

EcoHealth Alliance

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by 2016

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USAID

Bangkok, Thailand

Dear

Please find below the justification for BC Initiative (BCI) subcontract under the USAID Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL) program.

TERMS OF REFERENCE FOR THE TOOLKIT WORKSHOPS and IDEEAL SURVEY

1. Organizing the Toolkit Workshops for the Community and Plantations. Assist in setting up and running stakeholder, community meetings and Toolkit Workshops.
2. Assist in liaising and coordinating with local stakeholders - local government staff, village leaders, and plantation staff. (During TK Workshops additional feedback on HACS will also be shared)
3. To conduct the IDEEAL Endline Survey of 400 as the target population. Targeted respondents are people living in Kampung Bilit, Kampung Sukau and people working/living in Ladang Suan Lamba, Genting Suan Lamba Plantation, Yu Kwang Plantation and Gomantong Forest Reserve. Toolkit Workshops to be conducted before Endline Survey.
4. Study area – Kg Sukau, Kg Bilit, and plantations within 10km of – Kampung Sukau, Kampung Bilit, Gomantong Forest Reserve and any others determined to be important.
5. Recruit local interviewers to conduct survey – 5 interviewers.
6. Assist in organizing plan, timeline and logistics for completing survey of 400 people.

Total contract amount is USD \$36,750.

Thank you for your consideration.

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Sincerely,

Dr. Peter Daszak
President, EcoHealth Alliance

**Local conservation.
Global health.**

EcoHealth Alliance
460 West 34th Street, 17th Floor
New York, NY 10001-2320
212.380.4460

EcoHealthAlliance.org

USAID-00358



USAID | ASIA

FROM THE AMERICAN PEOPLE

May 10, 2016

Dr. Peter Danzak
President, EcoHealth Alliance
460 West 34th Street, 17th Floor
New York
NY 10002-2320

Subject: Approval to Subcontract with BC Initiative (BCI) under Cooperative Agreement No. AID-486-A-13-00005, USAID Infectious Disease Emergence and Economics of Altered Landscape (IDEEAL) Program

Reference: PDanzak [redacted] EcoHealth's Request Dated May 3, 2016
[redacted] Dated May 6, 2016

Dear Dr. Danzak:

Pursuant to 22 CFR 226.25(c)(8), and in accordance with the terms of the subject Award, paragraph A.10 Substantial Involvement, and after review of the information provided in the referenced request, the Agreement Officer hereby provides approval for EcoHealth's subcontract with BCI to perform field support activities.

This approval is provided with the understanding that:

1. The activities are consistent with the terms and conditions of the award and within its funding limitations;
2. This approval is provided with the understanding that sufficient obligated funds are available under the subject award and that the total estimated amount of the award will not increase as a result of these expenses to provide support for the sub-contract;
3. The Prime Recipient will review the sub-contractor's budget to ensure accuracy of all direct and indirect costs and any proposed fees (if any);
4. The sub-contract will contain all applicable Provisions as mandated by the subject award, and other relevant USAID regulations in force at the time of award;
5. The Prime Recipient shall regularly monitor sub-contractor performance to ensure compliance with all applicable Standard Provisions.
6. No fee/profit is included in the subcontract.

Finally, this sub-contract approval does not:

1. constitute a determination of the acceptability or approval of any sub-contract terms and conditions;
2. constitute a determination of the allocability, allowability or reasonableness of any cost under the sub-contracts;

3. constitute a determination of the revision of the subject award or any of the respective obligations of the parties thereunder;
4. create privity of agreement between any sub-contractor and USAID/RDMA or the U.S. Government;
5. obligate the Agreement Officer or the Agreement Officer's Representative to act as arbiters in the event of a conflict between the Prime Recipient and any sub-contractor; or
6. relieve the Prime Recipient of any responsibility for implementing the subject award in accordance with its terms, conditions and provisions.

If you have any further questions, please contact the undersigned.

[Redacted]

[Redacted]

Sincerely,

[Redacted]

USAID/R

Bangkok

[Redacted]

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USAID | ASIA

FROM THE AMERICAN PEOPLE

September 19 2013

Peter Daszak
President
EcoHealth Alliance
460 W 34th St, 17th fl
New York, NY 10001

Subject: Cooperative Agreement No.AID-486-A-13-00005 Titled "Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)".

Dear Mr. Daszak:

Pursuant to the authority contained in the Foreign Assistance Act of 1961, as amended, the U.S. Agency for International Development (USAID) hereby awards to EcoHealth Alliance, hereinafter referred to as the "Recipient", the sum of \$1,999,203 to provide support for a program in "Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)" as described in the Schedule of this award and in Attachment B, entitled "Program Description."

This Cooperative Agreement is effective and obligation is made as of the date of this letter and shall apply to expenditures made by the Recipient in furtherance of program objectives during the period beginning with the effective date specified in Section A.2 of the schedule and ending on the date specified in Section A.2 of the schedule. USAID will not be liable for reimbursing the Recipient for any costs in excess of the obligated amount.

This Cooperative Agreement is made to the Recipient on condition that the funds will be administered in accordance with the terms and conditions as set forth in Attachment A (Schedule), Attachment B (Program Description), and Attachment C (Standard Provisions), all of which have been agreed to by your organization.

Please sign the below to acknowledge the Cooperative Agreement, and scan it back to me.

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Attachments:

- A. Schedule
- B. Program Description
- C. Standard Provisions
- D. Branding and Marking Plan

ACKNOWLEDGED:

BY: Peter Daszak
TITLE: EcoHealth Alliance
DATE: 9/15/13

A. GENERAL

1. Amount Obligated this Action : \$1,999,203
2. Total Estimated USAID Amount : [REDACTED]
3. Total Obligated USAID Amount : \$1,999,203
4. Cost Share Amount (Non-Federal) : [REDACTED]
5. Activity Title : Infectious Disease Emergence
and Economics of Altered
Landscapes (IDEEAL)
6. USAID Technical Office : OPH, USAID/RDMA
7. Tax I.D. Number : [REDACTED]
8. DUNS No. : 077090066
9. LOC Number : N/A

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B. SPECIFIC

1. GLAAS Request No. : REQ-486-13-000077
2. Operating Unit : USAID, RDMA
3. EOCC : 4100201
4. Benefiting Geo Area : Thailand Regional
5. **Total Obligated Amount** : **\$1,999,203**

C. PAYMENT OFFICE

Office of Financial Management
USAID/Regional Development Mission for Asia
63 Athenee Tower, 25th floor
Wireless Road, Bangkok, 10330 Thailand

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ATTACHMENT A: SCHEDULE

SCHEDULE

A.1 PURPOSE OF COOPERATIVE AGREEMENT

The purpose of this Cooperative Agreement is to provide support for the program described in Attachment 2 to this Cooperative Agreement entitled "Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)."

A.2 PERIOD OF COOPERATIVE AGREEMENT

1. The effective date of this Cooperative Agreement is October 15, 2013. The estimated completion date of this Cooperative Agreement is October 14, 2016.

A.3 AMOUNT OF COOPERATIVE AGREEMENT AND PAYMENT

1. The total estimated amount of this Cooperative Agreement for the period shown in A.2.1 above is \$1,999,203.

2. USAID hereby obligates the amount of \$1,999,203 for program expenditures during the period set forth in A.2 above and as shown in the Budget below. USAID is not obligated to reimburse the Recipient for the expenditure of amounts in excess of the total obligated amount.

3. Payment will be made to the Recipient by cost Reimbursement in accordance with procedures set forth in 22 CFR 226.

A.4 COOPERATIVE AGREEMENT BUDGET

The following is the Agreement Budget. Revisions to this budget shall be made in accordance with 22 CFR 226.

The Budget is for the period under A.2.1

Cost Element

1. Program Activities
2. Indirect Cost
3. Total USAID Amount
4. Cost Share
5. Total Program Amount

AMOUNT
US\$

1,999,203

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A.5 REPORTING AND EVALUATION

1. Financial Reporting

The Recipient must submit an original and two copies of Standard Form 425 (SF-425) on a quarterly basis to the Agreement Officer's Representative (AOR) and to:

Office of Financial Management
USAID, Regional Development Mission/Asia
Box 47 APO AP 96546

Electronic copies of the SF-425 can be found at
http://www.whitehouse.gov/omb/grants/standard_forms/ff_report.pdf and
<http://www.forms.gov/bgfPortal/docDetails.do?dId=15149>.

Line item instructions for completing the SF-425 can be found at:
http://www.whitehouse.gov/omb/grants/standard_forms/ffr_instructions.pdf.

Additionally quarterly financial reports/worksheets shall be submitted to USAID/RDMA at the sub-element level and contain at a minimum:

1. Total funds awarded to date by USAID;
2. Total funds previously reported as expended by recipient by main line items;
3. Total funds expended in the current quarter by the recipient by main line items;
4. Total unliquidated obligations by main line items; and
5. Unobligated balance of USAID funds.

2. Program Reporting

a. Quarterly Progress Reports:

The Recipient shall submit one copy of a performance report to the USAID/RDMA AOR, and one electronic copy to the USAID/RDMA Regional Agreement Officer. The Recipient must prepare and submit to the USAID/RDMA AOR reports due on a quarterly basis, the exact format for preparation of and timing for submission of all reports will be determined in collaboration with the AOR, with the last quarter reporting on the annual performance of the respective year. The Recipient should consult the USAID/RDMA AOR prior to submission. The report shall contain, at a minimum:

- Progress (activities completed, benchmarks achieved, performance standards completed including gender related activities) since the last report by program area;
- Problems encountered and whether they were solved or are still outstanding;
- Proposed solutions to new or ongoing problems;

- Success stories (if available);
- Documentation of best practices that can be taken to scale;
- Activities proposed for the next quarter, noting where they deviate from the approved Annual Work Plan, and listing dates for upcoming events; and
- Information on costs expended.

The last quarter/annual report shall include a performance indicator data table presenting the baseline and targets established for each fiscal year, and the actual annual performance data using indicators from the performance monitoring plan (PMP).

The title page of all reports submitted shall include a descriptive title, the author's name(s), grant number, the project title, grantee's name, name of the USAID program office, and the publication or issuance date of the report.

b. Annual Work Plan:

An initial annual program Work Plan must be submitted within 45 days of award. The subsequent Work Plans are due 30 days prior to the start date of the subsequent year. The AOR must approve the annual work-plans, including any significant changes or revisions thereto.

The work plan must include, as a minimum:

- i. A strategic statement, articulating major program impacts over the life of the program;
- ii. All proposed activities, including expected accomplishments and progress towards achieving results and performance measures tied to the indicators agreed upon within the M&E plan;
- iii. Timeline for implementation of the year's proposed activities, including target completion dates;
- iv. Information on how activities will be implemented;
- v. Personnel requirements to achieve expected outcomes;
- vi. Details of collaboration with other major partners;
- vii. Targets and anticipated results and milestone indicators against which the recipient will be evaluated (jointly established with the AOR);
- viii. Anticipated international travel

The annual work plan should be organized in a manner that describes overarching (performance management-based) intermediate results in connection with programmatic inputs (program activities), outputs (process-based results such as model iterations developed), and outcomes (transformative results reflecting changed behaviors, policies and strategies informed). Annual Work Plans will also describe how activities in a given year will lead to further activities and outcomes in subsequent/remaining years, as well as how activities are leading towards long-term sustainability of Program impacts.

c. Monitoring and Evaluation (M&E) Plans:

Within 60 days of commencement of the Program, the Recipient will deliver a full monitoring and evaluation (M&E) plan which establishes concrete measures for achieving and capturing results, incorporating required indicators from RDMA's strategy, the project's Project Appraisal Document, the U.S. Foreign Assistance Framework, USAID Forward, and other initiatives/policies as applicable. The Program should adopt indicators in its M&E that quantify the extent to which its component program elements are contributing to the main objectives and allow for the tracking of progress made towards achieving those objectives.

The M&E should include introductory sections providing: a summary of indicators and targets (table format); an overall performance management framework; an overview of the Recipient's data collection and reporting process and systems; and detailed indicator tables.

The M&E will incorporate the M&E plan for the program. A standard format for indicator tables will be provided, following the standard format of the F Framework, and will include annual targets for the life of the program, quantitative and qualitative indicators, definition of the indicators, a description of the data collection process, and details on the underlying assumptions or calculation methodologies that form the basis of indicator targets, as applicable. The M&E plan will be revised as appropriate on an ongoing basis in collaboration with the AOR.

As part of the M&E plan, the Recipient should disaggregate information by gender and age and should provide an analysis of the differing impacts on women, children and vulnerable groups.

The AOR will approve the final PMP. Any revisions to the approved performance monitoring plan will require additional AOR approval.

3. Final Report

The Recipient shall submit the original and one copy, 90 calendar days after expiration or termination of award, to the AOR and the Agreement Officer, if desired, and one copy, in electronic (preferred) or paper form of final documents to one of the following: (a) Via E-mail: docsubmit@dec.cdie.org ; (b) Via U.S. Postal Service: USAID Development Experience Clearinghouse, M/CIO/ITSD/KM, Ronald Reagan Building M. 01, U.S. Agency for International Development, Washington, DC 20523 or (c) Online: <http://dec.usaid.gov>.

The final performance report shall contain the following information:

- A summary of the accomplishments against work plans, giving the final tangible results;
- Complete data from the monitoring and evaluation plan, highlighting the impact of key activities;

- A summary of deliverables/benchmarks, addressing lessons learned during implementation and suggesting ways to resolve constraints identified;
- A summary describing the final status of the benchmarks and results with recommendations for follow-on work that may complement the completed work;
- Documentation of best practices that can be taken to scale;
- Information on cost overruns, if any; and
- Success stories and lessons learned

A.6 INDIRECT COST RATE

Pending establishment of revised provisional or final indirect cost rates, allowable indirect costs shall be reimbursed on the basis of the following negotiated provisional or predetermined rates and the appropriate bases:

(b)(4)	Description	Rate	Base	Type	Period	(b)(4)
	Fringe					
	G&A					

1/Base of Application: Salaries and Wages
Type of Rate: Provisional
Period: 07-01-12 until amended

2/Base of Application: Total direct costs excluding capital expenditure (buildings, individual equipment, alterations and renovations), and that portion of each amount of each sub-award in excess of \$25,000 incurred and flow through funds.
Type of Rate: Provisional
Period: 07-01-12 until amended

A.7 TITLE TO PROPERTY (Recipient Title)

Title to all property financed under this award shall be subjected to the requirements of 22 CFR 226.30 through 37.

A.8 AUTHORIZED GEOGRAPHIC CODE

Goods and services provided by the Recipients under this USAID-financed award will be subject to the 937 Geographic Code which is defined as the United States, the cooperating country, and developing countries other than advanced developing countries, and excluding prohibited sources. Please refer to ADS 310 and 22 CFR 228 for more information on this subject.

A.9 COST SHARING

The Recipient agrees to expend [redacted] as cost share as specified in the budget in section A.4 of the schedule of this Cooperative Agreement and in accordance with Applicable Mandatory Standard Provision RAA.9 titled Cost Sharing.

A.10 SUBSTANTIAL INVOLVEMENT

Substantial involvement during the implementation of this Agreement shall be limited to prior written approval by the AOR of the elements listed below:

1. Approval of specified key personnel assigned to the positions listed below.

Title: Chief of Party
Deputy Chief of Party
Stakeholder Coordination Lead (SCL)
Policy Leader (PL)

2. AOR's approval of the Recipient's Annual Work Plans, Performance Monitoring Plan (PMP) and Monitoring and Evaluation Plan. The approval must be in writing. The first Annual Work Plan shall be submitted to USAID for approval 45 days after the Cooperative Agreement is signed, and the second shall be submitted 30 days prior to the start date of the subsequent year. In addition, any substantial revisions to the Work Plan, PMP or the Monitoring and Evaluation Plan shall require the written approval of the AOR.
3. Approval of all sub-awards over \$25,000 except those covered by 22 CFR 226.25(c.8).
4. Collaboration or joint participation: The AOR is responsible for management and oversight of the Recipient. The Applicant must meet with the AOR or his/her designees as required to review the status of activities, and should be prepared to make periodic, unplanned verbal and written briefings to USAID/RDMA, and U.S. Embassy staff as appropriate. Additionally, USAID may be involved in collaborative selection of advisory committee members, if the Program will establish an advisory committee that provides advice to the Recipient. USAID may participate as a member of this committee. Advisory committees must only deal with programmatic or technical issues and not routine administrative matters.

A.11 PROGRAM INCOME (if Applicable)

The Recipient shall account for Program Income, if any, in accordance with 22 CFR 226.24. Program Income earned under this award shall be added to the project.

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A.12 AGREEMENT OFFICER'S REPRESENTATIVE (AOR)

The [REDACTED]

A.13 SPECIAL PROVISIONS**A.13.1 SALARY SUPPLEMENTS**

Any payments by the Recipient to employees of any government in the region at any level shall be subject to the USAID policy on salary supplements dated April 1988 or as amended. When this issue arises during the life of the agreement, the Recipient shall consult with USAID on any questions regarding the applicability of the policy.

A.13.2 BRANDING STRATEGY and MARKING PLAN

The recipient will follow the approved Branding Strategy and Marking Plan as included in this agreement as Attachment D. All media releases must get AOR concurrence before being published.

A.13.3 ENVIRONMENTAL REGULATIONS

1. The Foreign Assistance Act of 1961, as amended, Section 117 requires that the impact of USAID's activities on the environment be considered and that USAID include environmental sustainability as a central consideration in designing and carrying out its development programs. This mandate is codified in Federal Regulations (22 CFR 216) and in USAID's Automated Directives System (ADS) Parts 201.5.10g and 204 (<http://www.usaid.gov/policy/ADS/200/>), which, in part, require that the potential environmental impacts of USAID-financed activities are identified prior to a final decision to proceed and that appropriate environmental safeguards are adopted for all activities. The Recipient environmental compliance obligations under these regulations and procedures are specified in the following paragraphs of this Cooperative Agreement.

2. In addition, the Recipient must comply with host country environmental regulations unless otherwise directed in writing by USAID. In case of conflict between host country and USAID regulations, the latter shall govern.

3. No activity funded under this Cooperative Agreement will be implemented unless an environmental threshold determination, as defined by 22 CFR 216, has been reached for that activity, as documented in a Request for Categorical Exclusion (RCE), Initial Environmental Examination (IEE), or Environmental Assessment (EA) duly signed by the Bureau Environmental Officer (BEO). (Hereinafter, such documents are described as "approved Regulation 216 environmental documentation.")

4. As part of its initial Work Plan, and all Annual Work Plans thereafter, the recipient, in collaboration with the USAID AOR and

Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)

Mission Environmental Officer, as appropriate, shall review all ongoing and planned activities under this Cooperative Agreement to determine if they are within the scope of the approved Regulation 216 environmental documentation.

5. If the Recipient plans any new activities outside the scope of the approved Regulation 216 environmental documentation, it shall prepare an amendment to the documentation for USAID review and approval. No such new activities shall be undertaken prior to receiving written USAID approval of environmental documentation amendments.

6. Any ongoing activities found to be outside the scope of the approved Regulation 216 environmental documentation shall be halted until an amendment to the documentation is submitted and written approval is received from USAID

7. Unless the approved Regulation 216 documentation contains a complete environmental mitigation and monitoring plan (EMMP) or a project mitigation and monitoring (M&M) plan, the recipient shall prepare an EMMP or M&M Plan describing how the recipient will, in specific terms, implement all IEE and/or EA conditions that apply to proposed project activities within the scope of the award. The EMMP or M&M Plan shall include monitoring the implementation of the conditions and their effectiveness.

8. Integrate a completed EMMP or M&M Plan into the initial work plan.

9. Integrate an EMMP or M&M Plan into subsequent Annual Work Plans, making any necessary adjustments to activity implementation in order to minimize adverse impacts to the environment.

A.13.4 NON-FEDERAL AUDITS

In accordance with 22 C.F.R. Part 226.26 Recipients and subrecipients are subject to the audit requirements contained in the Single Audit Act Amendments of 1996 (31 U.S.C. 7501-7507) and revised OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations." Recipients and subrecipients must use an independent, non-Federal auditor or audit organization which meets the general standards specified in generally accepted government auditing standards (GAGAS) to fulfill these requirements.

A.13.5 EXCHANGE VISITORS AND TRAINING

Definition: An eligible host-country resident or national sponsored by USAID for a learning activity conducted within the U.S., a third country or in-country for the purpose of furthering USAID development objectives. A learning activity takes place in a setting in which an individual (the participant) interacts with a knowledgeable professional predominantly for the purpose of acquiring knowledge, skills, or information for the professional or technical enhancement of the individual. Learning activities may be formally structured, such

Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)

as an academic program or a technical course, or they may be more informal, such as an observational study tour.

According to USAID/RDMA Mission Order No. 253.001, all RDMA counterparts/contractors are responsible for entering/is required to enter all training related data into TrainNET/VCS system. USAID's TrainNET system is a web-based repository that enables the planning and reporting of information on all USAID-funded training and education data. This includes all in-country, third-country, regional and U.S. training that takes place during each fiscal year. Accurate and complete data entry will allow Bureau for Economic Growth, Education, and Environment (E3) (in Washington DC) to complete its annual submission to the State Department. This data is also shared with the Congress and other interested parties. It is important that each Mission be able to showcase the short and long term training and education that have taken place across its portfolio.

Application of ADS Chapter 252 and ADS Chapter 253: The recipient will conform to USAID Automated Directives System (ADS) Chapter 252 - Visa compliance for Exchange Visitors and ADS Chapter 253 - Training for Development, as well as USAID/RDMA-Specific requirements for processing of J-1 Exchange visitors. The recipient will enter applicable information into USAID's web-based training information system, TrainNET, for any exchange visitors and participant training that is funded through this award. For assistance and further details on legal restrictions, you may contact TrainNET/VCS Administrator, Program Development Office, USAID/RDMA, Bangkok, Thailand and the AOR.

References and Authorities:

1. ADS 252, "Visa Compliance for Exchange Visitors"
<http://www.usaid.gov/policy/ads/200/252.pdf>
2. ADS 253, "Training for Development"
<http://www.usaid.gov/policy/ads/200/253.pdf>
3. ADS 206, "Prohibition of Assistance to Drug Traffickers"
<http://www.usaid.gov/policy/ads/200/206.pdf>

-End of Schedule-

ATTACHMENT B

PROGRAM DESCRIPTION



Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)
In response to USAID-RDMA-RFA-486-13-000001

Original submission: May 24, 2013.
Revised submission: July 2, 2013.
Revised submission: August 7, 2013.

EcoHealth Alliance
460 West 34th Street,
New York, NY 10001
U.S.A.

Administrative Point of Contact:

[REDACTED]
[REDACTED] **@ecohealthalliance.org**
[REDACTED]

I. Executive Summary

Disease emergence is driven by complex socioeconomic and environmental changes, which include land use changes due to deforestation, agricultural expansion and habitat degradation. EcoHealth Alliance (EHA) has spent the last 40 years addressing these complex environmental and social challenges through multidisciplinary collaborative international networks. These include long-term partnerships within Malaysia, such as our 15-year old partnership with the Malaysian Government to tackle Nipah virus (the Henipavirus Ecology Research Group) which has now been formalized at the Ministerial level by an MOU among EHA, and the Malaysian Ministry of Health, Dept. of Veterinary Services, and Wildlife and National Parks (PERHILITAN). For the IDEEAL project, we will leverage our experience building successful partnerships, developing outreach programs, and our specific expertise in modeling disease emergence and its economic implications to address the challenge in this RFA.

Our modeling strategy will draw on existing datasets curated by EHA, datasets identified through partners and government agencies in Malaysia, and new data collected through the DEEP FOREST project, managed by EHA. Using a Bayesian statistical framework, we will examine how changes in land cover and land-use has affected the incidence of disease over the last few decades. We will calculate the value of damages from past disease outbreaks, and construct a model for expected damages under different land use scenarios, and different severity of outbreaks. We will parameterize our models with data that explicitly measure the different rates of exposure to disease by men and women (of all ages) attributable to gender-specific roles in society. To address gender issues effectively, we will solicit the direct participation of women and children in our behavioral surveys to clarify the implications of gender-specific roles.

