfer and dissemination to share project findings with researchers and other target audiences. The OPAL team has published widely in peer-reviewed publications (Doc23, Doc24, Res10, Res20, Res24, Web1; Hasanah et al., 2019; Yulian et al., 2018). OPAL researchers have also participated actively in international academic conferences (Res16, Web1). OPAL outputs are available on OPAL and partners websites, and have been promoted on different social media channels like CIFOR Forests News, OPAL's Twitter, and tweets by OPAL researchers and partners. The OPAL team also has plans to engage government researchers (i.e., various *litbang* institutes) in future Companion Modelling games (Res20). There is also possible uptake of methods from young researchers recruited from local universities to support the game sessions (e.g., UNMUL, UNIKARTA) (TR73).

ERS

While there are increasingly more discussions happening around the topic of gender and oil palm in Indonesia, one researcher had the impression that findings from the ERS Project are not

referenced much by researchers or other target audiences (Res3). The ERS research team missed the opportunity to publish a peer-reviewed article to bring the findings of the ERS Project into the academic debate, instead producing occasional papers (Li, 2015), technical reports (Elmhirst et al., 2017), and infobriefs (Li, 2018; Sijapati Basnett et al. (2016). To get a sense of how ERS outputs have been used by researchers, the bibliometrics and altmetrics of one of the infobriefs was analyzed. Sijapati Basnett et al. (2016) has been cited twice, supporting impressions of low academic engagement. Researchers cited the infobrief to present an overview of the current academic debate (de Vos, 2019), and note the peripheral status of gender in these debates (Dewi et al., n.d.). One of the citing articles also refers to the study's critique on the absence of gender in RSPO requirements and auditing practices, which is used to position their own research focus on women's responses to debates and policies omitting gender (de Vos, 2019). Sijapati Basnett et al.'s (2016) infobrief has also received attention from researchers over Twitter, being tweeted three times. Li's (2015) occasional paper was a foundational piece of research on which the ERS Project built (Res3, Res4). While not produced as part of the ERS Project, Li (2015) was one of the first CIFOR outputs to touch on gender and oil palm and it received significant attention from researchers. Li (2015) has been cited 76 times and tweeted four times by researchers out of a total of 21 tweets (two are by CIFOR researchers), both of which are likely facilitated by the author's academic networks (Res4). ERS findings may also have transferred to researchers through events, such as a panel hosted by CIFOR that invited Indonesian researchers as panelists (TR4).

Alternative Explanations

There is extensive research published on oil palm in Indonesia, meaning that portfolio outputs compete with a plethora of knowledge for uptake (Gov17, Res6, Res7, Res12, Res15, Res30, Res31). One respondent felt that a lot of CIFOR's research would be useful for Indonesian and independent researchers, but this has not happened (IGO2). Scopus results indicate prominent research institutions publishing on various oil palm topics in Indonesia since 2015, which include IPB, UI, UNTAN, UNMUL, Universitas Sumatera Utara, University of Jambi, FOERDIA, CIFOR, WWF, Universiti Teknologi Malaysia, University of Queensland, Queensland University of Technology, Cornell University, ETHZ, University of Bern, Wageningen University, Utrecht University,