We will develop a center of excellence for economic analysis of land use change and health outcomes. The Center for Development and Health (CDH) will be an international resource for the science and policy of land use change and the cost of disease emergence and will be based at the School of Business and Economics at the Universiti Malaysia Sabah (UMS). The CDH will be a forum for a state-of-the-art multi-disciplinary think tank composed of experts from the fields of economics, disease ecology, agriculture, forestry, wildlife conservation, and health as well as industry experts involved in land development in Sabah. We will collaborate with these experts to develop outreach materials and strategies, and the CDH will serve as a platform from which we will disseminate information and toolkits that provide all relevant stakeholders—community members, private industries, researchers, government officials, and policy makers—the ability to translate the science into action, with particular consideration for gender sensitive issues.

At the end of the project period, we will have produced four main deliverables that satisfy the proposed IRs and sub-IRs. They are: 1) quantitative models of land use change and disease emergence (risk

maps, economic impacts and health impacts) to use in local and regional decision making and that can be generalized or modified for other applications 2) the Center for Development and Health at UMS to serve as a permanent Center of Excellence and platform for continued research and training, stakeholder engagement, and as a regional and national source of information on the economic relationships of land use change, disease emergence, and subject area gender-related issues, 3) gender-sensitive health impacts toolkits for promoting best practice approaches and translate project findings to ensure gender equality benefits, and 4) scientific translation communications toolkits that translate research and modeling results to be useful for policy makers, private companies and government organizations, and civil society stakeholders.

II. Goal and Objectives

Overall aim: In partnership with the Universiti Malaysia Sabah School of Business and Economics, the Sabah Wildlife Department, and other governmental and non-governmental stakeholders, we will develop a functional, field-trialed, quantitative set of models which capture gender sensitive emerging infectious disease-related health savings as a function of land use; produce actionable model outputs and analyses to help promote reduced-impact land utilization by governments, private sector stakeholders and civil society; build alliances amongst a diverse range of stakeholders; integrate cross-disciplinary approaches in gathering, analyzing and disseminating information; and establish a training, learning, and resource sharing platform in Sabah to sustain program impacts after the project.

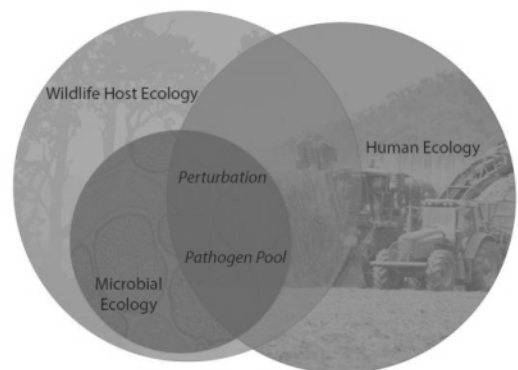
Models will be parameterized using empirical data from our extensive collection of datasets as well as other existing datasets and new data generated by USAID investments including EPT PREDICT and our DEEP FOREST project. We will create a Center of Excellence in Sabah to act as an outreach resource for key stakeholders in Sabah, Malaysia, and USAID. The Center will disseminate our findings and actively communicate them to local stakeholders including women's groups and indigenous communities who may be directly impacted by land use change. We will work directly with government partners in Sabah and industry stakeholders to translate the outputs of our models into policy-level actions and corporate sustainability strategies that will reduce the risk and mitigate the impact of land-use and climate associated zoonotic disease outbreaks, with particular attention to reducing gender-based adverse health events. This project will be scalable and will serve as a prototype for similar national and regional initiatives in other parts of Asia or the world that are particularly vulnerable to EIDs.

III. Narrative: Section A - Technical Approach

Disease emergence is driven by socioeconomic, demographic and environmental changes which include deforestation, agricultural expansion, habitat degradation and other land use changes. These changes are particularly important for zoonotic diseases, which

account for ~60% of all EIDs, and almost all recent pandemics (Taylor *et al.*, 2001; Woolhouse & Gowtage-Sequeria, 2005). Land use change is the most significant driver of disease emergence. Analysis of our database of all known EIDs (from Jones *et al.*, 2008) shows that around one-fifth of EID events, an even higher proportion of zoonotic diseases, and most emerging pandemics, were associated with land use changes, including agricultural conversion, deforestation and activities associated with the extractive industries (e.g., mining, logging). The importance of land use change in the process of disease emergence make it a key target for control strategies (Patz, Daszak *et al.*, 2004; Jones *et al.*, 2008; Keesing *et al.*, 2010; Burnside *et al.*, 2012). However, to create effective control measures requires: 1) a detailed mechanistic understanding, supported by field data, of how land use change drives disease risk; and 2) a strategy to control this problem that will be supported by local stakeholders (industry, government and local communities) because these stakeholders play a role in promoting, legislating or engaging in activities that lead to land use change, and are vulnerable to their adverse consequences, including disease emergence.

Our extensive previous work on modeling EID dynamics; on the emergence of Nipah virus, West Nile virus, SARS and avian influenza; and our current work in USAID EPT PREDICT (including the DEEP FOREST project) provide strategic direction for this proposed. We have shown that land use change leads to zoonotic disease emergence by increasing opportunities for contact and pathogen spillover between wildlife and humans and by perturbing host-pathogen ecological dynamics that promote cross species transmission (Patz, Daszak *et al.*, 2004; Murray & Daszak, 2013) (Figure on right). These factors act either together or independently, and because of the diversity of reservoir hosts, vectors, and human behavior in a region, they create a complex, dynamic system.



To understand this complexity requires collection and analysis of data on all of the processes involved in land use change that affect disease risk. For example, road building or other economic development activities in intact forests usually involve movement of people into previously uninhabited areas, which increases their contact with wildlife and their exposure to the novel pathogens they carry, as well as vectors such as mosquitoes. Different sectors of the community tend to have different types and degrees of contact with wildlife, and this also varies with age and gender. In addition, land use change modifies existing habitat with often dramatic impacts on the abundance of disease reservoirs and vectors (Norris, 2004; Patz & Olson, 2006; Olson *et al.*, 2010). All of these factors can alter disease risk. Once a pathogen has spilled over into a single person, or established itself in a community, the risk of spread depends on the amount and type of contact among people, and their movement into

and out of the interface where spillover happened, in addition to the characteristics of the causal pathogen and its associated disease dynamics. Finally, assessing the role of disease emergence in the economic cost/benefit analysis of land use change requires specific information on the frequency and magnitude of disease emergence and outbreaks, and their economic and health impact on individuals, on communities and on production, trade and travel. Our approach for the IDEEAL Project brings together these components to produce actionable information to local and regional stakeholders for informed decision-making with the goal of reducing the risks of disease emergence associated with altering landscapes.

Cross-Disciplinary Approaches

EcoHealth Alliance (EHA) has spent the last 40 years addressing complex environmental and social challenges by building multidisciplinary teams via collaborative international networks. These include long-term partnerships within the region, such as our 15-year old partnership with the Malaysian Government to tackle Nipah virus (the Henipavirus Ecology Research Group) which has now been formalized at the Ministerial level by an MOU among EHA, and the Malaysian Ministry of Health, Dept. of Veterinary Services, and Wildlife and National Parks (PERHILITAN). Our team has provided multi-disciplinary training, research support, and policy guidance to Sabah Wildlife Department since 1988. Our work in the region includes consortia that we founded such as the One Health Alliance of South Asia, a partnership of SAARC country government agencies for health, agriculture and the environment, and the Consortium for Conservation Medicine, set up in 1997 to link leading US institutions of public health, wildlife health, environmental sciences, medicine and veterinary medicine. Official affiliated partners of EHA (www.ecohealthalliance.org/partners/all_partners) include key government departments in the USA (e.g. CDC, NIH, USDA), in Malaysia (e.g. Dept. Veterinary Services, Sabah Wildlife Dept.) and globally (e.g. OIE, FAO, WHO, and IUCN). We work closely with leading corporations involved in agricultural development in the region (e.g. Cargill, Mars, PepsiCo) and leaders of industry globally (e.g. Bayer, Exxon). Our economics research includes partnership in the NIH-NIGMS MASpread project which analyzes the economic impacts of disease on trade. Our outreach programs include multidisciplinary training programs such as EcoHealthNet, which provides disease ecology training in more than 10 countries. Finally, EHA is one of four partners in USAID EPT PREDICT, with specific responsibility for zoonotic disease surveillance in Malaysia, leadership in all PREDICT modeling activities, and the DEEP FOREST project.

For this project, we will leverage our experience building successful collaborative programs, in public outreach, and our expertise in modeling disease emergence and their economic implications to address the challenge in this RFA. We have already established close working partnerships with experts from the fields of wildlife health, economics, conservation biology, public health, and social advocacy in Sabah, including the Sabah Wildlife Department's Wildlife Health Unit

(our DEEP FOREST team), The Danau Girang Field Centre, HUTAN, the Sabah Department of Health, the Malaysian Palm Oil Council, and the School of Business and Economics at the Universiti Malaysia Sabah (UMS).

We plan to create a center of excellence for land use change and health (the Center for Development & Health (CDH) based in the School of Business and Economics at UMS. This will engage experts in agricultural science and policy from within UMS, including the Department of Sustainable Agriculture, and State government experts in economic planning and development from the Sabah Economic Development and Investment Authority (SEDIA) as well as several other local NGOs and government agencies. The CDH will link key departments within the university to private and public institutions in Sabah whose members can provide real-world insight into the challenges of development. It will create training and educational opportunities for men and women, which provides students with a multidisciplinary framework that links environmental and ecological science with economics, social science, and political science. This will provide long-term sustainability by producing a generation of graduates ready to address the challenges of responsible land development in Malaysia and the broader region.

Modeling strategy

We propose a 3-phase approach, with each phase informing the next: 1) model the relationship between land cover/land-use change and the likelihood of pathogen spillover, disease outbreaks and emergence, utilizing available data at three spatial scales (global for EIDs, regional and local for endemic diseases) and novel data from DEEP FOREST (local scale); 2) develop an avoided damages model at each corresponding scale to understand the economic consequences of these linkages; and 3) examine potential for integration of these models into a total ecosystem value model (local scale). Although the focus of this proposal is #1 and #2, we will evaluate the potential to achieve #3 in the early stages of the project. Progress in #3 will place the goals and results of the current RFA in broader context of ecosystem use and contribute to future policy and planning efforts.

1. Modeling the relationship between land-use change and disease outbreaks/emergence

This objective will be achieved by analyzing and modeling data from two domains: 1) A detailed analysis of available data; and 2) analysis of newly generated data primarily from DEEP FOREST. The first domain uses a correlative approach and provides insight from a very broad range of data sources while the second focuses in on the mechanisms of disease emergence (primarily contact rate and host-pathogen ecology) to provide novel insights on the links between land-use change and risks of disease emergence.

Available data: Our first step will be to examine how changes in land cover and land-use have affected the incidence of disease over the last few decades. We will focus on a range of disease outcomes, including localized spillover events, small outbreaks, larger scale

outbreaks and pandemic emergence. We will assess how land use has changed from pristine conditions using historical data on land cover, and we will match this with recent historical data on disease outbreaks and emergence that we have already amassed as part of EHA's modeling program (e.g., global EID distribution), as well as from other sources (regional endemic diseases, and local diseases known to be important to health of the population of Sabah). **For land use data,** we will use our datasets on land cover/land use for natural systems, croplands, grasslands, urban areas and areas used for livestock, originally sourced from FAO, HYDE-IMAGE, GLOBIO3, European Commission, USGS, NASA and others, but that have undergone subsequent processing for our applications in studying disease emergence processes. Our spatial database also includes current state, forecasts (2050) and back-casts (1700) of land cover/land use. These datasets are highly variable in spatial resolution, ranging from country level to 500 m of resolution (e.g., classified land cover MODIS-Terra). We have access to downscaled scenarios of land use and climate change under various projected policy frameworks from Rio+20 (e.g., business as usual vs aggressive policy changes). We have also gathered, vetted and produced a series of socio-economic and ecological variables thought to drive disease outbreaks, including global human population density (GPW & GRUMP), gross domestic product (World Bank), mammal diversity (IUCN), human conflict (Political Instability Task Force), climate (WorldClim) and others. Currently we are in the process of designing methods to downscale some of the country level data to finer spatial resolution models, which in pilot analyses significantly enhances our ability to detect trends among noisy and biased datasets. We are also developing methods to calculate a single metric combining all forms of land-use change into a 'Land-use development index' (LDI). The LDI project has been developed for DF, and again we would expect seamless integration of this DF product with the IDEEAL project under EHA management. Although the LDI is currently applicable to individual location points at various potential scales around that point, we have developed a statistical method utilizing a 'moving window' approach that will effectively produce continuous maps of LDI for any spatial scale (i.e., for every pixel in a landscape, we will calculate the LDI taking into account all land-use changes occurring in and around that pixel at any chosen spatial scale). This unique product will be critical for our assessments of the effects of land-use change on disease emergence in spatial models, as well as understanding DF risk determination outputs at the landscape level.

For disease data, we will use EHA's online EID database (the 'Sicki Project' - www.ecohealthalliance.org/programs/35-the-sicki-project), which serves as a platform to enter information on EIDs, including standardized pathogen taxonomy, bibliographical references and spatial information. We will build a database of outbreaks and other relevant information (e.g., drivers of outbreaks) relevant to this RFA. To do this, we will ingest data from public databases such as GIDEON, the WHO Disease Outbreak News reports and from reviewing the literature. In conjunction with our Malaysian partners and the Center of Excellence, we will also identify relevant local and regional datasets

(e.g., government reports or articles in local languages, such as Bahasa-Melayu, Bahasa-Indonesia, Mandarin and Cantonese) on an as needs basis (see also Contingency Planning section below).

To account for temporal and geographic variability in emergence, we will perform analyses at different temporal and spatial scales. For the temporal analysis, 10-year intervals will be used. We will also investigate the possibility that there is a time lag between land cover/land use changes and the emergence of new infectious diseases or enhanced risk of endemic and localised diseases. In this scenario, a change in land use may gradually alter population dynamics of a wildlife reservoir, so that after a period of time, some wildlife become much more common, and their pathogens have an opportunity for spillover. The spatial analysis will include a multi-scale analysis focused on local (within Sabah), regional (e.g., Southeast Asia) and global spatial scales. At each of these scales, the effect of geographic variability on land-use change will be investigated. For example, as part of our Deep Forest project, we have developed a land-use development index (LDI) that can be calculated at varying spatial scales (i.e., a site may appear pristine at a scale of 100m, but highly disturbed at a scale of 5km if it is an isolated patch of forest surrounded by converted land or urban areas) to produce continuous maps of land-use intensity (see 'land-use data' above), reflecting the uncertainty of how geographic scale of land-use may influence disease risk. This framework of analysis will also allow us to investigate whether the drivers themselves are scale dependent (e.g., deforestation may have more spatially acute impacts on disease risk than more diffuse types of land-use change such as road network construction).

New data: For the second component of this objective, we will leverage the theory, methodology and results of the DEEP FOREST project to bolster and support the current proposal. Spillover of pathogens due to land use change is an ecological process based on the community ecology of pathogens within wildlife populations, and their interactions and disease-relevant contact with people. Contact rates are notoriously difficult to acquire during disease outbreak situations. However, the EHA-led DEEP FOREST project is tasked with specifically measuring disease-relevant contact among people, livestock and wildlife across an urban-to-rural gradient in Sabah. It also will capture data on the community ecology of wildlife hosts and their pathogens over this gradient.

We will use data obtained by the DEEP FOREST team to inform the likelihood of EID spillover within specific regions undergoing land use change. In Borneo, the DEEP FOREST project sites are in the region of Sukau near one section of the Kinabatangan River. The sites are distributed along a disturbance gradient from highly disturbed (generally in the vicinity of the town of Sukau or in areas heavily converted to e.g., palm oil plantations) to largely pristine and intact (Gomantong Forest Reserve). Here, wildlife sampling and surveys of human contact with wildlife are taking place at 9 sites along the

gradient (3 sites in each of three levels of the gradient). These surveys provide samples that are being fed into our PREDICT pathogen discovery program to provide information on the prevalence/incidence of known pathogens and completely novel pathogens from viral families which are known to contain zoonotic agents. DEEP FOREST human contact (DFHC) will provide standard estimates of rates of human contact with different animals or taxa and determine how these rates vary across an urban-to-rural gradient. In addition, this work will identify populations and sub-groups with particularly high rates of exposure and how this varies by age, occupation and gender. This gender specificity may be critical because some occupations consist of mainly male workers (e.g. palm oil plantations, hunters), and we expect exposure rates to differ significantly both quantitatively and qualitatively between men and women. DFHC surveys will be undertaken by PREVENT, in collaboration with EHA.

In addition to Deep Forest human contact (DFHC) surveys, which will be undertaken by PREVENT in collaboration with EHA in Sabah, we have developed a plan to generate 'spatialised' human occupancy data to complement the DFHC surveys. This will involve additional survey effort using a randomized point or transect survey design to get an unbiased estimate of the number of people occupying landscapes of varying characteristics (e.g., pristine forest, semi-degraded forest, converted landscapes). We then plan to develop spatial models from these surveys that will use environmental and geographic covariates to produce an overall human occupancy map. This will be fundamentally different but potentially related to currently available human population density maps that are frequently used in EID associative analyses as it will provide a more accurate picture of human occupancy by accounting for human population movement, rather than relying on fixed household data, which is the usual method of data collection for censuses.

Covariates of potential interest for their ability to predict human occupancy will include habitat characteristics, demographic data (e.g., habitation patterns), geographic relief (e.g., elevation), human constructions (e.g., dwellings, roads, plantations) and others. This point / transect survey method will involve systematically counting the number of people at each randomly selected survey point/transect for a set duration and over time with a consistent number of replicate surveys to provide a rate of human presence (e.g., occupied x% per hour per grid cell). We are currently trialing the viability of this survey method in our DF sites using the DF site evaluation surveys implemented on the ground by the field teams and directed by EHA scientists. The point / transect survey method will also involve collation of additional information about people to the extent that can be remotely observed, such as gender, age class, ethnicity) that will strongly complement DFHC survey data. For example, in addition to the self-reporting data from DFHC, our additional survey may be able to estimate that e.g., x% of the people at point y are utilizing the space to hunt/socialize/transit, and that z% are adult males. Our model will then allow us to extrapolate via

the use of predictive covariates to the unsurveyed regions between sampling points to provide a spatial map of human occupancy that can be stratified by subgroups of interest as required (e.g., hunters, plantation workers etc). Funding and labor for the additional point/transect survey will come from the IDEEAL Centre of Excellence.

These data will inform our model of the likelihood of pathogen spillover for a given contact pattern, corrected for the patterns we expect to see in the viral pool across the land-use change gradient. This means that we will be able to compare the likelihood of an individual hunted animal being positive for a pathogen at any site along the gradient, and of a specific risk behavior occurring there. Finally, to calibrate the likelihood of such a scenario leading to infection of a person, we will use data from published studies of zoonotic spillover for various model viruses. **This level of predictive capacity has never been achieved before, and is uniquely possible by a group that brings together expertise in modeling EIDs and has access to the unique datasets that DEEP FOREST will produce.**

Statistical framework: For analyses of collated available data linking disease events to spatial predictors, we will evaluate and compare regression models used to analyze count data (e.g., negative binomial, Poisson, zero-inflated under a hierarchical Bayesian framework) while controlling for other factors (including research bias) that influence disease detections. We plan to make use of the following general Bayesian model:

$$Y_i \sim \text{Poisson}(\mu_i) \text{ or } Y_i \sim \text{Binomial}(\mu_i)$$

$$g(\mu) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \varepsilon_i$$

$$\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$$

where $g(\mu)$ is a link function (see below), β_0, β_1 , etc., are parameters to be estimated and ε is an error term with a normal distribution. Link functions are used to indicate whether the predictor variable (Y_i) represents a Poisson distribution (e.g., outbreak counts) or a Binomial distribution (e.g., presence or absence of a new disease). Links are defined as $g(\mu) = \log(\mu)$ for count data (e.g., number of outbreaks) or as $g(\mu) = \log\left[\frac{\mu}{(1-\mu)}\right]$ for presence/absence data (an EID event). Bayesian analysis has the advantage over frequentist methods under some circumstances for its ability to specify prior probabilities to parameters (e.g., through literature reviews and consultation of experts). We will assign prior probabilities using two different approaches: 1) Uninformative prior: an inverse gamma distribution will be assigned for each parameter. An uninformative prior approach will help us develop a generalizable model and make it relevant for other parts of the world where disease-related data may be scarce. 2) Informative prior: to achieve greater specificity and regional relevance, we will investigate the use of additional sources of information for integration into this framework. For example, we may be able to leverage a range of data sources from the literature, from our DEEP FOREST project, and EID emergence and outbreak

databases. Bayesian models with informative priors can help make the most of available data, narrow parameter estimates, reduce uncertainty in those estimates, and reduce new data requirements (i.e., sample sizes) in order to achieve equivalent statistical power for inference. For example, they will give us the advantage of being able to incorporate system-specific data that we have collected under our other programs in order to produce a tailored Bayesian model for regional and local conditions. Markov Chain Monte Carlo (MCMC) methods with a Gibbs sampler algorithm (i.e., each randomly sampled value is conditional to the previous value) will be used to estimate the posterior probability of the mean and percentiles.

For DEEP FOREST analyses, we will proceed with analyses in a four stage process, including 1) Biodiversity analysis among gradient levels, 2) Virodiversity analysis among gradient levels, 3) Human-animal contact patterns and random point/transect human occupancy surveys among gradient levels, and 4) Integration of biodiversity, virodiversity and human-animal contact/human occupancy data to assess risk of disease spillover and emergence as a function of land-use change. We will tailor metrics from the biodiversity sciences (including metrics that quantify 'diversity' of species within communities and similarity indices that measure differences between ecological communities) to evaluate the effect of land-use change on host community ecology, which includes changes in occupancy and relative abundance of host species across sample locations. This will be paired with similar analyses that characterise the distribution and relative abundance of pathogens within those wildlife host species. Biodiversity metrics have the capacity to compare community compositions given unequal sampling opportunity across species (i.e., some species are more difficult to detect due to their relative abundance or detectability), as well as the capacity to assess sampling completeness, which controls for the portion of the community that is likely to have been missed during sampling. We will also investigate modeling tools that could allow us to extrapolate trends from our survey sites to larger areas of the landscape; for example, environmental covariates may be able to predict changes in host and or viral community structure, and tools such as generalized dissimilarity modelling may be able to be applied to Deep Forest data.

Our analysis of the DFHC survey data will yield standard estimates of contact rates between humans and animals (both wildlife and domestic animals that may serve as intermediaries) and will allow for comparison among gradient levels, and help link field data to relative risk of disease emergence. In our analysis, contact will be characterized as a function of the type of animal (e.g. specific species or taxa), timing and duration of contact, intensity of contact, and type of contact (e.g. direct versus indirect). To quantify contact we will develop various indices of exposure in collaboration with PREVENT, and our additional spatial data (random spot/transect surveys) will allow us to 'spatialise' human occupancy and potential contact patterns with wildlife across the landscape, which will be particularly relevant for the IDEEAL project. Finally,

we will investigate the use of simulation tools such as agent based models (ABMs) that can be parameterized from our DF data. Simulations can be useful for scenario / 'what if' analyses such as those presented by the Millennium Ecosystem Assessment.

2. Avoided damages modeling

Our preliminary analyses and other studies strongly suggest that deforestation and other land-use practices contribute to disease emergence and outbreaks. Intact forests can thus be considered a 'public good' from a disease emergence perspective - that is, they provide a service to society through protection against infectious disease outbreaks. Unlike harvesting natural products for use or profit, this service does not involve society's direct use of the ecosystem, making the valuation of this public good a challenge. One way to measure the benefits of disease regulation from intact forests is to value the damages that are avoided by keeping the ecosystem intact (Groot et al., 2010). In practical terms, we expect that the costs of disease control will increase with deforestation, i.e. with decreasing forested area, and we will examine this relationship in the proposed work.

Calculating the Expected Damages of Disease Outbreaks

Our approach is based on work EHA has developed within our MASpread project in which we are examining the anthropogenic impacts that contribute to the spread of disease and their associated costs. We use a set of well-studied emerging diseases each with different characteristics representing typical impacts from disease emergence - i.e. those causing spillover vs. human-to-human transmission vs. pandemic outbreaks. Our damage functions are assessed by teasing apart the wide range of potential outcomes of these diseases into their morbidity, mortality, and impacts on travel and trade - i.e. factors that have already been valued in separate studies. Our strategy is to then use that function to predict the damages of other diseases that have similar characteristics to different members of this subset that have little or no available cost data based on the same explanatory variables.

A general description of this model takes the form of:

$$D_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_n X_{ni} + \epsilon$$

Where:

D_i = Damages from disease i in 2013 US dollars

X_{1i} to X_{ni} = Morbidity, mortality, loss of worker days, duration trade restrictions, etc.

β_1 to β_n are estimated parameters representing the effect size of each variable (X) on the damages

ϵ = error term

Our categorization of EIDs by type of economic damages, and derivation of a different damage function for each category make our estimates more robust and potentially amenable to early classification of forecasted costs of novel diseases based on rapid descriptions of its basic characteristics. Using the results from the count data model at

each spatial scale (global, regional, local - see 1 above), we will examine the expected damages under three different 'forecast' scenarios: 1) business-as-usual (current rate of land use conversion extrapolated forward), 2) increased rates of deforestation relative to historical rates, and 3) no deforestation. These hypothetical land-use policy scenarios were utilized by the Millennium Ecosystem Assessment, and we will ensure that our forecasts are in line with updated versions of the MEA as they become available (see also 'Linking spatial and economic models' section below).

We will tailor damages from the above formula (listed in 2013 US dollars) to the unit with the most impact for the system and stakeholders we are addressing (e.g., USD, Thai Baht or Malaysian Ringgit). Generally speaking damages will include the direct costs associated with human health impacts and mortalities, as well as other costs such as impacts on travel and trade.

Health impacts: We will quantify the 'value' of health, healthiness or the perception of healthiness using a value of statistical life (VSL) and value of a statistical life year (VSLY) framework, i.e. typical inputs into cost-benefit analyses (CBA). VSL is the marginal dollar value attributable to a human life, while VSLY is the annualized equivalent (value of a year of healthy life). VSLY will be particularly relevant here because damages are often non-fatal and this measure encapsulates loss due to disability or other reduction in quality of life over a fixed time period. As a starting point, we will work from previous estimates of these parameters. These exist mainly for high-GDP countries in Europe, North America and elsewhere and we will therefore adapt them to local conditions. A previous review (from Australia) suggests a mean VSL of ~A\$9.4 million (median of \$6.6M), and a mean VSLY of A\$433,437 (median of A\$119,589). These mean figures are also affected by sector, e.g. health (A\$4.0 million), transport (\$7.9 million), 'other' (consumer choice, crime and fire safety - \$8.5/\$6.0 million), environment (\$11.2/\$8.1 million) and occupational safety (\$11.1/\$7.4 million), highlighting the need to understand the human population in the area of study if we are to attribute economic values to disease emergence due to land use change.

Healthy life is a unique and valuable commodity, which does not fit easily into more traditional economic benefits frameworks. For this reason, several metrics have been developed that can attribute costs to specific subcategories (e.g., infectious diseases). These include fatalities averted/life-years saved (LYS), and several quality of life metrics (QoL e.g., DALY - disability adjusted life years, and QALY - quality adjusted life years). Both DALYs and QALYs incorporate mortality and morbidity components. DALY valuation is the preferred approach here due to its extensive use in previous studies and because a pre-existing framework based on expert weights of various health states is available. A DALY value of 0 equates to perfect health, such that DALYs are already in the form of something to be averted.

Other damages: The economic impact of a disease outbreak often extends beyond losses from morbidity and mortality. SARS claimed 774 lives out

of 8,096 infected, but the majority of the economic burden (perhaps as high as US\$30-50 Billion) resulted from losses in the travel and trade sectors (Keogh-Brown 2008). For each outbreak, depending on its scope (local, national, multi-country), we will gather data on a variety of other indicators that contribute to the overall economic burden of the disease. These may include treatment costs, the number and value of livestock culled in control measures, travel and trade restrictions and other relevant costs.

Linking spatial disease risk models with economic models: We propose two broad methods of linking disease risk maps with the economic modeling in order to 'spatialise' the averted damages estimation at the landscape level with respect to each of the scenarios and scales that we will investigate. First, and most generally, we will investigate the possibility of using average economic costs associated with the emergence of novel diseases and weighting this cost by the relative risk of disease emergence across the landscape as determined by a combination of our correlative spatial analyses and our DF results. The advantage of this method is that average economic costs can be calculated from a smaller sample size of EIDs for which impact data has been adequately estimated, albeit with higher associated uncertainty. Second, and our preferred approach, would be to adequately cost out all EIDs for which we can obtain data, impute missing data to diseases with no data using models, and then establish a framework to predict the economic impacts using predictive covariates. Although more labour intensive, the advantage of this method is the lower uncertainty of the cost estimates for a broader suite of diseases and the potential for us to categorize diseases into groups of roughly equivalent costs, thereby helping to improve resolution on the potential costs of novel EIDs with varying characteristics (see above). At each spatial scale (global for EIDs, regional or local for endemic diseases), we will have parallel economic cost estimates, so the pairing of spatial risk models to economic models will be scale dependent. These methods would allow us to assign avoided damages values to various land use strategies and map these in geographic space, thus linking results to real potential changes in land-use associated with specific development projects.

3. Total Ecosystem Value Modeling

Although the RFA does not call for quantification of the total ecosystem value (TEV), the avoided costs calculated in our model could be incorporated into other models to determine the economic and societal value of converting land (adapted from Barbier, 2009). This will have particular relevance to policy makers in Malaysia and elsewhere in Tropical regions under pressure for development.

$$\max_{c(t)} V = \int_0^{\infty} [R(D) - C(c) - B(A) - O(A)] e^{-rt} dt$$

Where:

R - rent from converted land

C - cost of conversion of intact land to developed land

B - benefit from intact ecosystem
 D - developed land
 c - area of land converted in each period
 A - undeveloped/intact land
 O - avoided cost of disease outbreaks

$O'(A)) < 0, O''(A)) < 0$ as intact land decreases, the cost of an outbreak increases at an increasing rate.

Following the Red List of Ecosystems initiative, of which EHA is a major partner, we operationally define an ecosystem as assemblages of organisms (biotic component) and their associated physical environment (abiotic component). These two components interact within and between them, operating in a physical space. Thus, ecosystems are defined by a degree of uniqueness in composition and processes (involving the biota and the environment) and a spatial boundary. The characteristics that define an ecosystem are temporal and spatially dependent. For example, ecosystems will persist and change over time and vary spatially from water droplets to oceans. For the IDEEAL project, we will consider terms, commonly used in the conservation and ecological literature, such as 'ecological communities', 'habitats', 'biotopes' and 'vegetation types', as operational and explicit units of an ecosystem. The value of damages avoided through the disease regulating services that this project will generate will add to the current state of knowledge on the Total Ecosystem Value of lowland dipterocarp forests on a local (within Sabah) scale, as summarized in the UNDP Biodiversity conservation in multiple use landscapes in Sabah, Malaysia

(http://www.undp.org/content/dam/undp/documents/projects/MYS/00060158/4186_FINAL_Sabah_Prodoc.pdf). Avoided costs of disease outbreaks are not included in this list, but provisioning services such as timber, and other regulating services such as carbon sequestration from primary and secondary forests are valued using market-based approaches. We will aggregate these component values with careful attention to scale and to the definitions of services provided to ensure that the services values do not overlap, and maximize the value from the land through comparison of the value of ecosystem goods and services and value of competing uses.

Model outputs

Model outputs will at first be in the form of statistical tables describing associations between key predictor variables and both disease risk and economic impacts. The statistical associations described within these tables will be projected into geographic space to provide maps of both disease risk at multiple spatial scales depending on the input data (global EID risk, regional endemic disease risk, local risk (including risk map outputs of Deep Forest) as well as maps of potential economic costs associated with the risk of disease emergence due to land-use change. In subsequent stages of the project, maps of potential influence and interest for end user stakeholders will be made interactive and available. For example, maps

will be able to be explored in a similar way that Google Maps or Google Earth can be used to explore physical features of the landscape. We will have the capacity to create these maps at different spatial scales suitable to the data, as well as for the future scenario analyses such that stakeholders will be able to visually and interactively compare the impacts of future policy decisions on both disease risk and economic impacts (including averting damages). These data will all feed directly in to the creation of toolkits for information dissemination, education and behavioral and policy change.

Contingency planning

We have a strong track record in sequestering available data and developing novel datasets for the purposes of project development on EIDs and land use change. We will bring this experience to the fore under the IDEEAL project, which includes extensive experience in overcoming data deficiencies, integrating parallel projects, and outreach and collaboration with relevant stakeholder groups (including local research groups, Sabah Wildlife Department, Palm Oil council etc.) to overcome deficiencies in data acquisition. For example:

- **Deep Forest/DFHC data:** We do not anticipate any delays around accessing DF data as the two projects would become seamlessly integrated under EHA management. Our current timeline indicates that all DF data (1 year of field sampling, and completed DFHC surveys) should be collected by April 2014, with analysis products to follow soon after. The main impediment will thus be how rapidly laboratory analyses are completed and the analysis of DF results in Yr5 of PREDICT. We anticipate that securing the IDEEAL project will yield multiple co-benefits, including an increased capacity to handle and leverage DF data.
- **Economic data** - as part of our ongoing EHA projects investigating economic aspects of disease emergence, we have already commenced canvassing the data requirements for the purposes of determining the health and economic impacts of disease emergence due to land-use change. This is a very time consuming task, but we have already developed a strategy to estimate the workload required to understand these costs. The main requirement will be sufficient research assistance to review the literature and populate our growing database on the impacts (including direct and indirect economic and costs) of infectious diseases. Hence, contingency planning to ameliorate the risk of failing to collate sufficient data would include leveraging our contacts with universities and other bodies that have been a steady supply of research assistance in the form of students and interns in the past.
- **Data to correct for reporting bias** - we have extensive experience with the problem of coping with nuisance variables such as research bias in EID research (e.g., Hotspots, HP3, Deep Forest etc). We anticipate that we will be able to leverage both data and methodology from existing projects to mitigate the risk of having bias overshadow our analyses.
- **New data sources:** We continue to explore and search for novel and emerging data and products relevant to our projects. For example, since the submission of our original IDEEAL project proposal, we

have developed links with potential data suppliers and other researchers that will give us access to or collaborate on developing data products of direct relevance and applicability to the IDEEAL project in the study area (Kinabatangan region, Sabah regional, country level); For example:

- Generic natural vegetation/Forest cover 2010-2011
- Habitat map
- Carbon map
- High resolution species habitat suitability maps (based on distribution models)
- Oil palm age and productivity categories 2010-2011
- Economic data including alternative finance mechanisms and oil palm profit
- Land cover (oil palm, industrial timber plantations, other land cover), mangrove, intact forest, logged forest, severely logged forest, agro-forest areas/regrowth (2010)
- Probability of deforestation (2010)
- Opportunity cost layers
- Ruggedness layer
- Oil palm suitability layer
- Elevation
- Rivers
- Soil
- Catchments
- Political boundaries
- Impervious surface layer (2010)
- Population 2007
- Poverty index 2007

How will the project adapt should the initial data and models not support the underlying development hypothesis? While a push for policy change will always be easier with strong evidence in hand, even in the absence of clear data there remains a strong case arising from prior data and previous case studies linking deforestation to increased risk of certain diseases to invoke and promote the precautionary principal. One of the products that we will provide as part of the IDEEAL project will be a full investigation of this prior data via an extensive scientific review of the current evidence. We will thus be well placed to provide a strong and clear scientific platform to support the long-term objectives of the RFA. If the economic impact argument turns out to be weaker than expected, we anticipate that we will be able to focus more on endemic disease risk, and with the total ecosystem risk model. We will also be able to identify specific activities with higher relative risks that we can combat together with industries to improve their activities.

Generalizability

We anticipate that the results generated from our approach will represent a significant addition to the state of the knowledge on the value of a specific ecosystem's disease regulating services. The tools that we develop above will have the potential for widespread adoption,

providing it is correlated to local conditions. We will therefore develop a checklist to accompany the tools that will contain information on how to tailor the models to different regions and different types of ecosystems based on our recent research on the spatial drivers of emerging diseases. Our analyses are adaptable to different landscapes and scales, and the checklists will enumerate the necessary steps for other scientists and researchers to replicate these analyses under different environmental and political conditions. The Deep Forest Liaison will assume responsibility for checklist development in cooperation with the Center of Excellence Director and Policy Lead. For example, we have analyzed all previous 450 EID events to assess the relative role of land use change in driving their emergence, and how this varies in importance in different regions globally. These data were published in our paper on biodiversity and health in *Nature* (Keesing et al., 2010) and will be made available with the tool. Similarly, for our models to have relevance to other regions (e.g. South America, Africa), data will be required on how human contact and pathogen diversity patterns vary with land use change in these regions. Data from DEEP FOREST Uganda and DEEP FOREST Brazil, as well as our IDRC-funded project in Southern Brazil, will be available to make these correlations.

Gender Specification

Men and women experience the risks and costs of infectious diseases differently. This likely has specific relevance to land use change, especially with regards to extractive industries, with manual labor health costs, and the economic benefits of work largely falling to men and social and environmental costs falling to women. In many regions, gender also determines one's access to resources, particularly land. The DEEP FOREST Human Contact (DFHC) surveys are providing information we can use to assess gender specific risks and costs of disease along a land-use change gradient. These surveys were designed as part of a collaborative project between EPT PREDICT and PREVENT and are being rolled out at our DEEP FOREST sites in Sabah, Brazil and (in the first year of this project) in Uganda. In Sabah, we hypothesize that the specific costs of disease to individuals, as well as to the economy, will be gender-specific. For example, although men and women often work in the same places, women are often concentrated in distinct sectors or are responsible for distinct activities exposing them to different risks compared to men. Division of labor, recreational activities and occupations related to animals (hunting, butchering, caring for domestic animals, etc.) are also influenced by social factors. Similarly, men are often engaged in manual labor activities in areas away from urban centers. For example, in Sabah there is a strong bias towards male workers in oil palm plantations, which may expose them to specific hazards associated with this form of land-use change.

Our working hypothesis will be that men and women have different rates of exposure to diseases that may be attributable to gender-specific roles in society. To address gender issues effectively, we will solicit the direct participation of stakeholders including women to

clarify gender roles and their implications in project activities. Quantitative data collected from the contact surveys will be disaggregated by gender to highlight the differences in traditional roles and learned behaviors of men versus women based on gender attributes. Gender-specific analyses will also take into account other variables including income, race, ethnicity, and other social characteristics, as well as explicitly address the specific differences between young girls and boys, and adult women and men. To assess the effect of both gender and age on relative risk of infectious disease emergence, the following sub-groups have been chosen to survey as part of the DEEP FOREST project: Adult women (age 18 and older); Adult men (age 18 and older); Boys (age 10-14); Girls (age 10-14). We will liaise closely with the USAID EPT PREVENT team that is conducting this work collaboratively with EHA in Borneo.

Using gender-relevant information from the DEEP FOREST surveys, we will examine: Knowledge, beliefs, and perceptions; what beliefs and perceptions shape gender identities and norms; human practices and distribution of labor - what are the gender roles that dictate the activities in which men and women participate; how men and women engage in different activities relevant to land use change and rates of exposure to different animals; and time and space - how women and men spend their time. Understanding the role of gender in disease risks and costs will be fundamental in planning the prevention, detection and treatment of illness.

In addition to the gender specified data collected from the human contact surveys, additional data will be collected from stakeholders and used to inform the gender-sensitive health impacts toolkit to be produced. Additional data may include: local legal and cultural frameworks with regard to land ownership, community leadership; possible impact on local gender relations; barriers and facilitators of gender sensitive data collection; and levels of female participation in decision-making structures. Additional data collection methods may include community mapping, stakeholder analysis, focus groups, and key informant interviews with women, local government, and representatives from the private industry. The tool will list high-risk activities and behaviors with unique attention to the specific disease exposure risks for women, and provide practical 'how-to' methodology to operationalize gender sensitive risk reduction strategies on a policy and individual level. The tool will also include a stakeholder assessment tool so women will know whom to contact, and an organizational chart for developing a local media campaign, and instructions on how to lead interactive community health education sessions. The Center of Excellence Director and Policy Lead will assume primary responsibility in drafting this tool, and the Center of Excellence Director and the DCoP will be primarily responsible for finalizing the tool.

Outreach Strategy for Communicating Model Outputs to Government and Local Stakeholders

We will directly engage with policy makers and private sector partners involved in land utilization via several regular meetings at the Center for Development and Health and Sabah Wildlife Department that will involve specific representatives government agencies responsible for development such as the Director General from the Sabah Economic and Development and Investment Authority (SEDIA), which is leading the Sabah Development Corridor initiative to develop agriculture and industry in Sabah; The Sabah Economic Ministry of Agriculture Development and Food Industry; Ministry of Rural and Entrepreneurial Development; and the Director of the Malaysian Palm Oil Council (see letter of support from MPOC). Sabah Wildlife Department Director Laurentius Ambu has received agreement from SEDIA leadership to engage with the IDEEAL project. We see SEDIA as a key government partner for IDEEAL, and we will formalize and strengthen our engagement with SEDIA in the first year of the project. Sabah Wildlife Department will organize and host an annual meeting on Conservation and Land Development, which will be attended by our Chief of Party, Deputy Chief of Party, Policy Lead, and Stakeholder Coordination Lead as well as government officials from Peninsular Malaysia such as the Director General of the Department of Veterinary Services, the DG of PERHLITAN, and the DG of the Ministry of Health; creating a broader forum for outreach to government agencies responsible for land use change in Malaysia. The quarterly meetings at CDH and the annual meeting at SWD will provide an opportunity for us to initially hear directly from policy-makers about what information they need to help with their planning, and for us ultimately to provide model outputs and toolkits to them so that they can use them for state planning activities. Lastly, we will link in with a project currently being conducted by our IDEEAL partners at Hutan, WWF, and other local NGOs and Sabah government partners called the Spatial Planning For Conservation and Sustainable Development project, which includes a rapid assessment using existing public data followed by an in-depth on the ground study for 2-3 years aiming to develop more fine-scale spatial data that will incorporate land cover, habitat, and various ecosystem services. We have an existing agreement with the lead on this spatial analysis project to be able to co-analyze data with our economic modeling and other activities that fall under the IDEEAL proposal. We will make these results available to State government partners through aforementioned meetings so that policy makers have analyses available. In this way, we will be in direct communication with government planning councils who are relying on the analyses that will come from this and the IDEEAL project to inform land development strategies.

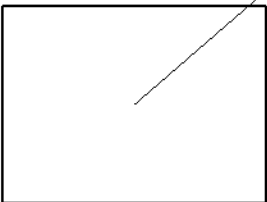

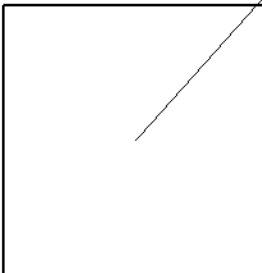
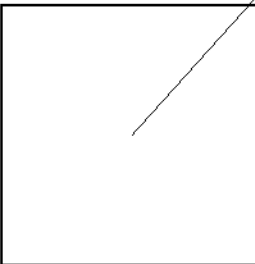
Stakeholder engagement

We will develop a stakeholder engagement program around the principle that decisions on land use management that minimize EID spillover risk can contribute to widely distributed health savings. These occur due to averted disease control and containment costs; avoided costs of

individual health care; avoided costs to livestock health and productivity, trade and tourism status, financial markets stability; and the preservation of individual, gender-sensitive livelihoods and earnings potential. Our engagement will build upon 1) existing partnerships established in Malaysia (and Sabah in particular) through EHA's work with our DEEP FOREST project, the USAID EPT PREDICT program, and our 11-year partnership with the Malaysian Govt. and other agencies; 2) the organizations we have identified and contacted for the purposes of developing this proposal, and 3) organizations working with the above agencies and partners on other related programs. Stakeholders will include government agencies (both Sabah State and Federal) for wildlife, forestry, agriculture, development, tourism, public health, and social development. Para-governmental and Non-governmental organizational stakeholders will include Yayasan Sabah (Sabah Foundation), the Malaysian Palm Oil Council, Forest Research Centre Sabah, Sabah Women's Action-Resource Group, and the Sabah Tourism Association, The LEAF (Lowering Emissions in Asia's Forests) Program and its relevant partners such as The Centre for People and Forests. Additional private sector stakeholders will be identified by existing partners, their industry organizations (such as above) and those working in communities surrounding project activity sites (e.g. tourism companies, logging companies, plantation managers and owners, livestock and small-holder farmers, health clinics, shop owners, restaurant owners, lodging and logistics, etc.). University stakeholders will include Universiti Malaysia Sabah and the members of the Malaysia One Health University Network (MYOHUN).

The goal of our stakeholder engagement will be (in both phases of the project) to improve relevant data (knowledge) acquisition and to establish target audiences and users of the project so that we can disseminate data and findings, models, tool kits and handbooks, organizational platforms, and other deliverables. Early in Phase 1 of the project, stakeholders will be identified, briefed on project goals and invited to participate. In partnership with the Sabah Wildlife Department, following the release of the RFI, we have already held an initial informational meeting to identify interested parties and discuss the concept of the center of excellence. This has allowed us to better understand the stakeholder landscape and to identify potential sources of data for use in our modeling activities. If funded, we will organize our first formal meeting(s) of stakeholders within 4 months of project initiation, and schedule regular (quarterly) meetings and sub-group meetings out of that initial gathering. Stakeholder identification and inclusion will continue through the life of the project. We will use facilities at the Universiti Malaysia, Sabah to arrange and hold stakeholder meetings (see Center of Excellence).

Table of partner organizations in Sabah

Organization Name	Role	Key contacts / names
Sabah Wildlife Department	Provide data on biodiversity, land use, DEEP FOREST	
Department of Agriculture	Data on land conversion, crop production	Director
Sabah Forestry Department	Data on Forest cover and historically cleared land	Director
Sabah Parks	Data on protected land	Director
Yayasan Sabah	Timber concession data and educational outreach expertise	
Malaysian Palm Oil Council	Coalition of large-scale Oil Palm Plantations	
Malaysia Palm Oil Board	Malaysian Govt. Agency overseeing Oil Palm industry	Director
School of Business and Economics, University of Malaysia, Sabah	Center for Development and Health	
SEDIA (Sabah	State agency	Director

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Economic and Development Investment Authority)	responsible for development and economic growth		(b)(6)
World Wildlife Fund - Malaysia	Conservation NGO		(b)(6)
HUTAN	Conservation and social responsibility NGO		(b)(6)
Danau Girang Field Centre (Sabah Wildlife Department and Cardiff University)	Provide data on biodiversity, land use, forest cover and conservation	Danau Girang Field Centre, Sabah, Malaysia	(b)(6)
		Danau Girang Field Centre, Sabah, Malaysia	

Public-Private partnerships

We plan to develop a powerful public-private partnership that produces multiple initiatives of mutual benefit - whereby industry advises our model building on the details of land-use change projects, and we advise industry and our government agency and other private partners on risk of disease outbreaks and emergence. EHA has extensive experience working in exactly this role in the region and we have developed working or growing relationships with government authorities, academia, the private sector (e.g. the Malaysian Palm Oil Council <http://www.mpoc.org.my/>, and the relevant regulatory/watch-dog groups, such as the Roundtable on Sustainable Palm Oil <http://www.rspo.org/>) and local government agencies such as the Sabah Department of Health and the new Sabah Wildlife Department Health Unit, which EHA helped build in 2012. We will leverage these partnerships in both Phase 1 and Phase 2 of the project and have garnered letters of support from our main partners.