	Universität Göttingen, Lund University, CIRAD, and University of Brighton. Respondents corroborated knowledge of researchers working on oil palm from IPB (Res31) and Wageningen University (Gov17, Res16, Res20), and also referred to research produced by the University of Groningen (Gov17), the University of Maryland (Res30), TNC (Res31), Greenpeace (Res30), local Indonesian universities (Res6, Res15), and government agencies or *litbangs* (Res6, Res7).	
Researchers pursue new questions on oil palm [EoP outcome]	**General** As one of the "*pioneers*" (PS1) on oil palm research, CIFOR has drawn attention to a multitude of oil palm issues in Indonesia through its portfolio of research (PS1, Res5). The attribution of new research questions emerging as a result of the portfolio is difficult as there is copious research conducted on oil palm in Indonesia (Gov17, Res6, Res7, Res12, Res15, Res30, Res31). In order to pursue new research questions, need donor support which can be driven by many competing interests (NGO1). However, CIFOR is not always reliant upon direction given by funders, as internal funding from CIFOR and CGIAR can allow CIFOR researchers to explore new questions and topics. **EK** As a result of the EK Project, further questions related to the PERDA and its implementation arose. CIFOR and ICRAF proposed follow-up studies to "strengthen the argument contained in the PERDA" (TR63). CIFOR's study intends to focus on implementation of the PERDA, while ICRAF will conduct an economic analysis of the economic development impact of the implementation of the PERDA (TR63). **GOLS** As a result of their experience in GOLS, project researchers and partners developed greater interest in the topic the more they learned about the intricacies of the oil palm sector in Indonesia. Subsequently, a few are now pursuing new questions on oil palm in new projects (Gov1, Res5, Res23). Respondents and citing articles identified new knowledge gaps and entry points for future research. One NGO respondent suggested future studies on the impact of peat restoration on oil palm emissions, the scaling up of oil palm concession restoration model, and the impact of restoration on smallholders (NGO1). Researchers citing portfolio research identify entry points for their own studies. For example, Asner et al. (2018) positioned their research to "resolve carbon	**General** "*Personally I feel if CIFOR hadn't been around to do the work that it has been doing, perhaps that move in oil palm research would not have been* [...] *CIFOR has been like one of the pioneers of research that has built on oil palm and has contributed to that in this region in research, their research has also brought more people's interest in research on oil palm to the region*" (PS1) "*I think the question of attribution and how much you can attribute,* [...] *especially in the palm oil sector that is flooded with activity* [...] *You have so many NGOs, so many researchers, so many companies and doing pieces of work, publishing,* [...] *in terms of agricultural crops, it's got to be one of the most written about crops and commodities, and so many different events, conferences on it*" (Res12) **EK** "It was agreed to follow up another meeting to discuss the revised draft. CIFOR proposes to hold a specific study to further strengthen the argument contained in the PERDA. ICRAF proposed the idea of conducting an economic analysis of the PERDA on how it would contribute to the local revenue and, through development of scenario, how it affect the lanscape [*sic*]" (TR63) **GOLS** "*I personally have research questions and concerns about the protection and management of HCV area viewed from institutional aspect, as follow up from the GOLS project.* [...] *Based on GOLS research, it expands my research interest to fill gaps that occur in the field*" (Gov1) "*there are gaps on the sector related to research nowadays, for example on the impact of peat restoration on palm oil area in terms of emissions and then on how restorations model of palm oil concessions could be scaled up, other*	**M** **Realized, clear portfolio contribution** Project researchers, partners, and external researchers have pursued new questions on oil palm with supporting evidence of contributions from each project.

stocks on previously deforested lands or in regrowing forests" (p.290) not done in the original study. Others cited Gaveau et al. (2016) to compare and distinguish differences of the environmental impacts of oil palm between Colombia and Asia (Ocampo-Peñuela et al., 2018) and the drivers of deforestation across Indonesia as the original study only focuses on a sub-region (Austin et al., 2019). Researchers citing Jelsma et al. (2017) referenced the original study to position their focus on the contextual role of local and domestic knowledge and systems on oil palm production by smallholders (Khatun et al., 2020); the implementation of good agricultural practices on oil palm for smallholders to support market linkages (Woittiez, 2019); and expand the original study's scope to include West and Central Kalimantan (Schoneveld et al., 2019b).

To attract researcher interest in oil palm issues and stimulate new questions, GOLS researchers shared the findings widely in conferences and events attended by researchers. For example, findings were presented to an audience of graduate students at Kyushu University (TR32). The Atlas was also presented at the Wonderfruit Music Festival in Thailand to incite interest from younger audiences (TR69).