Collaborating with the private sector is essential to any initiative that hopes to influence policy and community involvement. It is particularly important in this project because government and industry partners are both involved in the activities that drive EIDs and also

suffer from their impacts. Engaging industry partners such as the palm oil sector from the beginning will allow us to draw on their expertise and minimize potential conflicts as new activities and policies evolve. EcoHealth Alliance, in partnership with Chatham House and USAID, recently facilitated a roundtable discussion with key extractive industry stakeholders to present the current state of science linking natural resource industries and infectious disease emergence. We found that industry representatives were highly receptive to our characterization of disease emergence scenarios, in particular where they create health threats to their worker, and negative public perception of the industry. Similarly, our experience consulting for other global industry leaders including the food sector (e.g. Cargill, Mars, PepsiCo), the agricultural sector (e.g. Bayer Crop Science) and consultancy services (e.g. McKinsey & Co.) demonstrates that industry is a willing partner in initiatives that produce a fair evaluation of risk, particularly when we can advise companies directly on health threats to their workers, or threats to the public perception about their business. We have used these experiences to develop our engagement strategy. For this project, we will aim to garner financial support and in-kind contributions from the private sector to assist in the longterm sustainability of the project outreach. At EHA, our approach to this has been to build a relationship with the companies, trade groups and other private sector institutions of relevance, and assist them in developing their corporate sustainability programs in a way that benefits people on-the-ground in regions where they have active production facilities. This is the approach we have used previous with Bayer, PepsiCo, Exxon, Cargill and others, and our initial discussions with Malaysian Palm Oil Council have been encouraging about their financial support of projects that would fit under the IDEEAL program.

Utilizing the Center of Excellence in Sabah (discussed below) we will host regular roundtable events for key players in the region from major commercial agricultural industries such as palm oil (the Malaysian Oil Palm Council, IOI Corp, TH Group, Kwantas Corp and Selangor Agriculture Development Board) rubber, (the Rubber Industry Board, Rubber Settlement Scheme) and cocoa (Malaysian Cocoa Board, Tech Guan Cocoa company). At these meetings, we will leverage relationships with our current partners including Mars, Cargill, PepsiCo and others that are active in Southeast Asia to develop projects that incorporate data on EID threats to their workers, and on their activities in the region. We will mutually develop plans with private partners to trial out our toolkits, and develop small-scale on-the-ground tests of our approaches. We envisage that this will include working with data on population exposure to wildlife at sites where individual partner companies are actively working and developing. These partnerships will help ensure long-term sustainability of both data collection, research, and implementation of best practices, and the continued development or the proposed center of excellence. We will also investigate in collaboration with key government and industry stakeholders the potential for leveraging other market-based initiatives that could strengthen the protection of

carbon stocks, biodiversity, health and other social objectives (e.g., REDD+).

Center for Development and Health (CDH)

We will develop a center of excellence for economic analysis of land use change and health outcomes. The Center for Development and Health (CDH) will be an international resource for the science and policy of land use change and the cost of disease emergence and will be based at the School of Business and Economics at the Universiti Malaysia Sabah (UMS). The CDH will be a forum for a state-of-the-art multi-disciplinary think tank composed of experts from the fields of economics, disease ecology, agriculture, forestry, wildlife conservation, and health as well as industry experts involved in land development in Sabah. Scientific experts and policy makers will hold roundtable discussions with industry leaders and discuss project findings and current land use practices in order to create guidelines on how to reduce the risks of disease emergence as a consequence of land use change and development.

By generating robust quantitative models of the cost of disease emergence and interventions and serving as a repository for data related to development and land use change, the Center will aim to establish a reputation for being an international leader on this subject. In order to translate the findings of this project into actionable policy, the CDH will develop communication and outreach strategies, including a website and social media, and we will work with local public and private partners to disseminate project findings to stakeholders in Sabah. We will create long-term sustainability by providing mechanisms for advanced multi-disciplinary training at UMS by offering short courses and seminars to graduate students and professionals related on the subjects of sustainable land use, conservation, disease ecology, economics, and global health.

Phase one of this project will entail establishing the center at UMS and identifying local stakeholders who will be engaged in center activities. On May 14, 2013 EcoHealth Alliance and Sabah Wildlife Department convened a meeting of potential stakeholders in Kota Kinabalu (see table of potential stakeholders). In attendance were representatives from Sabah state government such as the Department of Veterinary Services, the Sabah Wildlife Department, and the Department of Health. Also in attendance were members of academia and local NGOs including the University of Malaysia, Sabah School of Business and Economics, HUTAN, WWF Malaysia, LEAP (Land Empowerment, Animals, People) and the Danau Girang Field Center. We are currently working with the Dean and several faculty members of the Business school to link the modeling team from EcoHealth Alliance with faculty to construct economic models based on a scenarios approach of disease emergence. We will also work with UMS and Sabah Wildlife Department to identify and regularly convene relevant stakeholders from Sabah who will participate in the meetings held at the CDH. We have also engaged the Malaysian Palm Oil Council and SEDIA (Sabah Economic and Development Investment Authority) to ensure that we include private sector and business interests that are driving land use change in

Sabah. Phase 1 will also include data acquisition from available government and academic sources as well as the USAID PREDICT DEEP FOREST project. We have begun to compile a list of available data and will continue to identify data sources during the first few months of this program. Graduate students from the Business school will be identified to participate in model development.

Phase II will include the establishment of regular meetings at the CDH for stakeholders to synthesize project findings and generate public and policy outreach material. We expect that the center will grow over the 3-year timeline to include scientists and other experts from Sabah and the international community who wish to learn spatial analysis or economic modeling via short courses and student projects. The Center will be open to both male and female students and community members from Sabah. We will engage graduate students from UMS and staff from SWD to train in the Center in order to develop local capacity and create long-term sustainability for the Center's activities.

Our proposed outreach will build on EHA's extensive experience producing policy-relevant analyses aimed at guidelines on best practice, as well as innovative tools that can be used in capacity-building programs and training. For this project, we will introduce innovative tools to the private sector in Malaysia which will include a risk assessment tool to audit industry practices with respect to the risk of negative health outcomes. The tools in this Scientific Translation Communications toolkit will give detailed instructions to private sector Environment, Health and Safety (EHS) Officers to ensure that the industry is aware of emerging infectious disease hazards in their facility or surrounding environment. It will then recommend specific mitigation and control strategies should the industry not already have specific measures in place. We will also aim to provide supplemental information to the International Finance Corporation's (IFC) guidelines on health impact assessments (HIA). Additional tools include stakeholder assessment tools to identify outcomes and responsible parties within stakeholder organizations will also be provided and media strategy organizational charts for effective engagement of television, print, and radio media. The Center of Excellence Director and Social Science Lead will take the lead in developing this toolkit.

Included in the gender-sensitive health impacts toolkit, we will identify opportunities to promote women's leadership, communication propensity and community/familial participation in mitigating disease risks (see description in Gender Sensitivity section above). We will produce printed and web-based materials and other educational outreach material on infectious disease risk in collaboration with the Malaysian Ministry of Health to be distributed to private partners, government agencies and other institutions. We will organize workshops for worker populations drawing on expertise from EHA, public

entities (Department of Health) and private industries. The aim of these will be to improve understanding of and access to healthcare services and strengthen the skillset of the healthcare workforce. These workshops and interactions will provide iterative opportunities to refine and strengthen the toolkit throughout the life of the project, as well as to identify additional audiences that will benefit from the toolkit.

Data from the DFHC survey will provide private partners with information on relative risk of outbreaks and disease emergence, as well as cost of infection in men, women and children. Data from this survey could be used by private partners in collaboration with the Department of Health to inform the design of interventions to reduce the transmission of zoonoses by 1) providing standard estimates of rates of human contact with different animal species, 2) identifying populations and sub-groups with particularly high rates of contact, 3) determining which human activities are associated with particularly high rates of contact and 4) specifying other environmental and social issues that place people at increased risk of disease transmission.

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Section B - Proposed Outcomes/Results

The overall project outcome will be the development of an evidence-based model that values emerging infectious disease avoidance as a function of land use, and application of this model in real-world land use decision contexts to reduce risk of emerging infectious diseases and to mitigate climate change toward climate-resistant low emissions development. To achieve this, EcoHealth Alliance and its partners will generate two Intermediate Results and five associated Sub-Intermediate Results:

Intermediate results

Intermediate Result 1: Availability of field-trialed quantitative models capturing gender sensitive EID-related health savings as a function of land use. This result will be generated through two sub-intermediate results:

Sub-IR 1.1: Data gathering required to run the quantitative model

Sub-IR 1.2: Development of quantitative algorithm assessing EID spillover likelihood and cost as function of land use.

Intermediate Result 2: Improved multi-channel availability of EID-focused quantitative resources amongst civil society advocates and government policy makers. This result will be generated through three sub-intermediate results:

Sub-IR: 2.1. Establishment of a center of excellence (the Center for Development and Health (CDH)) for additional research, analysis, and cross-disciplinary partnerships

Sub-IR 2.2: Development of a gender sensitive tool kit for communicating the health impacts of differing land use options

Sub-IR 2.3: Improved outreach and communication of translated, quantitative resources to policy makers and civil society advocates.

The full objectives and sub-objectives, activities, measurable outcome or indicator, time frame, and responsible party are listed on the "Monitoring and Evaluation" table in Annex A.

At the end of the project period, we will have produced four main deliverables that satisfy the proposed IRs and sub-IRs (see Annex A). They are: 1) quantitative models of land use change and disease

emergence to use in local and regional decision making and that can be generalized or modified for other applications (described in Section A of Narrative above, sub-IR 1.1 and sub-IR 1.2), 2) the Center for Development and Health at UMS to serve as a permanent Center of Excellence and platform for continued research and training, stakeholder engagement, and as a regional and national source of information on the economic relationships of land use change, disease emergence, and subject area gender-related issues (sub-IR 2.1), 3) gender-sensitive health impacts toolkits for promoting best practice approaches and translate project findings to ensure gender equality benefits (sub-IR 2.2), and 4) scientific translation communications toolkits that translate research and modeling results to be useful for policy makers, private companies and government organizations, and civil society stakeholders (sub-IR 2.3).

The final products of the modeling components have been previously described in Section A of the Narrative.

The creation of the Center for Development and Health (CDH) at UMS will sustain the Project's impacts beyond the project period. The CDH will provide an environment for experts to continually update data, refine models, and sustainably understand the impact of land use change on economic parameters. The Center operationalizes concepts developed by EcoHealth Alliance and its partners under the One Health approach, bringing together a multidisciplinary team to discover new information about the intersection of human and animal health, disease risk assessment, and ecology. By creating the Center within the Business School at UMS, we promote collaboration and innovation across disciplines and the formation of effective non-traditional partnerships.

The team at EcoHealth Alliance will work with the Center for Development and Health to develop communications toolkits and strategies for disseminating scientific findings to policymakers and key partners in industry, government and the public. The aim of these strategies is to translate the our scientific analyses into actionable policies and practices for decision makers so that they can more formally integrate infectious disease and economic considerations into land use change planning and decision-making. One example of a near-term opportunity that our team will take if this proposal is successful, is to provide input to the Sabah Economic Development and Investment Authority which has developed a blueprint for development called the Sabah Development Corridor (SDC) - coordinated multi-sectoral development roadmap through 2025. SEDIA has made a commitment to responsible development, and has called for public input into the SDC. We would have an opportunity during the first year of this program, to provide input to SEDIA for the SDC regarding considerations of the cost of health impacts of land alteration. As we develop our models, we would continue to provide information to SEDIA regarding the costs associated with potential disease outbreaks.

In addition to working with Sabah government, we will develop outreach materials for the public, focusing on gender-specific health and economic impacts of land conversion relevant to local communities where land use change activities are planned or are currently underway. Our local partners such as SWD, UMS, LEAP (Land Empowerment, Animals, People), and HUTAN have a long history of working with local communities on conservation and social welfare issues, and we will leverage their expertise and relationships with local communities to implement educational outreach strategies. This outreach strategy will significantly enhance the scientific knowledge base around ecosystem services valuation of benefits derived from intact ecosystems, especially with regard to disease risk assessment. Thus, the generation of knowledge in this area will allow for communication of evidence-based findings and actions. The policy and public outreach materials generated through the Center for Development and Health will be generalizable and adaptable to Malaysia-wide or regional policy considerations related to land use decisions.

The gender sensitive health impacts toolkit will include practical "how-to" methodologies, tools, and guides designed to facilitate the integration of gender issues into health policies and programs. It is designed for government policymakers, private industry, program managers, and community health workers to explore different strategies, media, and messages about gender and to communicate the EID-related human health impacts and economic implications of potential land use decisions.

The toolkit will provide a roadmap for translating the results of the quantitative model into actionable practices and policies. It will be designed to communicate disease risk assessment results effectively, with specific attention to unique considerations of women and their disease exposure risks. It will enable such diverse groups as civil society advocates, private industry, and government policymakers, to operationalize gender sensitive policy communication strategies. Finally, because mainstreaming gender falls under the third Millennium Goal of gender equality, and aligns with USAID goals and policies, the toolkit will highlight the importance of incorporating women into leadership and planning capacities related to land use change decisions.

The scientific translation communications toolkits for scientific findings will disseminate and translate scientific findings into actionable policies and practices for decision makers to more formally integrate infectious disease and economic considerations into land use change planning and decision-making. This outreach strategy will tie into the generation of the findings from the models, which will drastically enhance the scientific knowledge base around ecosystem services valuation of benefits derived from intact ecosystems, especially with regard to disease risk assessment. Thus, the generation of knowledge in this area will allow for communication of evidence-based findings and actions. Toolkits and/or outreach materials will be tailored to the various stakeholder audiences described above in Section A of the Narrative. Tools will also be

generalized and adapted for integration in landscape land use decisions regionally and globally.

In sum,

1. M&E 1.1.6, Generalizability Checklist: Our analyses are adaptable to different landscapes and scales, and the checklists will enumerate the necessary steps for other scientists and researchers to replicate these analyses under different environmental and political conditions.

- a. Primary Responsible: Deep Forest Liaison
- b. Secondary: Center of Excellence Director and Policy Lead

2. M&E 2.2 Gender Sensitive Toolkit—This tool will list high-risk activities and behaviors with unique attention to the specific disease exposure risks for women, and provide practical 'how-to' methodology to operationalize gender sensitive risk reduction strategies on a policy and individual level. The tool will include a stakeholder assessment tool so women will know whom to contact, and an organizational chart for developing a local media campaign, and instructions on how to lead interactive community health education sessions.

- a. Drafting
 - i. Primary: Center of Excellence Director and Social Science Lead,
 - ii. Secondary: Economic Modelers & Policy Lead
- b. Finalized Toolkit:
 - i. Center of Excellence Director and DCOP
 - ii. Secondary: Social Science Lead and Policy Lead

3. M&E 2.3.2 Scientific Translation Communications Toolkit for scientific findings—The goal of this toolkit is to give policy makers the ability to make evidence based decisions regarding optimal land use regionally and globally. This involves the explanation of the model findings to a non-scientific audience and enumerates related policy implication that would be necessary to achieve development goals and will include:

- i. Stakeholder assessment tools to identify outcomes and responsible parties within stakeholder organizations will also be provided.
- ii. Provide supplemental information to the International Finance Corporation's (IFC) guidelines on health impact assessments (HIA).
- iii. Template PowerPoint presentations for policy-makers to communicate emerging disease hazards and mitigation and control strategies to industry (Environmental Health and Safety Officers) and relevant constituents.
- iv. Media strategy organizational charts for effective engagement of television, print, and radio media.
- b. Responsible party—Primary: Center of Excellence Director (AOE associate) Social Science Lead

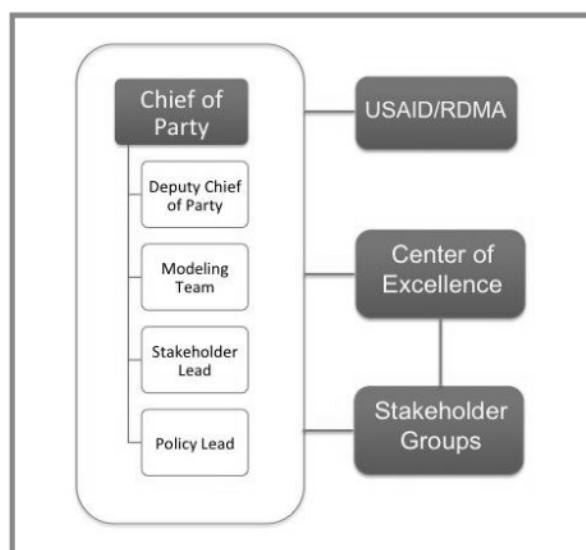
c. Responsible party-Secondary: Economic Modelers,
Stakeholder Coordinator Lead, Policy Lead

Section C - Management Plan and Key Personnel

Management Plan

EcoHealth Alliance, by charter, is structured as an alliance of partner organizations and agencies collaborating to achieve multi-disciplinary and mutually agreed upon outcome. As such, EHA's standard operational approaches are particularly well suited for managing this program. To significantly reduce both start-up time and project costs, EHA will assign current key staff and utilize existing partnerships in the region to manage and implement the project. During the course of the project, additional local staff and partners will be identified and added with the goal of a local, sustainable center of excellence being functional by the end of the project.

Project oversight and administrative management (including sub-awards or sub-contracts) will be provided by the EHA home office in New York and oversight and implementation of Malaysia-based activities will be managed by the Deputy Chief of Party and their team based in Kuala Lumpur and Kota Kinabalu, Malaysia. As the project will be based on a Cooperative Agreement, we envision that USAID/RDMA would also serve in providing advice and guidance the project oversight and management team.



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To facilitate this exchange of ideas, we are proposing a minimum of 1) 6-monthly in-person meetings between key project personnel and partners and USAID/RDMA staff to be held either in Bangkok or in Kota Kinabalu, 2) quarterly written reports to USAID/RDMA, and 3) monthly conference calls. These communication vehicles will also serve to augment monitoring and evaluation.

Sub-recipient arrangements: Two sub-recipients are anticipated as key partners on this project, the Sabah Wildlife Department and the School of Business and Economics at the Universiti of Malaysia Sabah. Details of capacity and roles are provided in ANNEX C. Support will be provided for expenses such as student stipends, conducting workshops and meetings, production of deliverables such as the toolkits and other informational products, and no project funds will be used to pay salaries of Malaysian government employees at these institutions. All collaboration on the project will be established by

Memoranda of Understanding signed by EHA and the relevant legal authority for each of these parties and contracts will be signed for specific activities and duties. Contracts will be consistent with all US Regulations as consistent with EHA's current protocols used for the USAID EPT program.

Proposed Key Personnel and their project duties are listed below. Resumes and references are provided in Annex B and details on activities and time allocations are provided in Annex C.

Chief of Party (CoP):

Project Responsibilities (Job Description): The CoP will provide overall management and coordination of program vision, direction and functional successes; and is responsible for the administration and integration of the entire program. To guarantee fiscal responsibility and responsiveness to the needs of the program, the CoP will review and approve budgets to ensure they are in line with the work proposed, consistent with applicable rules and guidelines and committing sufficient effort for project participants. The CoP will conduct periodic reviews with the Administrative Coordinator to assess ongoing budgetary needs and will call and lead meetings with the Senior Management Team (CoP, Deputy CoP, Stakeholder and Partners Lead, Policy Lead, and Administrative Coordinator) to assess the program's productivity and accomplishments with respect to its goals. He/she will request and conduct site visits as needed. The CoP will also directly oversee the Modeling Team and be responsible for ensuring modeling activities and products are integrated with other project components.

Deputy Chief of Party (DCoP):

Project Responsibilities (Job Description): The day-to-day management of the project in Malaysia will be the overall responsibility of the DCoP, performed with regular communications and assistance of the other key personnel, the administrative staff from the home office, the Center of Excellence in Sabah and other key partners. The DCoP will serve as the most frequent Point of Contact for USAID RDMA for programmatic matters, the Center of Excellence and key partners in Malaysia. The DCoP will divide his/her time between Sabah, peninsula Malaysia and Bangkok as needed to interact with partners and supervise activities.

Stakeholder Coordination Lead (SCL):

Project Responsibilities (Job Description): The SCL will work with Malaysian National and State government authorities and private sector parties to identify, engage and maintain working relationships with relevant stakeholders throughout the life of the project. The SCL will ensure high level integration of project activities and products with stakeholder and partner needs and priorities, help develop and implement workshops with the DCOP and the Center for Development and Health, provide consistency in approaches across the project, and

provide the oversight for sustainable transition of relevant activities to partners by the end of the project.

Policy Leader (PL):

Project Responsibilities (Job Description): The PL will be responsible for identifying opportunities and strategies for program outcomes to serve as guidance for policy and best practices among government and non-governmental stakeholders in Sabah, Malaysia, and regionally as appropriate. The PL will meet with high-level government agency representatives to share finding and discuss opportunities for policy engagement. The PL will also share findings and policy opportunities with international and inter-governmental organizations and agencies such as the World Bank, WHO, FAO, OIE, CGIAR, and bi-lateral aid agencies

Proposed Key Technical Personnel

Center of Excellence Director (CED):

Project Responsibilities (Job Description): The CED will work with Senior Personnel and local partners to establish the Center for Development and Health at UMS. The CED will also facilitate workshops and mentor graduate students working under this project.

Center of Excellence Associate (CEA):

Project Responsibilities (Job Description): The CEA will work with the CED to develop workshops and facilitate stakeholder meetings at the university. The CEA will also mentor graduate students from the business school and staff from partner agencies that work under this project.

Sabah Wildlife Department Chief Liaison to IDEEAL (SWDCL):

Project Responsibilities (Job Description): The SWDCL will provide input and insight on biodiversity and land use as well as work with CED and CEA to facilitate workshops and training as well as maintaining alliances amongst a diverse range of stakeholders and participate in discussions.

Economic Modeler (EM):

Project Responsibilities (Job Description): The EM will work to develop the avoided costs model and participate in the associated data collection. The EM will work closely with the other Research Scientists to ensure the successful integration of other model components, and will document the processes and information needed to adapt the model to other contexts and ensure generalizability of the tool.

Social Science Lead (SSL):

Project Responsibilities (Job Description): The SSL will work closely with the DCOP to assist in the supervision of the data collection, and connection of DEEP FOREST project data to the quantitative tools. The SSL will work towards the integration of gender sensitive data for the

models, and assist in the interpretation of the differential disease risks to men and women based on their daily activities.

DEEP FOREST Liaison (DFL):

Project Responsibilities (Job Description): The DFL will oversee the execution of the modeling strategy (lead the modeling team), collaborating with the other scientists and actively communicating and discussing the model developments with the COP. The DFL will also draw on the project DEEP FOREST data and other data sources to assist with scenario building to project disease risks for different levels of land use change, and clearly communicate these findings to key stakeholders. The modeling team will work closely and iteratively with the COP and DCOP under their guidance and direction -- in frequent contact with the staff and students of the Center of Excellence, the PL and the SCL.

Senior Modeler (SM):

Project Responsibilities (Job Description): The SM will manage the disease and land cover geodatabases with particular attention to the assurance of data quality. The development of the statistical framework, and the use of Bayesian statistics to assess the likelihood of disease outbreak given differing levels of deforestation will be the SM's primary responsibility.

Program Coordinator for Health and Policy (PCHP):

Project Responsibilities (Job Description): The PCHP will be actively involved in tracing the policy implications of the scientific findings. The PCHP will provide programmatic support for the project's health communication and policy outreach activities, including considerations around the social determinants of health as well as the formation of collaborations with non-traditional partners. The PCHP will also provide program evaluation expertise to assist in tracking achievement of project objectives.

ANNEX A: Implementation Work Plan, Monitoring and Evaluation plan and Time Line

EcoHealth will use the proposed (and negotiated) monitoring and evaluation (M&E) plan to provide the structure for project management oversight and determining adherence to timelines for activities and deliverables. In designing the M&E plan for this project, EHA and partners based in Sabah, Malaysia have combined relevant USAID agency indicators with our experience working on disease and economic modeling projects, as well as long-term stakeholder engagement in the state, to develop project indicators that quantitatively (employing numerical indicators, as well as binary classifications where appropriate) demonstrate how the proposed work plan will contribute to the two intermediate results, five sub-intermediate results, and the overall project outcome. The proposed performance-based M&E plan aims to be consistent with the evaluation requirement features outlined in the USAID Evaluation Policy. EHA will deliver a draft Performance Management Plan within sixty days following the award, during which it will work with USAID/RDMA to further refine the proposed M&E plan. The M&E plan will be revised as necessary with RDMA through the annual work plan development to ensure consistency with any changes to standard indicators.

EcoHealth Alliance will oversee M&E activities for the project. Monitoring systems will be established that enable regular tracking of indicators and will include compilation of information from quarterly reports of project activities and employment of project management systems to pair activities and indicators with timelines. Each activity will also be assigned a lead point of contact responsible for tracking the progress of the activity and helping to proactively identify and respond to any situations that could cause potential delays in meeting planned time frames. The project's Primary Investigators will also conduct monthly meetings with project personnel for updates on the progress of each activity. In addition, EcoHealth Alliance will submit quarterly reports to RDMA, and will provide verbal updates at semi-annual meetings at RDMA headquarters or at facility site visits. These opportunities will assist in providing additional assessment of progress towards meeting intermediary and overall objectives. All evaluation data generated from the project will be provided to USAID monitoring and evaluation systems as directed by the Agreement Officer's Representative (AOR).

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
Structure project and establish management capacity	0.1 Secure core management staff	All Management staff hired and assigned to duty	EHA	X											
	0.2 Identify and secure core administrative staff	All Administrative staff hired and assigned to duty	EHA	X											
	0.3 Finalize and establish approved monitoring and evaluation plan with RDMA	Monitoring and evaluation plan approved and finalized	EHA	X											
	0.4 Set up of financial management systems	Accounts created with mechanisms for tracking expenditures		X											
	0.5 Quarterly reporting of overall program activities	On-time submission of reports	EHA	X	X	X	X	X	X	X	X	X	X	X	X
	0.6 Semi-annual review of program activities and progress at RDMA or during site visits to Sabah	Completion at RDMA headquarters or site visit	RDM A and EHA		X		X	X		X		X			X
Sub-IR 1.2: Required	1.2.1 Meet with relevant partners to identify data	Meeting held; list of available data assembled	EHA	X	X	X	X								

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
data gathered to run the quantitative model	availability														
	1.2.2 Obtain available temporal, geospatial data of land use/land-cover and disease data	a. Temporal, geospatial land-use/land-cover data obtained	EHA	X	X	X	X								
		b. Disease data obtained	EHA	X	X	X	X								
	1.2.3 Obtain available demographic and land planning data from relevant government sources and partners	Available demographic and land planning data obtained	EHA			X	X								
	1.2.4 Obtain available economic parameter/indicator data	Available economic parameter/indicator data obtained	EHA	X	X	X	X								
	1.2.5 Identify and obtain data to correct for reporting bias	Data to correct for reporting bias identified and obtained	EHA	X	X	X	X								
	1.2.6 Obtain new data, including DEEP FOREST human contact and disease data	New data obtained	EHA	X	X	X	X								
	1.2.7 Ensure gender-specified data is included in activities 1.2.2-1.2.6	Gender-specified data is included	EHA	X	X	X	X								

IDEEAL Work Plan and Time Line				Time line																
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4	Y 4 Q 1	Y 4 Q 2	Y 4 Q 3	Y 4 Q 4	
Sub-IR 1.1: Development of quantitative algorithm assessing EID spillover likelihood and cost as function of land use	1.1.1 Estimate the likelihood of EID outbreaks	Bayesian, count-data models for different temporal and spatial scales developed	EHA		X	X	X	X												
	1.1.2 Determine the value of avoided damages from past EID events	Value of avoided damages determined	EHA		X	X	X	X												
	1.1.3 Create a model to predict expected damages of future disease events	Model to predict damages created	EHA			X	X	X												
	1.1.4.a. Determine rates of land-use/land cover change under 3 different scenarios— Business as Usual (BAU), Increased land-use change, halted land-use change	Three scenario models created	EHA			X	X	X	X											
	1.1.4.b. Use expected damages function to predict damages under deforestation scenarios	Expected damages under deforestation scenarios predicted	EHA			X	X	X	X	X										
	1.1.5 Investigate incorporation of avoided damages into total ecosystem services model	Integration with total ecosystem services model explored	EHA						X	X	X	X	X							
	1.1.6 Produce actionable model outputs and analyses	Models produced and scientific translation	EHA					X	X	X	X	X	X							

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
	for application in promoting reduced-impact land utilization	communications toolkit produced (see 2.3.2)													
Sub-IR 2.1: Establishment of a center of excellence, for additional research, analysis, and crossdisciplinary partnerships	2.1.1 Establish Center for Development and Health (CDH) at the School of Economics and Business at University Malaysia, Sabah	a. Concept developed and agreed upon	UMS and EHA	X											
		b. CDH established	UMS and EHA	X	X										
	2.1.2 Select local or regional graduate students for involvement	Graduated students selected	UMS/CDH			X		X				X			
	2.1.3 Develop and oversee student projects to promote use of spatial analysis, health outcome and economic models	Completed student projects submitted to the CDH / UMS faculty	UMS/CDH and EHA				X		X			X		X	X
	2.1.4 Develop short-courses around LUCDEP themes	Short-course developed	UMS/CDH and EHA							X	X	X	X	X	X
	2.1.5 Identify stakeholders for participation in the Center with help from UMS and SWD	Stakeholders identified	UMS/CDH, SWD and EHA	X	X	X	X	X	X	X	X	X	X	X	X
	2.1.6 Establish regular meetings,	a. Meetings held	UMS/CDH												

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
	including quarterly roundtables at the CDH for stakeholders for public dissemination of materials and information	b. Meeting schedule established	UMS/CDH	X	X	X	X	X	X	X	X	X	X	X	X
Sub-IR 2.2: Development of a gender sensitive tool kit for communicating the health impacts of differing land use options	2.2.1 Conduct survey of differential gendered disease risk exposure pathways to inform toolkit development and dissemination strategies	Survey(s) conducted	UMS/CDH and EHA		X	X	X								
	2.2.2 Integrate findings from quantitative models and additional data		UMS/CDH and EHA						X	X	X	X	X		
	2.2.3 Generate draft toolkit	Draft toolkit developed	UMS/CDH and EHA							X	X				
	2.2.4 Conduct external review of toolkit by stakeholder representatives, including focus group involvement to generate feedback on gender sensitivity and utility to stakeholders	External review conducted and feedback compiled into broad themes and actionable modifications	UMS/CDH and EHA									X			
	2.2.5 Finalize toolkit	Incorporate feedback into toolkit	UMS/CDH									X			

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
		to generate final version	and EHA												
	2.2.6 Develop an outreach plan to share gender-sensitive health impacts toolkit with the public as well as with government agencies, civil society, and the private sector (link to sub-IR 2.3)	Outreach plan developed	UMS/ CDH and EHA							X	X				
Sub-IR 2.3: Improved outreach and communication of translated, quantitative resources to policy makers and civil society advocates	2.3.1 Establish regular meetings, including quarterly roundtables at the CDH for stakeholders engagement in design and production of outreach materials	a. Meetings held	UMS/ CDH	X	X	X	X	X	X	X	X	X	X	X	X
		b. Number of unique stakeholder organizations	UMS/ CDH	X	X	X	X	X	X	X	X	X	X	X	X
		c. Number of individual sectors	UMS/ CDH	X	X	X	X	X	X	X	X	X	X	X	X
	2.3.2 Develop printed and web-based materials for dissemination to community leaders, industry leaders, and government partners	Scientific translation communications toolkit produced	EHA, UMS/ CDH, SWD							X	X				
	2.3.3 Develop dissemination strategy for outreach materials including scientific translation communications toolkit in consultation	Dissemination strategy developed	EHA, UMS/ CDH, SWD							X	X				

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
	with stakeholders														
	2.3.4 Disseminate outreach materials and toolkits to community leaders	a. Outreach materials and toolkits disseminated to communities	EHA, UMS/CDH, SWD									X	X	X	X
		b. Town hall meeting public fora held	EHA, UMS/CDH, SWD									X	X	X	X
	2.3.5 Develop website and social media platforms	Platforms developed; usage monitored by visits/followers	UMS/CDH and EHA			X	X	X	X	X	X	X	X	X	X
	2.3.6 Design and deliver short-term training programs (in person and/or online) to address immediate needs of existing professionals to increase their knowledge and capacity in the area of land use change	Per-session person counts (in-person counts, or IP address counts for online training)	UMS/CDH and EHA							X	X	X	X	X	X
	2.3.7 Conduct workshops for SWD and other relevant local govt staff in use of toolkits and other outreach	Number of workshop attendees	UMS/CDH and EHA							X	X	X	X	X	X

IDEEAL Work Plan and Time Line				Time line											
Objective / Result	Activity	Measurable Outcome or Indicator	Responsible Party	Y 1 Q 1	Y 1 Q 2	Y 1 Q 3	Y 1 Q 4	Y 2 Q 1	Y 2 Q 2	Y 2 Q 3	Y 2 Q 4	Y 3 Q 1	Y 3 Q 2	Y 3 Q 3	Y 3 Q 4
	materials														
	2.3.8 Evaluate stakeholder awareness of issues of land use change, risk of disease emergence, and gender implications	Baseline and follow-up surveys conducted	UMS/ CDH and EHA	X										X	

ANNEX B - Institutional Capabilities/Partnerships

Project oversight, contracts and administrative management will be provided by the EHA home office in New York and implementation oversight of Malaysia based activities will be managed by the Deputy Chief of Party and his/her team based in Kuala Lumpur and Kota Kinabalu. As the project will be based on a Cooperative Agreement, we envision that USAID/RDMA would also serve in providing advice and guidance to the project oversight and management team. Personnel Proposed and their project duties are listed below. Resumes and references are provided in Appendix B.

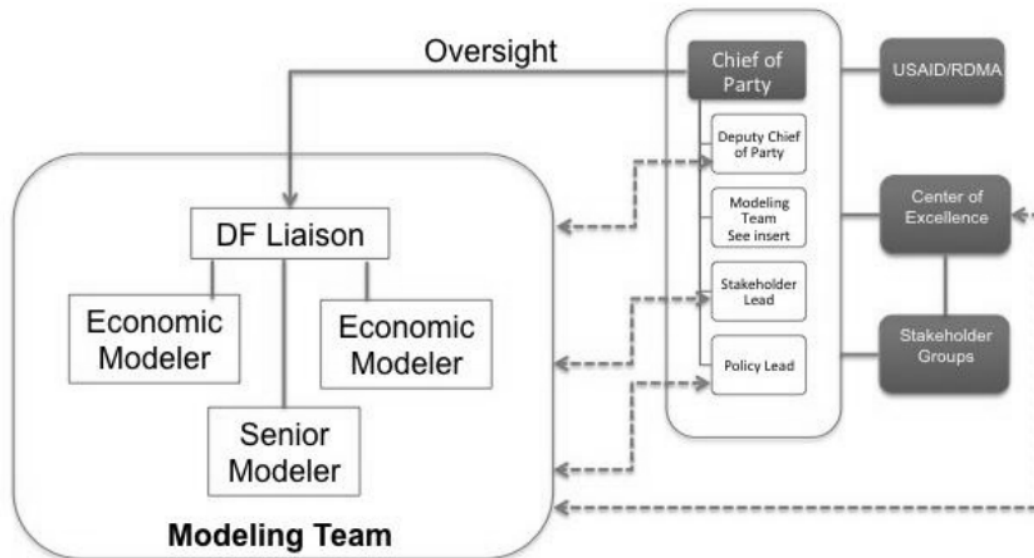
Two sub-recipients are anticipated as key partners on this project, the Sabah Wildlife Department and the School of Business and Economics at the Universiti of Malaysia Sabah. Details of capacity and roles are provided in ANNEX C. Support will be provided for expenses such as student stipends, conducting workshops and meetings, production of deliverables such as the toolkits and other informational products, and no project funds will be used to pay salaries of Malaysian government employees at these institutions. All collaboration on the project will be established by Memoranda of Understanding signed by EHA and the relevant legal authority for each of these parties and contracts will be signed for specific activities and duties. Contracts will be consistent with all US Regulations as consistent with EHA's current protocols used for the USAID EPT program.

Sabah Wildlife Department: The Sabah Wildlife Department works under the authority of the Sabah Ministry for Tourism Development, Environment, Science and Technology. The Wildlife Department has its headquarter in Kota Kinabalu and it has a number of district offices, centers and stations throughout the state. Over 230 staff members work in the SWD. The department is responsible for implementation and administration of the Sabah Wildlife Conservation Enactment, 1997. Under this Enactment the department conserves and regulates wildlife utilization in Sabah and it manages a number of protected areas. The department also implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as well as contribute to the implementation of the international convention of Biological Diversity and to a number of other international, regional and bilateral agreements. The objective of the SWD is to manage the State's wildlife resources for the benefit of the people of Malaysia in general and of Sabah in particular. The SWD is the lead local partner for the USAID EPT program, working directly with both PREDICT and PREVENT. As such, they are also the key implementation partner for the DEEP FOREST project. **For IDEEAL, SWD will serve to bring together relevant stakeholders to participate in the efforts of the UMS Center for Development and Health to strengthen the center of excellence platform. SWD will also prove to be the key in liaising with other Sabah government departments for obtaining additional data and input for modeling and to engage in policy outreach efforts.**

School of Business and Economics at the Universiti of Malaysia Sabah: The Universiti of Malaysia Sabah (UMS) strives to be an innovative

university of global standing. UMS strives to achieve academic excellence and international recognition through its attention to learning and teaching, research and publications, social services and balance in knowledge specialization. The university also prioritizes the personal growth of its students, resulting in greater innovation and productivity for the benefit of society and the nation as a whole. **The School of Business and Economics**, was established in 1995 with intention of fulfilling the country's need for managers and entrepreneurship in various areas of business to ensure that Malaysia achieves its objective to be an industrialized country by 2020. SBE seeks to ensure that its academic programs are update with the most recent research finding and by an understanding of contemporary business, government and management practices. As a result of its proactive policy, the school is capable of disseminating the recent development in knowledge in business and economics to its students and other audiences. The School has already earned recognition in providing quality MBA among profesional in the State and hopes to gain international recognition in the years to come. **UMS will be creating the Center for Development and Health under this project inline with it's other existing Centers of Excellence such as the Institute for Tropical Biology and Conservation.** The ITBC works at various sections of the society including the traditional communities, government agencies, non-governmental organizations and relevant ministries, ensuring a fair bit information exchange, technology transfer, assistance and smart-partnerships. The institute has developed a tradition of working with many partners both within and outside Malaysia. Faculty from UMS will serve as and work with Senior Personnel, as well as work with local partners to establish the Center for Development and Health at UMS. They will facilitate workshops, mentor graduate students working under this project, work with local stakeholders, play a key role in developing, producing and distributing the toolkit products of this project and serve as the sustainable operational center of excellence for continued components of IDEEAL.

Modeling Team Structure:



PART 2. Institutional Capability.

EcoHealth Alliance (EHA) is a science-based organization incorporated over 40 years ago, now working with local partners in over 30 countries at the nexus of public health, biodiversity conservation and international development. EHA has a staff of 35 at headquarters office in New York, including administrative staff (development, finance, marketing & communications), science staff (modelers, economists, social scientists, veterinarians, ecologists, analysts, IT researchers etc), outreach staff (educators, researchers, communication staff). EHA also has international staff of in-country field scientists, social scientists, program managers and country leads based in around 30 countries, including Malaysia (both peninsular and Sabah). EHA has an extensive record of publishing high quality, peer-reviewed papers, journals, briefing documents and reports. Given that a primary indicator of success in this project is based on utilization of data and findings by decision makers, EHA's demonstrated expertise in producing highly utilized and understandable science-based outputs will contribute significantly to achieving both project goals and provide objective methods for tracking project utilization of project findings.

Work experience with USAID EPT and DEEP FOREST

EHA is a core partner of the USAID EPT PREDICT project, and staff at EHA include the PREDICT [redacted] the lead for the modeling component of PREDICT (Dr. Peter Daszak), the DEEP FOREST [redacted] the majority of the PREDICT modeling staff, the [redacted] for Asia [redacted] and country leads for Malaysia [redacted] Indonesia [redacted] and Thailand [redacted] EcoHealth Alliance formulated the concept and design of the PREDICT

DEEP FOREST project, and is the implementation lead at our tropical forest sites along land use gradients in Sabah, Malaysia and Brazil. At these sites, EHA staff are sampling high-risk wildlife, coordinating surveys of human contact and behavior (in collaboration with EPT PREVENT), and managing viral testing and capacity building. The aims of DEEP FOREST have direct relevance to the current project, and are to understand how land-use change affects 1) patterns of biodiversity, 2) patterns of viral diversity and 3) patterns of human occupancy and behavior that influence contact rates with wildlife. The human behavioral data gathered includes gender-specific issues of relevance to EID risk, and, similarly, opportunities for gender empowerment and health savings. In addition, EHA scientists are currently working on the DEEP FOREST contact surveys, and other social science aspects of its projects such as our IDRC-supported 'Pontal' project in Brazil.

Work Experience in Modeling Land-use Change

EcoHealth Alliance is a leader in modeling and analyses of the emergence of new diseases. EHA staff led the development of analytical tools and models resulting in the "Hotspots of Emerging Diseases", have conducted extensive fieldwork on emerging diseases in tropical regions, and have led the thinking on the relationship of land-use change and disease emergence. Our portfolio of projects that model disease emergence risk, land-use change, and economic valuation is outlined in below. EHA is a global leader in developing the science, analytical frameworks and field studies to understand the relationship between land use change and disease emergence; in applying spatial analyses to understand drivers of emergence; in the theory of the drivers of zoonotic EIDs; in climate change modeling with respect to public health; in valuing the economic damages associated with EIDs; in understanding and estimating the global wildlife trade and their impacts on public health; and in understanding the ecosystem services associated with EIDs. EHA staff are members of the HEAL (Health and Ecosystems: Analysis and Linkages) project

(www.onehealthcommission.org/en/resources/health_ecosystems_analysis_of_linkages_heal/); Dr. Daszak leads the DIVERSITAS ecoHEALTH project (www.diversitas-international.org/activities/research/ecohealth), both of which have specific goals of understanding the ecosystem services related to zoonoses.

Work Experience Modeling Disease Emergence

The thrust of this RFA corresponds directly with the analytical and modeling work EHA is conducting on understanding and predicting disease emergence. For example, EHA modelers have shown that the underlying drivers of disease emergence vary depending on region, but in the place where most zoonoses emerge (the Tropics, including SE Asia) are primary land use change, agricultural intensification, or secondary factors associated with these (e.g. bushmeat), see **Figure 1**, below.

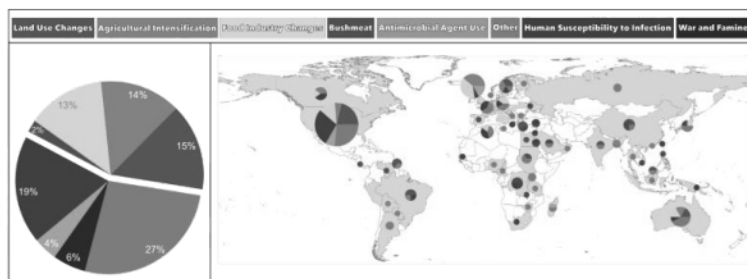


Figure 1: EHA modeling staff have analyzed the underlying causes of all EIDs since 1940. This figure shows that disease emergence in the Asian region, and the Tropics globally, is dominated by land use change, agricultural intensification, and secondary factors these lead to.

EcoHealth Alliance scientists are currently developing a new version of the EID 'hotspots' model, which is currently gridded to 1km², and therefore will be useful in providing subnational information on the highest disease risk regions within SE Asia (see **Figure 2**, below). This approach is based on an online Wikipedia-like project (Sicki) that provides far better data on the origins of EIDs than the scientific literature.

Figure 2: High-resolution image of EID risk in Thailand. Version 2 of the hotspot maps, currently being produced by EcoHealth Alliance, will significantly improve capacity to target surveillance based on wildlife diversity and risk of human contact with zoonotic reservoirs.

The best models require significant data inputs to parameterize. In the DEEP FOREST sites in Borneo and Brazil (and the 'Pontal' project in Brazil), EHA is generating data of direct relevance to the work described in this RFA, including: the relative abundance and diversity of bats, primates, and rodents; the relative intensity of contact among humans and wildlife; and the diversity of known and unknown zoonoses. The collection of these data is driven firstly by models and analyses that identify the most important issues to target. For example, in regions such as SE Asia, where land use change brings people into contact with wildlife reservoirs, EHA has identified the most important transmission pathways that pathogens have previously used to spillover into people (**Figure 3**, below).

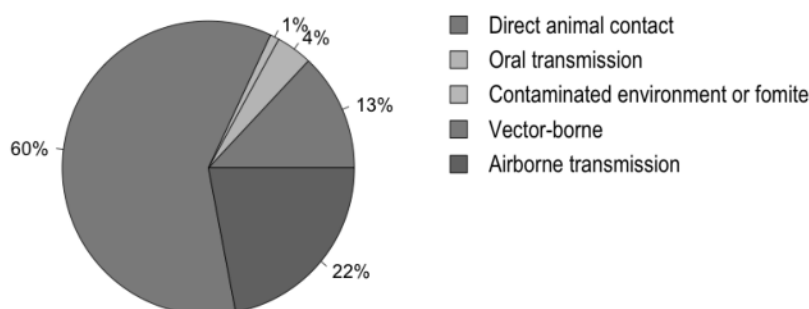


Figure 3: The most significant pathways that pathogens use to emerge in people in areas under intensive land-use change

Finally, EHA manages a portfolio of projects funded by NSF, NIH, DOD and other agencies which specifically analyze the risk of a range of zoonoses emerging in Tropical regions. These include models of how

spillover events develop from stuttering chains of zoonotic spillover, then chains of small clusters of human cases, to epidemic, then pandemic spread. We are currently comparing models that involve direct wildlife to human exposure to models that involve domestic animals as intermediate hosts. We are looking into this for henipaviruses, influenza viruses, coronaviruses and other critical zoonoses.

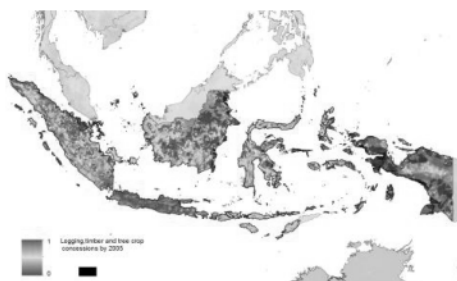


Figure 4: Map of Logging, tree crop and timber concessions in Indonesia. EHA scientists are actively working on mapping these activities with respect to the emerging disease hotspots across tropical Asia, Africa and America.

Work Experience in Economic Modeling

EHA has a program to understand the economic incentives that might be used to mitigate against globally emerging pandemics. Projects include modeling economic damages due to EIDs under different policy scenarios, the trade-offs between preserving ecosystems and the disease regulation services they provide, and cost-benefits of converting land for other productive activities. EHA leads the DEED (Diversity, Economics, EcoHealth and Emerging Diseases) project that is part of the UNESCO-ICSU DIVERSITAS cluster. This project is actively engaged in:

1. Valuing the Ecosystem Services from forests within EID hotspots and comparing the benefits of preserving the ecosystem to those from converting the land for another productive purpose
2. Valuing the damages associated with disease emergence
3. Evaluating systems of "EcoHealth Credits" that might be traded alongside or integrated into the trading of carbon credits (e.g., as per biodiversity, REDD+).
4. Using contingent valuation methodology—an approach that can also be applied to assign a value to ecosystem services—to gather data on individuals' willingness-to-pay to avert a pandemic.
5. Understanding the global relevance of the 'Dilution Effect' by which biodiversity conservation may help regulate zoonotic disease risk.