OPAL

One researcher had the impression that OPAL brought more attention to various oil palm issues and has contributed to the stimulation of new research on the topic (Res14). The respondents also believed the OPAL experience has prompted the graduate students to reflect on new questions and gaps in their knowledge, and more be motivated to continue a career in research as a result (Res14). There is evidence that the OPAL team has new projects planned with other researchers, building off OPAL research (Doc20, Res14, Res20).

ERS

The ERS Project was one of the first to focus on oil palm and gender in Indonesia, addressing a significant knowledge gap (Res3). There is some evidence that the project has contributed directly and indirectly to new questions on the topic. For example, researchers citing Sijapati Basnett et al. (2016) used the study to identify a knowledge gap of women's perspectives on current oil palm debates and policies that omit gender (de Vos, 2019). More indirectly, ERS researchers participated in a workshop hosted by SIDA on human rights and gender equality in response to climate change. Some of the discussions were dedicated to the

experience from other commodities, […] one of the biggest challenges on moving onwards in the sector, I think, is further support from funders or impact investment, on smallholders as well. There are opportunities for the studies" (NGO1)

"I also made a presentation in a science seminar (26 Sept) organized by Kyushu University. The title of my presentation is Governing Oil Palm Landscapes for Sustainability in Indonesia: Highlights of key research findings and recommended options for better governance of oil palm. This seminar was attended by Master and Phd Students along with their professors at the department" (TR32)

"To promote the work of CIFOR at Wonderfruit music festival in Pattaya, Thailand […] The main purpose of this event was to promote CIFOR to young generations of Southeast Asia" (TR69)

OPAL

"*More and more people are right now becoming aware on the issues of oil palm, some of course are thinking, 'Oh yeah, I will also research the oil palm'. So I think this has a very good impact on stimulating or motivating other people*" (Res14)

ERS

"SIDAs annual workshop 'Urgency in Action - Understanding Human Behavior and Ensuring Human Rights and Gender Equality in the Response to Climate Change' […] There is great potential to do addition [*sic*] work on human rights and gender equality issues in south east Asia. How is climate change, human rights and gender equality linked?" (TR24)

	identification of future research topics, such as the linkages between climate change, human rights, and gender equality (TR24). It is likely the ERS researchers partially contributed to the identification of these topics.		
The research agenda on oil palm advances toward sustainability and inclusion [high-level outcome]	Research has transformed from a predominantly disciplinary focus to the emergence of more inter- and transdisciplinary projects that aim to contribute to sustainability and inclusion (Res10, Res26, TR40). However, it was thought that some disciplinary siloing remains within certain structures within academia (Res26). Moreover, the reactive nature of the oil palm sector in Indonesia has made it challenging for the portfolio and other researchers to effectively communicate aims to build "*more positive perspectives for moving toward sustainability*" (Res18). Yet, sustainability has a firm focus within present research agendas. Conducting a Scopus search using 'oil palm', 'Indonesia', and 'sustainab*' as keywords, the results illustrate growing attention over time. Sustainability was first mentioned in research on oil palm in Indonesia in 1980, followed by a quiet period until 1998 and 2001, and low levels of publications over the 2000s. From 2010 onwards, there has been a steady rise from an average of three publications a year on sustainable oil palm in Indonesia in 2010 to a peak of 55 publications in 2019, with already 19 to date in 2020. CIFOR and partners (IPB, CIRAD) are listed among frequent affiliate organizations. In terms of inclusion, there has been a general shift away from one-size-fits-all approaches to more actor-specific intervention strategies in the R4D context (Res5). Findings are becoming more inclusive. For example, researchers are increasingly recognizing their role in promoting a "*coherence of the voices*" (Res24) for different system actors and the need to balance dominant perspectives with those that are being silenced. Research processes are also becoming more inclusive. For example, researchers recognize the value of problem co-identification, acknowledging the non-omniscience of researchers and their bias (Res10, Res16, Res24). The evolution of RSPO's research agenda is another example, as it was demand-driven, seeking input from multiple stakeholders to inform future research foci (PS1). Inclusion was thought to be "*a message that needs to get into the policy circle as well*" (Res4) as academia. Conducting a Scopus search using 'oil palm', 'Indonesia', and 'inclusi*' as keywords, the results illustrate low attention over time with a total of nine documents on the topic since 2010. Inclusion was not mentioned again in research on oil	"*This way of doing* [research] *has shaped our landscape as researchers, but I am not sure it has shaped at the same pace,* […] *you know our training on what are the real priorities, how to answer to very complex questions like deforestation or haze or water footprint in plantations, it is not a question for only one scientist, it is always a team of different disciplines and I think that the teaching is still done discipline by discipline* […] *but you need another layer of knowledge which is connecting all these things and how they are connected to answer key questions about sustainability*" (Res26) "*from the different perspectives and even for CIFOR and our research has been a bit difficult in looking at building more positive perspectives for moving towards sustainability, in opposition to this very reactive perspective*" (Res18) "*that happened on the KNOWFOR, I think it was one of the pioneering studies in all of Indonesia on this topic. And that was followed up by the GOLS, so I do think this narrative about, you know, moving away from one-size-fits-all to a sort of more actor-disaggregate intervention strategies* [has changed]" (Res5) "CSSPO 2018 Conference themed 'Harmonizing environmental, social and economic dimensions – is it possible? […] towards inclusive and sustainable agriculture'" (TR40) "The trip aimed to deliver a presentation about sustainable pathways in the palm oil sector in the symposium on "Sustainable Pathways in Agriculture in South East Asia: beyond Certification". […] The event was organized by the University of Maastricht and Wageningen University. The main debate was about whether certification as an indicator for sustainability has bring its intentions, and its implications on the smallholders in the palm oil, cocoa and coffee" (TR27) "*we were thinking that* […] *it was going to be helpful to convey a more nuanced message about the problems of*	**M** **Partially realized, clear portfolio contribution** There is evidence of momentum toward sustainability and inclusion within the research agenda on oil palm; however, sustainability is much more advanced than inclusion. Factors of politics and donor interests also affect the direction of the research agenda.