This and other associated work by members of our team has resulted in scientific papers that argue the case for preventive rather reactive responses to EID and other risks (Murray *et al.*, 2012), use climate change (adaptation vs. mitigation) approaches to address pandemic threat (Pike *et al.*, in review), evaluate strategies to tax livestock production as a way to reduce pandemic potential (Elwood *et al.*, in review), and evaluate a credit trading system as a way to reduce the risk of pandemics (Tutunjian *et al.*, in review).

Just like climate change, the risk of disease emergence from regions like Sabah can be viewed as a global commons issue (in this case a public 'bad', rather than a 'good'), which can either be mitigated

against, or adapted to. Here mitigation involves dealing with underlying causes of EIDs at source (e.g. the proposed work in this RFI) and adaptation involves reliance on current global surveillance, and drug and vaccine development. We have developed a stochastic dynamic model that examines the optimal timing in which to implement pandemic mitigation and/or adaptation policies (**Figure 5, below**). We used real options methodology, data on the incremental rise in EIDs and their associated damages, and the cost of current global health systems, to optimize the delivery of global policies to reduce the damages from EIDs. Our model demonstrates that mitigation projects, which address the underlying causes of pandemics at source, more efficiently reduce the damages associated with pandemics than adaptation. This experience and modeling approach has a direct application to valuing ecosystem services as not only the current value of services should be examined, but also the ability of the ecosystem to maintain these services over time.

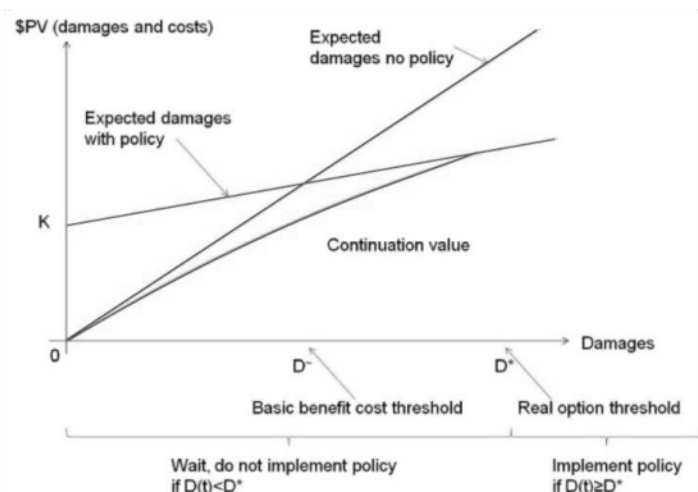
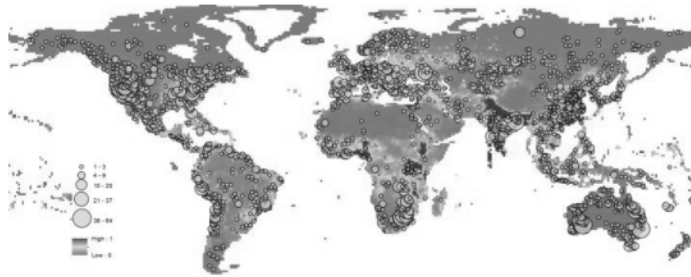


Figure 5: Stopping model for pandemic prevention. Y-axis: net present value of expected damages of an EID outbreak plus the cost, K , of a policy if implemented. X-axis: expected damages/time. Blue line: expected damages if policy is not implemented and the value of waiting (e.g. by more knowledge gained) is not considered. Green line: EID damages if a policy with cost, K , is implemented. If the value of waiting is ignored, $D\sim$ is the threshold

at which a policy should be implemented. The red line, known as the 'continuation value', illustrates the expected damages under business as usual. The decision model simply takes the currently experienced damage, a point on the x-axis, and determines which of the three lines is lowest (has lowest expected present damages and costs). For damages less than D^* it is optimal to "continue" to wait. For all damages above D^* it is optimal to implement the policy. D^* is the optimal threshold. Our results show that the waiting time to implement a global EID mitigation policy is between 4 and 24 years, after which it will be too costly to reduce the inexorable rise in EID emergence.

Work Experience in Ecosystem Services

The first step to a successful project that provides incentives to reduce, change or otherwise affect commercial activities such as logging, agricultural development and mining is to provide an industry-specific economically viable case. EHA is currently involved in key activities of direct relevance to this RFA. Via subcontract from PREVENT, EHA led the analysis and provided the scientific case for a white paper on reducing EID risk in the extractive industries.



world's largest ecological experiments to understand the ways in which logging, deforestation and forest fragmentation modify the functioning of tropical rainforests and impair their ability to deliver important ecosystem services.

Work Experience in REDD+ initiatives

EHA is engaged in a project to develop a trading system for 'EcoHealth Credits' that adapts to the features of REDD+. In its original form, REDD (Reducing Emissions from Deforestation and forest Degradation) was designed as a climate change mitigation tool based on the sale of carbon credits to encourage countries to reduce deforestation by selling the value of the carbon that would otherwise have been released. REDD+ is a more recent development that broadens the scope to include additional co-benefits of protecting carbon stocks, e.g., protecting biodiversity and improving livelihoods, after it was recognized that carbon investments could be manipulated to better achieve numerous targets for traditionally resource-poor but deforestation-related issues (e.g., biodiversity protection, livelihood enhancements) without compromising the overall efficacy of the program for climate change mitigation. It has also been suggested that optimization procedures could minimize the conflicts with other development goals, such as agricultural production and logging. Our analyses suggest that health could conceivably be considered as one of these additional co-benefits, which could influence the way that REDD+ funds are allocated or influence the perception or relative valuation of potentially conflicting development goals. The next step will be to develop ways that health benefits of intact forests can be integrated into a market-based instrument - something which is directly covered in this RFA, and which EHA has expertise in doing for EIDs.

Experience Implementing Projects in the Region

EHA has worked intensively in Malaysia since 1998, where it maintains an office. Our extensive partnerships and collaborations have led directly to implementation of a Zoonosis Technical Working Committee comprised of the Ministry of Health Malaysia, the Department of Veterinary Services, the Department of Wildlife and National Parks (PERHILITAN) and EHA as part of EPT PREDICT. This committee reports directly to the Malaysian government on the control of zoonotic diseases. In 2000, with our partners in the Dept. of Veterinary Services, the Veterinary Research Institute, Ministry of Agriculture, and the Department of Wildlife and National Parks (PERHILITAN) EHA scientists set up a large-scale international study on the ecology of Nipah virus. This has led to significant scientific outputs, changes to government regulations on pig farming, and regional approaches to zoonotic surveillance.

In 2012 we collaborated with our partners at Sabah Wildlife Department to create the Sabah Wildlife Health Unit that is dedicated to disease surveillance activities and to set up the Wildlife Health, Genetic and Forensic Laboratory. These partnerships have historically focused not only on scientific research, but capacity-building, training, and

public outreach to communicate our science. In the past five years, we have expanded our collaboration to include the Ministry of Health and the National Public Health Laboratory (NPHL), under a program looking at the risk of zoonotic disease transmission to people highly exposed to wildlife.

EcoHealth Alliance has also continued to focus on conservation in Malaysia. EHA scientists have worked with PERHILITAN to reduce hunting pressures on flying foxes and to raise awareness of the importance of these animals. In order to preempt harassment of *Pteropus hypomelanus* bats due to their association with Nipah virus, an outreach strategy was developed for a local primary school, located near the site of EHA's long-term bat surveillance Nipah virus study on Malaysia's Tioman Island. The take home message from the talks, games and leaflet was that flying foxes play a crucial role in seed dispersal and the pollination of forest and commercial plants. Malaysian fruits including Durian (*Durio spp.*) and Petai (*Parkia speciosa*) depend on flying foxes for pollination as does much of the timber Malaysia exports, a fact of which many Malaysians were unaware.

In 2012, we partnered with the Malaysian Ministry of Health to develop outreach education material including fact sheets, and pamphlets on zoonotic infectious diseases to provide information on potential risks and biosafety measures, as well as common routes of disease exposure. We are also working closely with MOH to develop standard operating procedures for the Healthy Hunters program. To date, EcoHealth Alliance has trained over 110 members of the PREDICT team in Malaysia, including staff from PERHILITAN, VRI, several local universities and NGOs, and Sabah Wildlife Department. We have also transferred technologies to PERHILITAN, VRI, and SWD to run molecular diagnostic assays for viral family detection in wildlife samples as an initial screen for viruses with zoonotic potential.

Home-office backstopping and its purposes.

The finance department at EHA will manage the cash flow from USA to Malaysia. EHA is a certified USAID prime contractor and subject to federal audits, for which it is considered a low risk organization. The Sub-recipients for these funds - DCOP, Sabah Wildlife Department, University Malaysia Sabah, Department of Veterinary Services and Department of State Health Sabah are all know entities that EHA has worked with in the past. EHA will have their certified public accountant manage the project accounts with oversight from the Chief Financial Officer. The accounts for the project will be submitted for annual external audit. The EHA office will also be responsible for the scientific and technical review and will lead the modeling effort.

The DCOP Tom Hughes has 8 years' experience managing large budgets and large field projects with multiple partners will receive funds from the EHA Finance Department. The DCOP will be responsible for the fiscal management of all funds in Malaysia associated with this contract to cover operating expenses and to support the activities of stakeholders involved in this project. The DCOP will track project

expenditures to ensure fiscal responsibility and prepare financial data for reporting. For stakeholders who may require regular financial support, such as to fund the running of the Center of Excellence we will establish at University Malaysia Sabah, a contract would be signed between EHA and the stakeholder.

Sub-recipient capabilities and expertise

Univesiti Malaysia Sabah (UMS)

UMS strives to be an innovative university of global standing UMS strives to achieve academic excellence and international recognition through its attention to learning and teaching, research and publications, social services and balance in knowledge specialization. The university also prioritizes the personal growth of its students, resulting in greater innovation and productivity for the benefit of society and the nation as a whole. The School of Business and Economics, was established in 1995 with intention of fulfilling the country's need for managers and entrepreneurship in various areas of business to ensure that Malaysia achieves its objective to be an industrialized country by 2020. SBE seeks to ensure that its academic programs are update with the most recent research finding and by an understanding of contemporary business, government and management practices. As a result of its proactive policy, the school is capable of disseminating the recent development in knowledge in business and economics to its students and other audiences. The School has already earned recognition in providing quality MBA among profesional in the State and hopes to gain international recognition in the years to come. UMS will be creating the Center for Development and Health under this project inline with it's other existing Centers of Excellence such as the Institute for Tropical Biology and Conservation. The ITBC works at various sections of the society including the traditional communities, government agencies, non-governmental organizations and relevant ministries, ensuring a fair bit information exchange, technology transfer, assistance and smart-partnerships. The institute has developed a tradition of working with many partners both within and outside Malaysia.

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References for Annex B:

- Elwood, S., et al. Evaluation of a levy on internationally traded meat to finance global disease surveillance. Emerging Infectious Diseases, in review.
- Groot, R. D., et al. (2010). "Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation." The Economics of Ecosystems and Biodiversity (TEEB): Ecological and Economic Foundations
- Murray, K. A., et al. (2012). "Cooling off health security hot spots: Getting on top of it down under." Environment International **48**(0): 56-64.
- Pike, J., et al. (2013). "Economic optimization of a global strategy to reduce the pandemic threat." Nature, in review.
- Tutunjian, C., et al. A credit trading system for pandemic prevention. EcoHealth, in review.

ATTACHMENT C

M. MANDATORY STANDARD PROVISIONS FOR U.S., NONGOVERNMENTAL ORGANIZATIONS

M.1 APPLICABILITY OF 22 CFR PART 226 (May 2005)

a. All provisions of 22 CFR Part 226 and all Standard Provisions attached to this agreement are applicable to the recipient and to subrecipients which meet the definition of "Recipient" in Part 226, unless a section specifically excludes a subrecipient from coverage. The recipient shall assure that subrecipients have copies of all the attached standard provisions.

b. For any subawards made with Non-US subrecipients the Recipient shall include the applicable "Standard Provisions for Non-US Nongovernmental Grantees." Recipients are required to ensure compliance with monitoring procedures in accordance with OMB Circular A-133.

M.2 INELIGIBLE COUNTRIES (MAY 1986)

Unless otherwise approved by the USAID Agreement Officer, funds will only be expended for assistance to countries eligible for assistance under the Foreign Assistance Act of 1961, as amended, or under acts appropriating funds for foreign assistance.

M.3 NONDISCRIMINATION (JUNE 2012)

No U.S. citizen or legal resident shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination on the basis of race, color, national origin, age, disability, or sex under any program or activity funded by this award when work under the grant is performed in the U.S. or when employees are recruited from the U.S.

Additionally, USAID is committed to achieving and maintaining a diverse and representative workforce and a workplace free of discrimination. Based on law, Executive Order, and Agency policy, USAID prohibits discrimination, including harassment, in its own workplace on the basis of race, color, religion, sex (including pregnancy and gender identity), national origin, disability, age, veteran's status, sexual orientation, genetic information, marital status, parental status, political affiliation, and any other conduct that does not adversely affect the performance of the employee.

In addition, the Agency strongly encourages its recipients and their sub-recipients and vendors (at all tiers), performing both in the U.S. and overseas, to develop and enforce comprehensive nondiscrimination policies for their workplaces that include protection for all their employees on these expanded bases, subject to applicable law.

M.4 AMENDMENT OF AWARD (JUNE 2012)

This award may only be amended in writing, by formal amendment or letter, signed by the Agreement Officer (AO), and in the case of a bilateral amendment, by the AO and an authorized official of the recipient.

M.5 NOTICES (JUNE 2012)

Any notice given by USAID or the recipient is sufficient only if in writing and delivered in person, mailed or e-mailed as follows:

To the USAID Agreement Officer, at the address specified in this award; or

To the recipient, at the recipient's address shown in this award, or to such other address specified in this award.

M.6 SUBAGREEMENTS (JUNE 2012)

a. Subawardees and contractors have no relationship with USAID under the terms of this award. All required USAID approvals must be directed through the recipient to USAID.

Notwithstanding any other term of this award, subawardees and contractors have no right to submit claims directly to

USAID and USAID assumes no liability for any third party claims against the recipient.

M.7 OMB APPROVAL UNDER THE PAPERWORK REDUCTION ACT (December 2003)

*Information collection requirements imposed by this grant are covered by OMB approval number 0412-0510; the current expiration date is 04/30/2005. The Standard Provisions containing the requirement and an estimate of the public reporting burden (including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information) are

Standard Provision	Burden Estimate
Air Travel and Transportation	1 (hour)
Ocean Shipment of Goods	.5
Patent Rights	.5
Publications	.5
Negotiated Indirect Cost Rates - (Predetermined and Provisional)	1
Voluntary Population Planning	.5
Protection of the Individual as a	1

Research Subject

22 CFR 226	Burden Estimate
22 CFR 226.40-.49 Procurement of Goods and Services	1
22 CFR 226.30 - .	36
Property Standards	1.5

Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, may be sent to the Office of Procurement, Policy Division (M/OP/P) U.S. Agency for International Development, Washington, DC 20523-7801 and to the Office of Management and Budget, Paperwork Reduction Project (0412-0510), Washington, D.C 20503.

M.8 USAID ELIGIBILITY RULES FOR GOODS AND SERVICES (JUNE 2012)

a This provision is not applicable to commodities or services that the recipient provides with private funds as

part of a cost-sharing requirement, or with Program Income generated under this award.

b. Ineligible and Restricted Commodities and Services:

(1) Ineligible Commodities and Services. The recipient must not, under any circumstances, procure any of the following under this award:

- (i) Military equipment,
- (ii) Surveillance equipment,
- (iii) Commodities and services for support of police or other law enforcement activities,
- (iv) Abortion equipment and services,
- (v) Luxury goods and gambling equipment, or
- (vi) Weather modification equipment.

(2) Ineligible Suppliers. Any firms or individuals that do not comply with the requirements in Standard Provision, "Debarment, Suspension and Other Responsibility Matters" and Standard Provision, "Preventing Terrorist Financing" must not be used to provide any commodities or services funded under this award.

(3) Restricted Commodities. The recipient must obtain prior written approval of the Agreement Officer (AO) or comply with required procedures under an applicable waiver, as provided by the AO when procuring any of the following commodities:

- (i) Agricultural commodities,
- (ii) Motor vehicles,
- (iii) Pharmaceuticals,
- (iv) Pesticides,
- (v) Used equipment,
- (vi) U.S. Government-owned excess property, or
- (vii) Fertilizer.

c. Source and Nationality:

Except as may be specifically approved in advance by the AO, all commodities and services that will be reimbursed by USAID under this award must be from the authorized geographic code specified in this award and must meet the source and nationality requirements set forth in 22 CFR 228. If the geographic code is not specified, the authorized geographic code is 937. When the total value of

procurement for commodities and services during the life of this award is valued at \$250,000 or less, the authorized geographic code for procurement of all goods and services to be reimbursed under this award is code 935. For a current list of countries within each geographic code, see: <http://www.usaid.gov/policy/ads/300/310.pdf>.

d. Guidance on the eligibility of specific commodities and services may be obtained from the AO. If USAID determines that the recipient has procured any commodities or services under this award contrary to the requirements of this provision, and has received payment for such purposes, the AO may require the recipient to refund the entire amount of the purchase.

e. This provision must be included in all subagreements, including subawards and contracts, which include procurement of commodities or services.

M.9 DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS (June 2012)

a. The recipient agrees to notify the Agreement Officer (AO) immediately upon learning that it or any of its principals:

(1) Are presently excluded or disqualified from covered transactions by any Federal department or agency;

(2) Have been convicted within the preceding three-year period preceding this proposal; been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, receiving stolen property, making false claims, or obstruction of justice; commission of any other offense indicating a lack of business integrity or business honesty that seriously and directly affects your present responsibility;

(3) Are presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph a.(2); and

(4) Have had one or more public transactions (Federal, State, or local) terminated for cause or default within the preceding three years.

b. The recipient agrees that, unless authorized by the AO, it will not knowingly enter into any subagreements or contracts under this award with a person or entity that is included on the Excluded Parties List System (www.eppls.gov/). The recipient further agrees to include the following provision in any subagreements or contracts entered into under this award:

DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION (JUNE 2012)

The recipient/contractor certifies that neither it nor its principals is presently excluded or disqualified from participation in this transaction by any Federal department or agency.

*c. The policies and procedures applicable to debarment, suspension, and ineligibility under USAID-financed transactions are set forth in Subpart C of 2 CFR Section 180, as supplemented by 2 CFR 780.

M.10 DRUG-FREE WORKPLACE (JUNE 2012)

a. The recipient must comply with drug-free workplace requirements in subpart B (or subpart C, if the recipient is an individual) of 2 CFR 782, which adopts the Government-wide implementation (2 CFR part 182) of sec. 5152-5158 of the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D; 41 U.S.C. 701-707).

M.11 EQUAL PARTICIPATION BY FAITH-BASED ORGANIZATIONS (JUNE 2012)

a. Faith-Based Organizations Encouraged.
Faith-based organizations are eligible to compete on an equal basis as any other organization to participate in USAID programs. Neither USAID nor entities that make and administer subawards of USAID funds will discriminate for or against an organization on the basis of the organization's religious character or affiliation. A faith-based organization may continue to carry out its mission, including the definition, practice, and expression of its

religious beliefs, within the limits contained in this provision. More information can be found at the USAID Faith-Based and Community Initiatives Web site: http://transition.usaid.gov/our_work/global_partnerships/fbci/ and 22 CFR 205.1.

b. Inherently Religious Activities Prohibited.

(1) Inherently religious activities include, among other things, worship, religious instruction, prayer, or proselytization.

(2) The recipient must not engage in inherently religious activities as part of the programs or services directly funded with financial assistance from USAID. If the recipient engages in inherently religious activities, it must offer those services at a different time or location from any programs or services directly funded by this award, and participation by beneficiaries in any such inherently religious activities must be voluntary.

(3) These restrictions apply equally to religious and secular organizations. All organizations that participate in USAID programs, including religious ones, must carry out eligible activities in accordance with all program requirements and other applicable requirements governing USAID-funded activities.

(4) These restrictions do not apply to USAID-funded programs where chaplains work with inmates in prisons, detention facilities, or community correction centers, or where USAID funds are provided to religious or other organizations for programs in prisons, detention facilities, or community correction centers, in which such organizations assist chaplains in carrying out their duties.

(5) Notwithstanding the restrictions of b.(1) and (2), a religious organization that participates in USAID-funded programs or services

(i) Retains its independence and may continue to carry out its mission, including the definition, practice, and expression of its religious beliefs, provided that it does not use direct financial assistance from USAID to support any inherently religious activities,

(ii) May use space in its facilities, without removing religious art, icons, scriptures, or other religious symbols, and

(iii) Retains its authority over its internal governance, and it may retain religious terms in its organization's name, select its board members on a religious basis, and include religious references in its organization's mission statements and other governing documents.

c. Construction of Structures Used for Inherently Religious Activities Prohibited. The recipient must not use USAID funds for the acquisition, construction, or rehabilitation of structures to the extent that those structures are used for inherently religious activities, such as sanctuaries, chapels, or other rooms that the recipient uses as its principal place of worship. Except for a structure used as its principal place of worship, where a structure is used for both eligible and inherently religious activities, USAID funds may not exceed the cost of those portions of the acquisition, construction, or rehabilitation that are attributable to eligible activities.

d. Discrimination Based on Religion Prohibited. The recipient must not discriminate against any beneficiary or potential beneficiary on the basis of religion or religious belief as part of the programs or services directly funded with financial assistance from USAID.

e. A religious organization's exemption from the Federal prohibition on employment discrimination on the basis of religion, set forth in Sec. 702(a) of the Civil Rights Act of 1964, 42 U.S.C. 2000e-1 is not forfeited when the organization receives financial assistance from USAID.

f. The Secretary of State may waive the requirements of this section in whole or in part, on a case-by-case basis, where the Secretary determines that such waiver is necessary to further the national security or foreign policy interests of the United States.

M.12 PREVENTING TERRORIST FINANCING -- IMPLEMENTATION OF E.O. 13224 (AUGUST 2013)

a. The recipient must not engage in transactions with, or provide resources or support to, individuals and organizations associated with terrorism, including those individuals or entities that appear on the Specially

Designated Nationals and Blocked Persons List maintained by the U.S. Treasury (online at: <http://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx>) or the United Nations Security designation list (online at: http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml).

b. This provision must be included in all subagreements, including subawards and contracts issued under this award.

M.13 MARKING AND PUBLIC COMMUNICATIONS UNDER USAID-FUNDED ASSISTANCE (AUGUST 2013)

a. The USAID Identity is the official marking for USAID, comprised of the USAID logo and brandmark with the tagline "from the American people." The USAID Identity is on the USAID Web site at www.usaid.gov/branding. Recipients must use the USAID Identity, of a size and prominence equivalent to or greater than any other identity or logo displayed, to mark the following:

- (1) Programs, projects, activities, public communications, and commodities partially or fully funded by USAID;
- (2) Program, project, or activity sites funded by USAID, including visible infrastructure projects or other physical sites;
- (3) Technical assistance, studies, reports, papers, publications, audio-visual productions, public service announcements, Web sites/Internet activities, promotional, informational, media, or communications products funded by USAID;
- (4) Commodities, equipment, supplies, and other materials funded by USAID, including commodities or equipment provided under humanitarian assistance or disaster relief programs; and
- (5) Events financed by USAID, such as training courses, conferences, seminars, exhibitions, fairs, workshops, press conferences and other public activities. If the USAID Identity cannot be displayed, the recipient is encouraged to otherwise acknowledge USAID and the support of the American people.

b. The recipient must implement the requirements of this provision following the approved Marking Plan in the award.

c. If a "Marking Plan" is not included in this award, the recipient must propose and submit a plan for approval within the time specified by the Agreement Officer (AO).

d. The AO may require a preproduction review of program materials and "public communications" (documents and messages intended for external distribution, including but not limited to correspondence; publications; studies; reports; audio visual productions; applications; forms; press; and promotional materials) used in connection with USAID-funded programs, projects or activities, for compliance with an approved Marking Plan.

e. The recipient is encouraged to give public notice of the receipt of this award and announce progress and accomplishments. The recipient must provide copies of notices or announcements to the Agreement Officer's Representative (AOR) and to USAID's Office of Legislative and Public Affairs in advance of release, as practicable. Press releases or other public notices must include a statement substantially as follows:

"The U.S. Agency for International Development administers the U.S. foreign assistance program providing economic and humanitarian assistance in more than 80 countries worldwide."

f. Any "public communication" in which the content has not been approved by USAID must contain the following disclaimer:

"This study/report/audio/visual/other information/media product (specify) is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of [insert recipient name] and do not necessarily reflect the views of USAID or the United States Government."

g. The recipient must provide the USAID AOR, with two copies of all program and communications materials produced under this award.

h. The recipient may request an exception from USAID marking requirements when USAID marking requirements would:

(1) Compromise the intrinsic independence or neutrality of a program or materials where independence or neutrality is an inherent aspect of the program and materials;

(2) Diminish the credibility of audits, reports, analyses, studies, or policy recommendations whose data or findings must be seen as independent;

(3) Undercut host-country government "ownership" of constitutions, laws, regulations, policies, studies, assessments, reports, publications, surveys or audits, public service announcements, or other communications;

(4) Impair the functionality of an item;

(5) Incur substantial costs or be impractical;

(6) Offend local cultural or social norms, or be considered inappropriate; or

(7) Conflict with international law.

i. The recipient may submit a waiver request of the marking requirements of this provision or the Marking Plan, through the AOR, when USAID-required marking would pose compelling political, safety, or security concerns, or have an adverse impact in the cooperating country.

(1) Approved waivers "flow down" to subagreements, including subawards and contracts, unless specified otherwise. The waiver may also include the removal of USAID markings already affixed, if circumstances warrant.

(2) USAID determinations regarding waiver requests are subject to appeal by the recipient, by submitting a written request to reconsider the determination to the cognizant Assistant Administrator.

j. The recipient must include the following marking provision in any subagreements entered into under this award:

"As a condition of receipt of this subaward, marking with the USAID Identity of a size and prominence equivalent to or greater than the recipient's, subrecipient's, other donor's, or third party's is required. In the event the recipient chooses not to require marking with its own

identity or logo by the subrecipient, USAID may, at its discretion, require marking by the subrecipient with the USAID Identity."

M.14 REGULATIONS GOVERNING EMPLOYEES (AUGUST 1992)

(The following applies to the recipient's employees working in the cooperating country under the agreement who are not citizens of the cooperating country.)

- a. The recipient's employees shall maintain private status and may not rely on local U.S. Government offices or facilities for support while under this grant.
- b. The sale of personal property or automobiles by recipient employees and their dependents in the foreign country to which they are assigned shall be subject to the same limitations and prohibitions which apply to direct-hire USAID personnel employed by the Mission, including the rules contained in 22 CFR Part 136, except as this may conflict with host government regulations.
- c. Other than work to be performed under this award for which an employee is assigned by the recipient, no employee of the recipient shall engage directly or indirectly, either in the individual's own name or in the name or through an agency of another person, in any business, profession, or occupation in the foreign countries to which the individual is assigned, nor shall the individual make loans or investments to or in any business, profession or occupation in the foreign countries to which the individual is assigned.
- d. The recipient's employees, while in a foreign country, are expected to show respect for its conventions, customs, and institutions, to abide by its applicable laws and regulations, and not to interfere in its internal political affairs.
- e. In the event the conduct of any recipient employee is not in accordance with the preceding paragraphs, the recipient's chief of party shall consult with the USAID Mission Director and the employee involved and shall recommend to the recipient a course of action with regard to such employee.
- f. The parties recognize the rights of the U.S. Ambassador to direct the removal from a country of any U.S. citizen or the discharge from this grant award of any third country national when, in the discretion of the Ambassador, the interests of the United States so require.

g. If it is determined, either under (e) or (f) above, that the services of such employee should be terminated, the recipient shall use its best efforts to cause the return of such employee to the United States, or point of origin, as appropriate.

**M.15 CONVERSION OF UNITED STATES DOLLARS TO LOCAL CURRENCY
(NOVEMBER 1985)**

Upon arrival in the Cooperating Country, and from time to time as appropriate, the recipient's chief of party shall consult with the Mission Director who shall provide, in writing, the procedure the recipient and its employees shall follow in the conversion of United States dollars to local currency. This may include, but is not limited to, the conversion of currency through the cognizant United States Disbursing Officer or Mission Controller, as appropriate.

M.16 USE OF POUCH FACILITIES (AUGUST 1992)

(a) Use of diplomatic pouch is controlled by the Department of State. The Department of State has authorized the use of pouch facilities for USAID recipients and their employees as a general policy, as detailed in items (1) through (6) below. However, the final decision regarding use of pouch facilities rest with the Embassy or USAID Mission. In consideration of the use of pouch facilities, the recipient and its employees agree to indemnify and hold harmless, the Department of State and USAID for loss or damage occurring in pouch transmission:

(1) Recipients and their employees are authorized use of the pouch for transmission and receipt of up to a maximum of .9 kgs per shipment of correspondence and documents needed in the administration of assistance programs.

(2) U.S. citizen employees are authorized use of the pouch for personal mail up to a maximum of .45 kgs per shipment (but see (a)(3) below).

(3) Merchandise, parcels, magazines, or newspapers are not considered to be personal mail for purposes of this standard provision and are not authorized to be sent or received by pouch.

(4) Official and personal mail pursuant to a.1. and 2. above sent by pouch should be addressed as follows:

Name of individual or organization (followed by letter symbol "G") City Name of post (USAID/_____) Agency for International Development Washington, D.C. 20523-0001

(5) Mail sent via the diplomatic pouch may not be in violation of U.S. Postal laws and may not contain material ineligible for pouch transmission.

(6) Recipient personnel are NOT authorized use of military postal facilities (APO/FPO). This is an Adjutant General's decision based on existing laws and regulations governing military postal facilities and is being enforced worldwide.

(b) The recipient shall be responsible for advising its employees of this authorization, these guidelines, and limitations on use of pouch facilities.

(c) Specific additional guidance on grantee use of pouch facilities in accordance with this standard provision is available from the Post Communication Center at the Embassy or USAID Mission.

M.17 TRAVEL AND INTERNATIONAL AIR TRANSPORTATION (AUGUST 2013)

PRIOR BUDGET APPROVAL

Direct charges for travel costs for international air travel by individuals are allowable only when each international trip has received prior budget approval. Such approval is met when all of the following are met:

(1) The trip is identified by providing the following information: the number of trips, the number of individuals per trip, and the origin and destination countries or regions;

(2) All of the information noted at a.(1) above is incorporated in the Schedule of this award or amendments to this award; and

(3) The costs related to the travel are incorporated in the budget of this award.

The Agreement Officer (AO) may approve, in writing, international travel costs that have not been incorporated in this award. To obtain AO approval, the recipient must request approval at least three weeks before the international travel, or as far in advance as possible. The recipient must keep a copy of the AO's approval in its files. No other clearance (including country clearance) is required for employees of the recipient, its subrecipients or contractors. International travel by employees who are not on official business of the recipient, such as rest and recuperation (R&R) travel offered as part of an employee's benefits package, must be consistent with the recipient's personnel and travel policies and procedures and does not require approval.

b. TRAVEL COSTS

All travel costs must comply with the applicable cost principles and must be consistent with those normally allowed in like circumstances in the recipient's non-USAID-funded activities. Costs incurred by employees and officers for travel, including air fare, costs of lodging, other subsistence, and incidental expenses, may be considered reasonable and allowable only to the extent such costs do not exceed reasonable charges normally allowed by the recipient in its regular operations as the result of the recipient organization's written travel policy and are within the limits established by the applicable cost principles.

In the absence of a reasonable written policy regarding international travel costs, the standard for determining the reasonableness of reimbursement for international travel costs will be the Standardized Regulations (Government Civilians, Foreign Areas), published by the U.S. Department of State, as from time to time amended. The most current Standardized Regulations on international travel costs may be obtained from the AO. In the event that the cost for air fare exceeds the customary standard commercial airfare (coach or equivalent) or the lowest commercial discount airfare, the recipient must document one of the allowable exceptions from the applicable cost principles.

c. FLY AMERICA ACT RESTRICTIONS

(1) The recipient must use U.S. Flag Air Carriers for all international air transportation (including personal effects) funded by this award pursuant to the Fly America Act and its implementing regulations to the extent service by such carriers is available.

(2) In the event that the recipient selects a carrier other than a U.S. Flag Air Carrier for international air transportation, in order for the costs of such international air transportation to be allowable, the recipient must document such transportation in accordance with this provision and maintain such documentation pursuant to the Standard Provision, "Accounting, Audit and Records." The documentation must use one of the following reasons or other exception under the Fly America Act:

(i) The recipient uses a European Union (EU) flag air carrier, which is an airline operating from an EU country that has signed the US-EU "Open Skies" agreement (<http://www.state.gov/e/eb/rls/othr/ata/i/ic/170684.htm>).

(ii) Travel to or from one of the following countries on an airline of that country when no city pair fare is in effect for that leg (see <http://apps.fas.gsa.gov/citypairs/search/>):

- a. Australia on an Australian airline,
- b. Switzerland on a Swiss airline, or
- c. Japan on a Japanese airline;

(iii) Only for a particular leg of a route on which no US Flag Air Carrier provides service on that route;

(iv) For a trip of 3 hours or less, the use of a US Flag Air Carrier at least doubles the travel time;

(v) If the US Flag Air Carrier offers direct service, use of the US Flag Air Carrier would increase the travel time by more than 24 hours; or

(vi) If the US Flag Air Carrier does not offer direct service,

- a. Use of the US Flag Air Carrier increases the number of aircraft changes by 2 or more,
- b. Use of the US Flag Air Carrier extends travel time by 6 hours or more, or

c. Use of the US Flag Air Carrier requires a layover at an overseas interchange of 4 hours or more.

d. DEFINITIONS

The terms used in this provision have the following meanings:

(1) "Travel costs" means expenses for transportation, lodging, subsistence (meals and incidentals), and related expenses incurred by employees who are on travel status on official business of the recipient for any travel outside the country in which the organization is located. "Travel costs" do not include expenses incurred by employees who are not on official business of the recipient, such as rest and recuperation (R&R) travel offered as part of an employee's benefits package that are consistent with the recipient's personnel and travel policies and procedures.

(2) "International air transportation" means international air travel by individuals (and their personal effects) or transportation of cargo by air between a place in the United States and a place outside thereof, or between two places both of which are outside the United States.

(3) "U.S. Flag Air Carrier" means an air carrier on the list issued by the U.S. Department of Transportation at <http://ostpxweb.dot.gov/aviation/certific/certlist.htm>. U.S. Flag Air Carrier service also includes service provided under a code share agreement with another air carrier when the ticket, or documentation for an electronic ticket, identifies the U.S. flag air carrier's designator code and flight number.

(4) For this provision, the term "United States" includes the fifty states, Commonwealth of Puerto Rico, possessions of the United States, and the District of Columbia.

e. SUBAGREEMENTS

This provision must be included in all subagreements, including all subawards and contracts, under which this award will finance international air transportation.

M.18 OCEAN SHIPMENT OF GOODS (JUNE 2012)

Prior to contracting for ocean transportation to ship goods

purchased or financed with USAID funds under this award, the recipient must contact the office below to determine the flag and class of vessel to be used for shipment:

U.S. Agency for International Development, Office of
Acquisition and Assistance, Transportation Division
1300 Pennsylvania Avenue, NW
Washington, DC 20523-7900

Email: oceantransportation@usaid.gov

b. This provision must be included in all subagreements, including subwards and contracts.

M.19 VOLUNTARY POPULATION PLANNING ACTIVITIES - MANDATORY REQUIREMENTS (MAY 2006)

Requirements for Voluntary Sterilization Programs

(1) None of the funds made available under this award shall be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any individual to practice sterilization.

Prohibition on Abortion-Related Activities:

(1) No funds made available under this award will be used to finance, support, or be attributed to the following activities:

(i) procurement or distribution of equipment intended to be used for the purpose of inducing abortions as a method of family planning; (ii) special fees or incentives to any person to coerce or motivate them to have abortions; (iii) payments to persons to perform abortions or to solicit persons to undergo abortions; (iv) information, education, training, or communication programs that seek to promote abortion as a method of family planning; and (v) lobbying for or against abortion. The term "motivate", as it relates to family planning assistance, shall not be construed to prohibit the provision, consistent with local law, of information or counseling about all pregnancy options.

(2) No funds made available under this award will be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilizations as a means of family

planning. Epidemiologic or descriptive research to assess the incidence, extent or consequences of abortions is not precluded.

M.20 TRAFFICKING IN PERSONS (JUNE 2012)

a. USAID is authorized to terminate this award, without penalty, if the recipient or its employees, or any subrecipient or its employees, engage in any of the following conduct:

(1) Trafficking in persons (as defined in the Protocol to Prevent, Suppress, and Punish Trafficking in Persons, especially Women and Children, supplementing the UN Convention against Transnational Organized Crime) during the period of this award;

(2) Procurement of a commercial sex act during the period of this award; or

(3) Use of forced labor in the performance of this award.

b. For purposes of this provision, "employee" means an individual who is engaged in the performance of this award as a direct employee, consultant, or volunteer of the recipient or any subrecipient.

c. The recipient must include in all subagreements, including subawards and contracts, a provision prohibiting the conduct described in a(1)-(3) by the subrecipient, contractor or any of their employees.

M.21 SUBMISSIONS TO THE DEVELOPMENT EXPERIENCE CLEARINGHOUSE AND PUBLICATIONS (JUNE 2012)

a. Submissions to the Development Experience Clearinghouse (DEC) .

1) The recipient must provide the Agreement Officer's Representative one copy of any Intellectual Work that is published, and a list of any Intellectual Work that is not published.

2) In addition, the recipient must submit Intellectual Work, whether published or not, to the DEC, either on-line (preferred) or by mail. The recipient must review the DEC Web site for submission instructions, including document

formatting and the types of documents to submit. Submission instructions can be found at: <http://dec.usaid.gov>.

3) For purposes of submissions to the DEC, Intellectual Work includes all works that document the implementation, evaluation, and results of international development assistance activities developed or acquired under this award, which may include program and communications materials, evaluations and assessments, information products, research and technical reports, progress and performance reports required under this award (excluding administrative financial information), and other reports, articles and papers prepared by the recipient under the award, whether published or not. The term does not include the recipient's information that is incidental to award administration, such as financial, administrative, cost or pricing, or management information.

4) Each document submitted should contain essential bibliographic information, such as 1) descriptive title; 2) author(s) name; 3) award number; 4) sponsoring USAID office; 5) development objective; and 6) date of publication.

5) The recipient must not submit to the DEC any financially sensitive information or personally identifiable information, such as social security numbers, home addresses and dates of birth. Such information must be removed prior to submission. The recipient must not submit classified documents to the DEC.

b. In the event award funds are used to underwrite the cost of publishing, in lieu of the publisher assuming this cost as is the normal practice, any profits or royalties up to the amount of such cost must be credited to the award unless the schedule of the award has identified the profits or royalties as program income.

M. 22 LIMITING CONSTRUCTION ACTIVITIES (AUGUST 2013)

a) Construction is not eligible for reimbursement under this award unless specifically identified in paragraph d) below.

b) Construction means -construction, alteration, or repair (including dredging and excavation) of buildings, structures, or other real property and includes, without limitation, improvements, renovation, alteration and refurbishment. The term includes, without limitation,

roads, power plants, buildings, bridges, water treatment facilities, and vertical structures.

c) Agreement Officers will not approve any subawards or procurements by recipients for construction activities that are not listed in paragraph d) below. USAID will reimburse allowable costs for only the construction activities listed in this provision not to exceed the amount specified in the construction line item of the award budget. The recipient must receive prior written approval from the AO to transfer funds allotted for construction activities to other cost categories, or vice versa.

d) Description

Construction is not eligible for reimbursement under this award.

e) The recipient must include this provision in all subawards and procurements and make vendors providing services under this award and subrecipients aware of the restrictions of this provision.

II. REQUIRED AS APPLICABLE STANDARD PROVISIONS for U.S., NONGOVERNMENTAL RECIPIENTS

RAA.1 RESERVED

RAA.2 NEGOTIATED INDIRECT COST RATES - PROVISIONAL (Nonprofit) (APRIL 1998)

Provisional indirect cost rates must be established for each of the recipient's accounting periods during the term of this award. Pending establishment of revised provisional or final rates, allowable indirect costs must be reimbursed at the rates, on the bases, and for the periods shown in the schedule of the award.

Within the earlier of 30 days after receipt of the A-133 audit report or nine months after the end of the audit period, the recipient must submit to the cognizant agency for audit the required OMB Circular A-133 audit report, proposed final indirect cost rates, and supporting cost data. If USAID is the cognizant agency or no cognizant agency has been designated, the recipient must submit four copies of the audit report, along with the proposed final indirect cost rates and supporting cost data, to the

Overhead, Special Costs, and Closeout Branch, Office of Acquisition and Assistance, USAID, Washington, DC 20523-7802. The proposed rates must be based on the recipient's actual cost experience during that fiscal year. Negotiations of final indirect cost rates must begin soon after receipt of the recipient's proposal.

Allowability of costs and acceptability of cost allocation methods must be determined in accordance with the applicable cost principles.

The results of each negotiation must be set forth in a written indirect cost rate agreement signed by both parties. Such agreement is automatically incorporated into this award and must specify (1) the agreed upon final rates, (2) the bases to which the rates apply, (3) the fiscal year for which the rates apply, and (4) the items treated as direct costs. The agreement must not change any monetary ceiling, award obligation, or specific cost allowance or disallowance provided for in this award.

Pending establishment of final indirect cost rate(s) for any fiscal year, the recipient must be reimbursed either at negotiated provisional rates or at billing rates acceptable to the Agreement Officer, subject to appropriate adjustment when the final rates for the fiscal year are established. To prevent substantial overpayment or underpayment, the provisional or billing rates may be prospectively or retroactively revised by mutual agreement.

f. Failure by the parties to agree on final rates is a 22 CFR 226.90 dispute.

RAA.3 RESERVED

RAA.4 EXCHANGE VISITORS AND PARTICIPANT TRAINING (JUNE 2012)

Definitions:

(1) An Exchange Visitor is any host-country or third-country national traveling to the U.S., for any purpose, including Participant Training and Invitational Travel, funded by USAID in whole or in part, directly or indirectly.

(2) A Participant is a host-country or third-country national sponsored by USAID for a Participant Training activity taking place in the U.S., a third country, or in the host country.

(3) Participant Training is a learning activity conducted within the U.S., a third country, or in the host country for the purpose of furthering USAID development objectives. A learning activity takes place in a setting in which an individual (the Participant) interacts with a knowledgeable professional, predominantly for the purpose of acquiring knowledge or skills for the professional or technical enhancement of the individual. Learning activities may be formally structured, such as an academic program or a technical course, or they may be more informal, such as an observational study tour.

(4) Invitational Travel is a type of travel that USAID funds for non-U.S. Government employees. This type of travel may be approved for both U.S. and foreign citizens who are not employed by the U.S. Government (USG), not receiving any type of compensation from the USG for such travel, and only when it is determined that the functions to be performed are essential to the interests of USAID.

b. Program Monitoring and Data Reporting: The recipient must monitor Exchange Visitors' and Participants' progress during their program and ensure that problems are identified and resolved quickly.

(1) For U.S.-based activities, the recipient must use USAID's official Exchange Visitor and Participant Training information system, currently called "Training Results and Information Network - TrainNet" (see <http://trainethelp.usaid.gov/>), to report and manage Exchange Visitor and Participant Training data. The recipient must also use the USAID Visa Compliance System - VCS (see <http://trainethelp.usaid.gov/>) to transfer required data for USAID Exchange Visitors to the Department of Homeland Security's Student and Exchange Visitor Information System (SEVIS).

(2) For all third-country activities, and for host-country activities of two consecutive days or 16 contact hours or more in duration, the recipient must use USAID's official Exchange Visitor and Participant Training

information system, currently called "Training Results and Information Network - TrainNet" (see <http://trainethelp.usaid.gov/>), to report and manage Participant Training data.

c. Health and Accident Insurance:

(1) For Exchange Visitors traveling to the United States, the recipient must enroll Exchange Visitors in health and accident insurance coverage that meets or exceeds Department of State and USAID minimum coverage requirements as set forth in 22 CFR 62.14 and ADS 253.3.6.2. The requirements may be obtained from the Agreement Officer's Representative.

(2) For Participants traveling to a third country, the recipient must obtain health and accident insurance coverage for all Participants.

(3) For Participants traveling within the host country, the recipient must determine whether specific in-country participant training activities subject them to any risk of health and accident liability for medical costs. Participants may incur, and if so, take appropriate steps according to the local situation, including obtaining health and accident insurance coverage for Participants.

d. Immigration Requirements:

(1) For Exchange Visitors traveling to the United States, the recipient must ensure that all USAID-sponsored Exchange Visitors obtain, use, and comply with the terms of the J-1 visa, issued in conjunction with a USAID-issued Certificate of Eligibility for J-1 Visa Status (DS-2019).

(2) For Participants traveling to a third country or within the host country, the recipient must ensure that all Participants obtain, use, and comply with the terms of all applicable immigration, visa and other similar requirements.

e. Language Proficiency: The recipient must verify language proficiency. Exchange Visitors must possess sufficient English language proficiency to participate in a U.S.-based activity. Participants of third-country or host-country training must be proficient in the language of training at a sufficient level for participation, unless an interpreter

has been arranged. Language competency can be verified through a variety of means including proficiency assessments of interviews, publications, presentations, education conducted in English, and formal testing.

f. Pre-departure Orientation: The recipient must conduct pre-departure orientation for U.S-bound Exchange Visitors and Participants of third-country training programs. Pre-departure orientation covers: program objectives; administrative and policy review; cultural aspects; and training/learning methods (see http://pdf.usaid.gov/pdf_docs/PNADT444.pdf).

g. Conditions of Sponsorship: The recipient must ensure that all Exchange Visitors read and sign the Conditions of Sponsorship for U.S.-Based Activities form (AID 1381-6). The recipient must also ensure that all Participants of long-term (six months or longer) third-country training read and sign the form Conditions of Sponsorship for Third-Country Training form (AID 1381-7). The recipient must report to the Agreement Officer any known violations by Exchange Visitors of visa or other immigration requirements or conditions.

h. Exchange Visitor Security Risk and Fraud Inquiry: Each USAID Mission has an established process for conducting a Security Risk and Fraud Inquiry (SRFI) for Exchange Visitors. The recipient must be prepared to assist Missions in conducting the SRFI, if requested. However, the recipient's role is contributive, and the Mission is ultimately responsible for conducting the SRFI.

i. Fly America: To the extent that participants travel by international air travel, the recipient must comply with the Standard Provision, "International Air Travel and Air Transportation of Property."

j. Use of Minority Serving Institutions: For U.S.-based Participant Training, the recipient must, to the maximum extent possible, maintain their use of Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions (MSIs), including Hispanic Serving Institutions and Tribal Colleges and Universities, as training or education providers.