| | palm in Indonesia until 2015, where the average number of publications fluctuates from either one or two articles per year until present. Only one article has been published in Scopus on the topic in 2020. CIFOR and CIRAD are listed among the affiliate organizations of literature on the topic.

Many researchers and institutions are working toward integrating and reinforcing sustainability and inclusion in the research agenda (Res12). Numerous studies, conferences, and dialogues have been dedicated to reconciling the environmental, social, and economic dimensions of sustainable oil palm development (PS1, Res15, TR6, TR27, TR40, TR50, TR71). There is evidence that the portfolio is both organizing and taking part of these types of fora (TR4, TR5, TR6, TR7, TR8, TR9, TR14, TR18, TR19, TR23, TR24, TR27, TR30, TR32, TR33, TR35, TR37, TR39, TR40, TR42, TR44, TR45, TR50, TR54, TR62, TR66, TR68, TR69, TR71). In addition, each of the projects within the portfolio aimed to contribute to either sustainability (EK Project), inclusion (ERS), or both (GOLS, OPAL). Using GOLS as an example, while the project's main target was to inform debates on oil palm sustainability, one of the components aimed to demonstrate how Indonesia's transition to sustainability could be accomplished through the inclusion of smallholders (Res18). Sustainability is currently more advanced in the research agenda, and there are opportunities for inclusion to be further integrated (Blog5). RSPO's research agenda, where sustainability has been a clear mandate, has changed to address previous gaps on inclusion (PS1). Challenges remain, however. At times, definitions are inconsistent and can be contradictory; for example, sustainability can be defined differently by different system actor groups, which creates polarization around the concept in research, policy, and practice (Doc34, IGO2, Res16, Res18). Furthermore, how sustainability and inclusion are positioned within the research agenda depend on donors, who faced competing interests, pressures, and politics in terms of research funding decisions (Res12). The ever-changing dynamics within academia, practitioner, and government debates also present challenges for researchers (Res18). | *smallholders* […] *as we were probing into the debates, but hopefully, I hope that leads some of the attention, from both sides, you know, to understand the diversity of smallholders* […] *our targets was led to inform those debates on sustainability, so it's not easy, it's not black and white, [but] let's explore more the details about the possibilities for smallholders to make the transition*" (Res18)

"*we are aware that there are gaps in* [RSPO's] *previous research agenda, so we are working to develop a stronger research agenda*" (PS1) | |
| Accumulation of scholarship on oil palm influences organizational practice

[high-level outcome] | No evidence of realization. While interviews with private sector intermediaries and NGO respondents confirmed that these types of organizations generally use scientific research to inform understanding and sometimes decision-making (NGO1, NGO2, NGO4, NGO5, NGO7, PS1, PS2, PS6), it is unclear as to whether significant changes in organizational practice in the oil palm sector | "Q: [Do] *you draw on science directly in your work?*
A: *Yes definitely, I think the most credible reports on showing how palm oil industries now are reducing deforestation and peat, I think, are mostly done by science* […] | **L**
Not realized, too early to assess
There is no evidence of realization. It is |

	have occurred as a result. Access to scientific information may prove to be a barrier, either in terms of sourcing access or digestibility (NGO1, NGO5, NGO7). One national government respondent felt it was possible for research to influence government and organizational practice in Indonesia, asserting that it is knowledge – scientific or otherwise – that can shift the current paradigm (Gov5). However, researchers recognize that it takes a long time for research to influence practice (Res1). In Indonesia, it appears that most research is used to support arguments for policy change rather than practice change. For example, there have been dialogues calling for sustainable oil palm, where research has been used to provide evidence and encourage alignment with the state's constitutional mandate for sustainability (TR50). Portfolio research has predominantly targeted government policy change, applying theory, providing estimations and projections of scenarios, and developing evidence-informed recommendations for policy development or revisions at the subnational, national, and international levels (Doc1, Doc4, Doc7, Doc9a, Doc26, Doc23, Gov1, Gov3, IGO7, Res3, Res5, Res6, Res23, Res29, TR20, TR73). Likely portfolio research will indirectly contribute to practice change via portfolio influence on policy change in Indonesia, but it is too early to assess.	Q: *To what degree are you drawing on Indonesian science and analysis?* A: *I think that's also one of the biggest gaps […] if the information only comes from NGOs, private sector, governments, it's not enough. I think more information or research, or scientific communities needs to be there as well. I think one of the biggest challenges is on communication wise. Sometimes it is not easy to communicate paper or journal articles' information*" (NGO1) "Q: *Can research create change, do you believe that?* A: *Oh, I really believe […] change starts from the paradigm, right from knowledge*" (Gov5) "There should be in the mindset of every Indonesian citizens that sustainability is mandate of our constitution. Sustainability should be considered and promoted as the advantage of palm oil from Indonesia" (TR50) "*we thought we would try to do something that would be more useful for, you know, local government and NGOs and researchers*" (Res19)	possible that portfolio research could indirectly contribute to practice change via portfolio influence on policy change.

Appendix 9. List of Articles Citing Portfolio Outputs

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Appendix 10. Affiliation of Researchers Citing Portfolio Outputs

Table 14. List of researchers citing portfolio outputs, categorized by affiliation with CIFOR, portfolio partners, or external researchers

Output	Citing Researchers				
	CIFOR Researchers (included as co-authors)	**Portfolio Partners (included as co-authors)**	**External Researchers**		
			Global North	**Global South**	**Mixed**
Pacheco et al. (2018)	Andrianto et al. (2019) Dermawan & Hospes (2018) Jelsma (2019) Schoneveld et al. (2019a) Schoneveld et al. (2019b)	Dharmawan et al. (2019) Hasanah et al. (2019a) Hasanah et al. (2019b)	Carmenta et al. (2020) Haines & Macdonald (2019) Hoekman & Sabel (2019) Macdonald (2020) Nesadurai (2018) Sabel et al. (2015) Schleifer et al.; (2019) Schouten & Hospes (2018) Schröder et al. (2019) Russychaert et al. (2019) van Noordwijk (2020)	Astari (2019) da Silva Medina (2019)	Astari & Lovett (2019)
Luttrell et al. (2018a)	Pacheco et al. (2018) Jelsma (2019) Schröder et al. (2019) Schoneveld et al. (2019b)	Nurfatriani et al. (2018)	Schröder et al. (2019)	–	Mafira et al. (2019)
Gaveau et al. (2016)	Budiharta et al. (2018) Gaveau et al. (2019) Langston et al. (2017) Miettinen et al. (2019) Mosnier et al. (2017) Purnomo et al. (2017) Purnomo et al. (2018) Saragi-Sasmito et al. (2019) Schoneveld et al. (2019a) Sloan et al. (2017) Voigt et al. (2018) Woittiez et al. (2018)	Manoli et al. (2018) Ocampo-Peñuela et al. (2018)	Asner et al. (2018) Austin et al. (2017) Austin et al. (2019) Carlson et al. (2018) Cerullo & Edwards (2019) Collins & Mitchard (2017) Enrici & Hubacek (2018) Fleiss (2018) Hearn et al. (2018) Hearn et al. (2019) Hughes (2018) Jucker et al. (2018) Khatiwada et al. (2018) Laurance (2016) Leblois et al. (2017) McAlpine et al. (2018)	Ibragimov et al. (2019) Sofiah et al. (2018)	Agrawal et al. (2018) Alamgir et al. (2019) Alisjahbana & Busch (2017) Cederberg et al. (2019) Cheng et al. (2017) Cheng et al. (2018) Davidson et al. (2019) Evans et al. (2017) Luke et al. (2019) Macdonald et al. (2018) Morgans et al. (2018) Ordway et al. (2017) Wright et al. (2018) Santika et al. (2017a) Santika et al. (2017b)

			Meijaard et al. (2017) Meijaard et al. (2018) Naylor et al. (2019) Noojipady et al. (2017) Ostfeld et al. (2019) Pendrill et al. (2019) Pendrill & Persson (2017) Pfeifer et al. (2017) Pirker et al. (2017) Romero & Putz (2018) Rulli et al. (2019) Shattuck (2017) Shevade et al. (2017) West et al. (2018) Wolff et al. (2018)		Santika et al. (2019a) Santika et al. (2019b)
Jelsma et al. (2017)	Andrianto et al. (2019) Jefferson et al. (2020) Jelsma et al. (2019) Luttrell et al. (2018a) Pacheco et al. (2018) Schoneveld et al. (2019a) Schoneveld et al. (2019b)	Cadman et al. (2019) Dharmawan et al. (2019) Meijaard et al. (2018) Wibowo et al. (2019)	de Vos (2019) Faust (2018) Hamilton-Hart (2019) Naylor et al. (2019) Nilan (2018) Österberg (2019) Woittiez (2019)	Apriani (2019) Astari (2019) Castellanos-Navarrete et al. (2019) Khair et al. (2020) Nesti et al. (2018) Ngan et al. (2019) Purnomo et al. (2019) Sokoastri et al. (2019) Suratin et al. (2018) Yanita et al. (2019)	Astari & Lovett (2019) Balchin et al. (2018) Bennett et al. (2019) Grass et al. (2020) Hutabarat et al. (2019) Khatun et al. (2020) Liu & Bona (2019) Moreno-Peñaranda et al. (2018) Santika et al. (2019a) Santika et al. (2020) Tey et al. (2020) Watts & Irawan (2018)
Sharma et al. (2018)	_	Hasanah et al. (2019b)	_	_	_
Yulian et al. (2017)	Langston et al. (2019)	_	Okita (2019)	_	_
Sijapati Basnett et al. (2016)	_	_	de Vos (2019)	_	Dewi et al. (n.d)

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Aerial oil palm land in Sabintulung village, Muara Kaman District, Kutai Kartanegara Regency, East Kalimantan. Photo by Ricky Martin/CIFOR.

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