RAA.5 RESERVED

RAA.6 RESERVED

RAA.7 RESERVED

RAA.8 RESERVED

RAA.9 COST SHARING (MATCHING) (FEBRUARY 2012)

If at the end of any funding period, the recipient has expended an amount of non-Federal funds less than the agreed upon amount or percentage of total expenditures, the Agreement Officer may apply the difference to reduce the amount of USAID incremental funding in the following funding period. If the award has expired or has been terminated, the Agreement Officer may require the recipient to refund the difference to USAID.

The source and nationality requirements and the restricted goods provision established in the Standard Provision entitled "USAID Eligibility Rules for Goods and Services" do not apply to cost sharing (matching) expenditures.

RAA.10 PROHIBITION OF ASSISTANCE TO DRUG TRAFFICKERS (JUNE 1999)

USAID reserves the right to terminate assistance to, or take other appropriate measures with respect to, any participant approved by USAID who is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR Part 140.

(1) For any loan over \$1000 made under this agreement, the recipient shall insert a clause in the loan agreement stating that the loan is subject to immediate cancellation, acceleration, recall or refund by the recipient if the borrower or a key individual of a borrower is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR Part 140.

Upon notice by USAID of a determination under section (1) and at USAID's option, the recipient agrees to immediately cancel, accelerate or recall the loan, including refund in full of the outstanding balance. USAID reserves the right to have the loan refund returned to USAID.

c. (1) The recipient agrees not to disburse, or sign documents committing

the recipient to disburse, funds to a subrecipient designated by USAID ("Designated Subrecipient") until advised by USAID that: (i) any United States Government review of the Designated Subrecipient and its key individuals has been completed; (ii) any related certifications have been obtained; and (iii) the assistance to the Designated Subrecipient has been approved. Designation means that the subrecipient has been unilaterally selected by USAID as the subrecipient. USAID approval of a subrecipient, selected by another party, or joint selection by USAID and another party is not designation.

(2) The recipient shall insert the following clause, or its substance, in its agreement with the Designated Subrecipient:

"The recipient reserves the right to terminate this [Agreement/Contract] or take other appropriate measures if the [Subrecipient] or a key individual of the [Subrecipient] is found to have been convicted of a narcotic offense or to have been engaged in drug trafficking as defined in 22 CFR Part 140."

RAA.11 INVESTMENT PROMOTION (NOVEMBER 2003)

a. Except as specifically set forth in this award or otherwise authorized by USAID in writing, no funds or other support provided hereunder may be used for any activity that involves investment promotion in a foreign country.

b. In the event the recipient is requested or wishes to provide assistance in the above area or requires clarification from USAID as to whether the activity would be consistent with the limitation set forth above, the recipient must notify the Agreement Officer and provide a detailed description of the proposed activity. The recipient must not proceed with the activity until advised by USAID that it may do so.

c. The recipient must ensure that its employees and subrecipients and contractors providing investment promotion services hereunder are made aware of the restrictions set forth in this clause and must include this clause in all contracts and other subagreements entered into hereunder.

RAA.12 REPORTING HOST GOVERNMENT TAXES (JUNE 2012)

a. By April 16 of each year, the recipient must submit a report containing:

- (1) Contractor/recipient name.
- (2) Contact name with phone, fax and e-mail.
- (3) Agreement number(s).
- (4) The total amount of value-added taxes and customs duties (but not sales taxes) assessed by the host government (or any entity thereof) on purchases in excess of \$500 per transaction of supplies, materials, goods or equipment, during the 12 months ending on the preceding September 30, using funds provided under this contract/agreement.
- (5) Any reimbursements received by April 1 of the current year on value-added taxes and customs duties reported in (iv).
- (6) Reports are required even if the recipient did not pay any taxes or receive any reimbursements during the reporting period.
- (7) Cumulative reports may be provided if the recipient is implementing more than one program in a foreign country.

b. Submit the reports to:

Office of Financial Management
USIAD/RDMA
63 Wireless Road
Lumpini, Pathumwan
Bangkok 10330

c. Host government taxes are not allowable where the Agreement Officer provides the necessary means to the recipient to obtain an exemption or refund of such taxes, and the recipient fails to take reasonable steps to obtain such exemption or refund. Otherwise, taxes are allowable in accordance with the Standard Provision, "Allowable Costs," and must be reported as required in this provision.

d. The recipient must include this reporting requirement in all applicable subagreements, including subawards and contracts.

RAA.13 FOREIGN GOVERNMENT DELEGATIONS TO INTERNATIONAL CONFERENCES (JUNE 2012)

U.S. Government funds under this award must not be used to finance the travel, per diem, hotel expenses, meals, conference fees or other conference costs for any member of a foreign government's delegation to an international conference sponsored by a multilateral organization, as defined below, unless approved by the Agreement Officer in writing.

b. Definitions:

(1) A foreign government delegation is appointed by the national government (including ministries and agencies but excluding local, state and provincial entities) to act on behalf of the appointing authority at the international conference. A conference participant is a delegate for the purposes of this provision, only when there is an appointment or designation that the individual is authorized to officially represent the government or agency. A delegate may be a private citizen.

(2) An international conference is a meeting where there is an agenda, an organizational structure, and delegations from countries other than the conference location, in which country delegations participate through discussion, votes, etc.

(3) A multilateral organization is an organization established by international agreement and whose governing body is composed principally of foreign governments or other multilateral organizations.

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(1) A foreign government delegation is appointed by the national government (including ministries and agencies but excluding local, state and provincial entities) to act on behalf of the appointing authority at the international conference. A conference participant is a delegate for the purposes of this

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RAA.14 RESERVED

RAA.15 RESERVED

RAA.16 RESERVED

RAA.17 USAID DISABILITY POLICY - ASSISTANCE (DECEMBER 2004)

- a. The objectives of the USAID Disability Policy are (1) to enhance the attainment of United States foreign assistance program goals by promoting the participation and equalization of opportunities of individuals with disabilities in USAID policy, country and sector strategies, activity designs and implementation; (2) to increase awareness of issues of people with disabilities both within USAID programs and in host countries; (3) to engage other U.S. government agencies, host country counterparts, governments, implementing organizations and other donors in fostering a climate of nondiscrimination against people with disabilities; and (4) to support international advocacy for people with disabilities. The full text of the policy paper can be found at the following website:

http://pdf.dec.org/pdf_docs/PDABQ631.pdf

- b. USAID therefore requires that the recipient not discriminate against people with disabilities in the implementation of USAID funded programs and that it make every effort to comply with the objectives of the USAID Disability Policy in performing the program under this grant or cooperative agreement. To that end and to the extent it can accomplish this goal within the scope of the program objectives, the recipient should demonstrate

a comprehensive and consistent approach for including men, women and children with disabilities.

RAA.18. RESERVED

RAA.19 RESERVED

RAA.20 RESERVED

RAA.21 RESERVED

RAA.22 CENTRAL CONTRACTOR REGISTRATION AND UNIVERSAL (OCTOBER 2010)

a. Requirement for Central Contractor Registration (CCR). Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently, if required by changes in your information or another award term.

b. Requirement for Data Universal Numbering System (DUNS) numbers. If you are authorized to make subawards under this award, you:

(1) Must notify potential subrecipients that no entity (see definition in paragraph c. of this award term) may receive a subaward from you unless the entity has provided its DUNS number to you.

(2) May not make a subaward to an entity unless the entity has provided its DUNS number to you.

c. Definitions. For purposes of this award term:

(1) Central Contractor Registration (CCR) means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the CCR Internet site (currently at www.ccr.gov).

(2) Data Universal Numbering System (DUNS) number means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business

entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at fedgov.dnb.com/webform).

(3) Entity, as it is used in this award term, means all of the following, as defined at 2 CFR 25, subpart C:

- (i) A governmental organization, which is a State, local government, or Indian tribe;
- (ii) A foreign public entity;
- (iii) A domestic or foreign nonprofit organization;
- (iv) A domestic or foreign for-profit organization; and
- (v) A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

(4) Subaward:

- (i) This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
- (ii) The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. --.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").
- (iii) A subaward may be provided through any legal agreement, including an agreement that you consider a contract.

(5) Subrecipient means an entity that:

- (i) Receives a subaward from you under this award; and
- (ii) Is accountable to you for the use of the Federal funds provided by the subaward.

ADDENDUM (JUNE 2012):

Exceptions. The requirements of this provision to obtain a Data Universal Numbering System (DUNS) number and maintain a current registration in the Central Contractor Registration (CCR) do not apply, at the prime award or subaward level, to:

- (1) Awards to individuals

(2) Awards less than \$25,000 to foreign recipients to be performed outside the United States (based on a USAID determination)

(3) Awards where the Agreement Officer determines, in writing, that these requirements would cause personal safety concerns.

b. This provision does not need to be included in subawards.

RAA.23 REPORTING SUBAWARDS AND EXECUTIVE COMPENSATION (OCTOBER 2010)

a. Reporting of first-tier subawards.

(1) Applicability. Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates \$25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5) for a subaward to an entity (see definitions in paragraph e. of this award term).

(2) Where and when to report.

(i) You must report each obligating action described in paragraph a.(1) of this award term to www.fsrs.gov.

(ii) For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

(3) What to report. You must report the information about each obligating action that the submission instructions posted at www.fsrs.gov specify.

b. Reporting Total Compensation of Recipient Executives.

(1) Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if -

(i) The total Federal funding authorized to date under this award is \$25,000 or more;

(ii) In the preceding fiscal year, you received—

(A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(iii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at www.sec.gov/answers/excomp.htm.)

(2) Where and when to report. You must report executive total compensation described in paragraph b.(1) of this award term:

(i) As part of your registration profile at www.bpn.gov/ccr.

(ii) By the end of the month following the month in which this award is made, and annually thereafter.

c. Reporting of Total Compensation of Subrecipient Executives.

(1) Applicability and what to report. Unless you are exempt as provided in paragraph d. of this award term, for each first-tier subrecipient under this award, you must report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—

(i) In the subrecipient's preceding fiscal year, the subrecipient received—

(A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

(ii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at www.sec.gov/answers/execomp.htm.)

(2) Where and when to report. You must report subrecipient executive total compensation described in paragraph c.(1) of this award term:

(i) To the recipient.

(ii) By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (for example, between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions.

If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report:

(1) Subawards, and

(2) The total compensation of the five most highly compensated executives of any subrecipient.

e. Definitions.

For purposes of this award term:

(1) Entity means all of the following, as defined in 2 CFR 25:

- (i) A governmental organization, which is a State, local government, or Indian tribe;
- (ii) A foreign public entity;
- (iii) A domestic or foreign nonprofit organization;
- (iv) A domestic or foreign for-profit organization; and
- (v) A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

(2) Executive means officers, managing partners, or any other employees in management positions.

(3) Subaward:

(i) This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.

(ii) The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. __.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").

(iii) A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.

(4) Subrecipient means an entity that:

(i) Receives a subaward from you (the recipient) under this award; and

(ii) Is accountable to you for the use of the Federal funds provided by the subaward.

(5) Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(i) Salary and bonus.

(ii) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(iii) Earnings for services under nonequity incentive plans. This does not include group life, health, hospitalization, or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.

(iv) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(v) Above-market earnings on deferred compensation which is not tax-qualified.

(vi) Other compensation, if the aggregate value of all such other compensation (for example, severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

RAA.24 PATENT REPORTING PROCEDURES (JULY 2012)

As incorporated by 22 CFR 226.36 and the standard provision "APPLICABILITY OF 22 CFR PART 226," the clause at 37 CFR 401.14 ("Patent Rights (Small Business Firms and Nonprofit Organizations)") is incorporated by reference into this award as if set forth in full text. The recipient must use the National Institutes of Health EDISON Patent Reporting and Tracking system (<http://www.iedison.gov>) to fulfill its disclosure obligations under 37 CFR 401.14(c)(1). The recipient must also submit reports on utilization of subject inventions annually to the Agreement Officer's Representative under 37 CFR 401.14(h), and the last report must be provided within 90 days of the expiration of the agreement.

RAA.25 RESERVED

ATTACHMENT D: MARKING PLAN

EcoHealth Alliance (EHA) will ensure that the IDEEAL Project and any sub-awardees under this cooperative agreement follow the branding and marking plan outlined below.

(1) Positioning

Name of Program: IDEEAL

Where appropriate the name is accompanied by USAID Logo, EHA Logo, Sub-grantee logo.

(2) Program Communications and Publicity

Primary Audience: Members of the National, State and local governments, community-based leaders, local community members and civil society organizations where the IDEEAL project is active. Focus will be on stakeholders ranging from local individuals to highest levels of Government of both genders. Communication materials for these target groups will range from posters to reports, media such as TV, radio, and press presentations.

Secondary Audience: International community, Governments, bi-lateral and multi-laterals donors, NGOs, and other actors working on emerging infectious diseases, land-use planning, forest and wildlife management, climate change, and community engagement.

Main Program Message: A diverse range of stakeholders can benefit from the development and utilization of models which capture gender sensitive emerging infectious disease-related health savings as a function of land use to help promote reduced-impact land utilization by governments, private sector stakeholders and civil society.

Press and Promotional Activities: In all USAID-funded and related activities, the IDEEAL Program, our collaborators and sub-awardees will consistently undertake the following steps to highlight USAID's collaboration and support:

- A) **TEXTUALLY:** EHA and sub-awardees and their partners will include references to USAID support in press releases, websites, publications and fact sheets relating to IDEEAL Program activities.
- B) **VERBALLY:** EHA and its partners will ensure that USAID is publicly credited in speeches, public presentations, training workshops, and community meetings when referencing project activities.

- C) **VISUALLY:** The USAID identity will be prominently displayed on all written reports regarding USAID-funded activities, with the same size as other logos to be included (i.e. EHA and sub-awardees). USAID, EHA and sub-awardees will be included as follows: USAID will always be placed in the upper or lower left, and EHA and sub-awardees on the far right. English versions of the USAID logo will be used on reports, publications and materials. Materials produced will be pre-reviewed by the USAID Communications Officer or other USAID-designated person. If pre-review is not possible, the communications disclaimer will be placed clearly as outlined in the USAID Branding policy.
- D) **IN MEDIA:** the USAID Communications Officer and AOR will be notified of all public events, workshops and activities at least two weeks in advance of the scheduled event. Host country and international press will be engaged at all possible opportunities. USAID will be acknowledged at all media events and reporting on the activities of the project. Media coverage of the work may include local radio, local TV, international TV, film, webcasts and reporting, magazines, and radio.
- E) **PHOTOS and STORIES:** Success stories and high quality, captioned digital photos will be provided at each reporting event. Noteworthy or especially interesting stories and photos will be sent to the USAID Communications Officer and AOR punctually.

(3) Acknowledgements

EHA and sub-awardees will acknowledge local Governments and their Ministries as appropriate (i.e. Ministries of Environment, Health, Agriculture, Wildlife Conservation, Tourism, etc.) as they collaborate in implementation of the various project activities. EHA and sub-awardees will co-brand jointly-produced materials and activities, where appropriate, and consistent with USAID and local government requirements.

We will acknowledge other donors for jointly funded activities and materials.

We will acknowledge other institutions for jointly-implemented, -funded and -produced materials as appropriate. Other organizations with whom we will be engaged in selected activities will be acknowledged.

Marking Plan

Description of communications, commodities, and program materials	How Labeled	Where Labeled	Exceptions to Labeling
Equipment	USAID identity, EHA or sub-awardees identity and inventory number	USAID and EHA or sub-awardees prominently and together	none
Selected Infrastructure used for project activities	Signs with USAID identity, EHA or sub-awardees identities and local government	USAID, EHA and sub-awardees prominently and together	none
Final programmatic report	USAID identity, EHA and sub-awardees identities	USAID upper or lower left, same size as other partners	none
Specific activity reports	USAID, EHA and sub-awardees	USAID upper or lower left, same size as other partners	none
Training materials, brochures, and toolkits	USAID, EHA and sub-awardees	USAID upper or lower left, same size as or larger than other partners	none
Project website	USAID identity, EHA and sub-awardees	USAID-listed, with other partners and donors (i.e. EHA and sub-awardees) same size text	none

MEMORANDUM OF NEGOTIATION

I. GENERAL

RECIPIENT : EcoHealth Alliance, Inc.
AGREEMENT NO. : AID-486-A-13-00005
GLAAS NO. : REQM-486-19-000013
MODIFICATION NO. : Five (5) (b)(4)
AGREEMENT PERIOD : 09/17/2013– 02/28/2019(as amended)
TOTAL ESTIMATED AMOUNT : (b)(6)
AMOUNT OBLIGATED : \$2,499,147.00
COGNIZANT TECHNICAL OFFICER : (b)(6) USAID/RDMA (b)(6)
NEGOTIATOR : (b)(6)
REGIONAL AGREEMENT OFFICER : (b)(6)
AUTHORIZATION : Foreign Assistance Act of 1961, as amended,
Executive Order 11223, and the Federal Grant &
Cooperative Agreement Act of 1977 (P.L. 95-224)

II. PURPOSE:

The purpose of this modification is to extend the completion date of the agreement from November 30, 2018 to February 28, 2019.

All other terms and conditions in the agreement remain the same and in full force.

III. DISCUSSION:

The Infectious Disease Emergence and Economics of Altered Landscapes (IDEAL) award was designed to quantify the disease regulatory value of ecosystems, and apply an informed economic analysis to land use decision making. Following a series of re-engagements with Thailand's Ministry of Public Health associated with delays in accessing malaria data required for the modeling, the Deputy Chief of Party requested a no-cost extension in person to the AOR on September 25th to accommodate data acquisition and associated work plan activities.

Delays in accessing requisite malaria incidence data in Thailand have precluded finalization of economic modeling and analyses, core components of the approved work plan. Although the formal request to the Thailand Ministry of Public Health ethical review committee for access to this data was made in May 2018, a 4-month period ensued requiring multiple re-engagements with the cognizant Bureau overseeing vector borne disease data access. In mid-October, the Bureau granted EcoHealth Alliance ethical approval for use of the malaria data. Thai MoPH has indicated they will authorize release of the data upon receipt of a signed letter from the partner to Thai MoPH, which, as of

November 1, 2018, has been issued. Data access is expected within November 15th, 2018. Thai data and analytics will additionally be utilized to validate modeling and analyses in Peninsular Malaysia and Sarawak. As such, an additional three-month no-cost extension will enable completion of economic modeling and analyses in Thailand, Peninsular Malaysia, and Sarawak; final preparation of a manuscript for peer-review publication; and final capacity building trainings in economic modeling using R (an open-source data processing, analytic, and statistics program) both in Thailand and Malaysia as well as formal project close out at the Development and Health Research Unit in Malaysia.

The justification and breakdown of remaining funding anticipated under the no-cost extension was presented in the memorandum from the AOR to the AO requesting approval for a no-cost extension. The memorandum was approved by the AO on November 5, 2018. Other necessary mission clearances have been received and saved to the file. The technical office then released the REQM to the negotiator on November 19, 2018 and a modification was drafted. The recipient signed the modification on November 20, 2018. The GLAAS action was completed on November 28, 2018.

IV. COMPETITION:

This action is a no cost extension action so it does not trigger any competition.

V: ADMINISTRATIVE DETAILS

Legislative and Public Affairs: No notification is required since this is an administrative modification.

Lobbying Certification: Since this modification does not involved increasing funds over \$200,000 no certification is required.

SAM, OFAC and UN Sanction List were checked as per USAID policies for any negative findings and nothing was indicated.

VI. RECOMMENDATION

Based on the foregoing, this cooperative agreement modification to EcoHealth to extend the completion date is recommended for award.

Recommended by:

(b)(6) (4)

Date: 11/28/18

Approved by:

(b)(4) (b)(6)

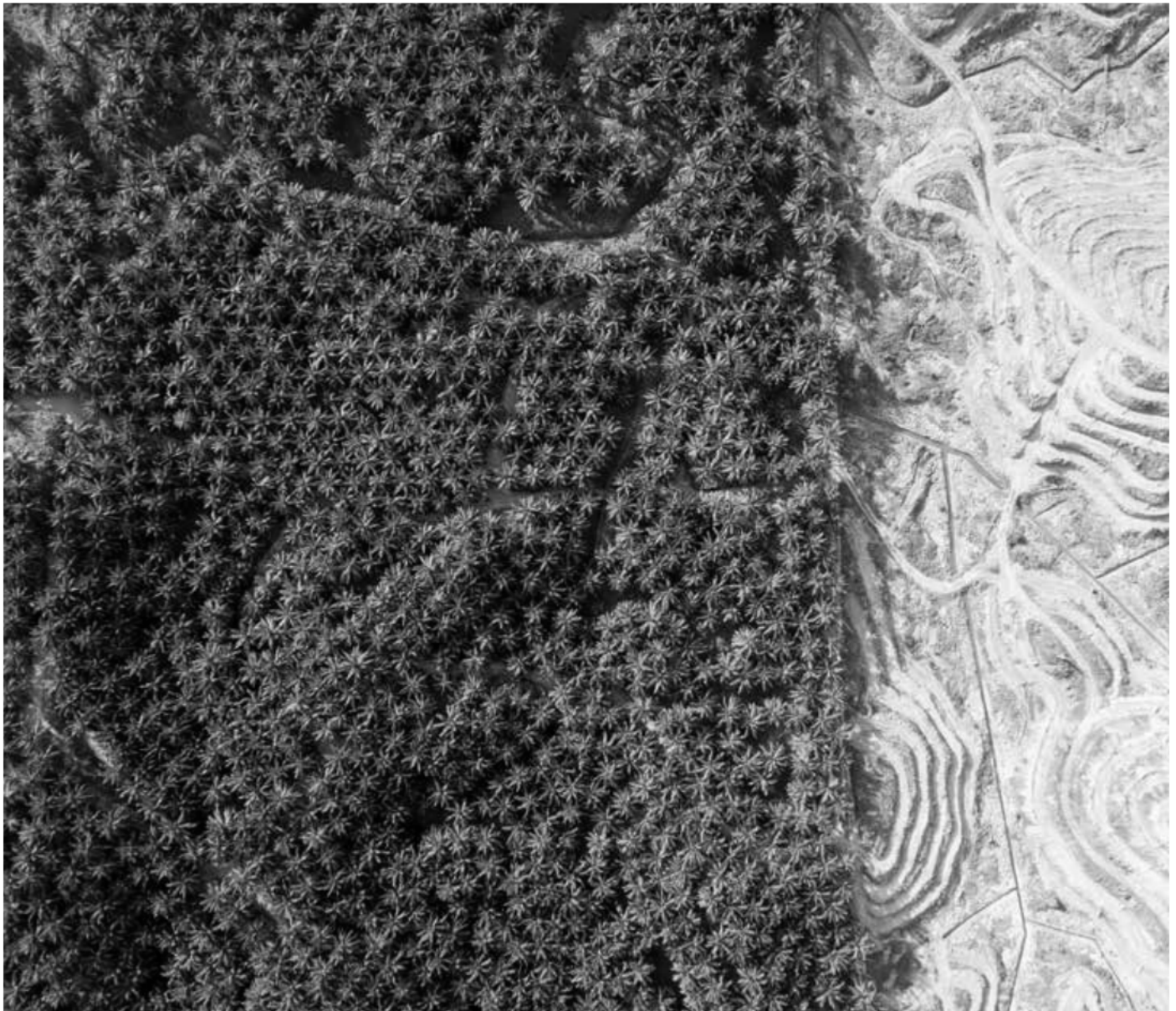
Date: 11-28-18



USAID
FROM THE AMERICAN PEOPLE



**EcoHealth
Alliance**



FINAL REPORT

INFECTIOUS DISEASE EMERGENCE AND
ECONOMICS OF ALTERED LANDSCAPES



USAID
FROM THE AMERICAN PEOPLE

INFECTIOUS DISEASE EMERGENCE AND ECONOMICS OF ALTERED LANDSCAPES (IDEEAL)

FINAL REPORT

**This document was produced for review
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This report in the form of a PDF can be viewed and downloaded at
www.ecohealthalliance.org



Activity Start Date And End Date:

October 15, 2013 - February 28, 2019

Name of Prime Implementing Partner:

EcoHealth Alliance

[Contract/Agreement] Number:

AID-486-A-13-00005

Major Counterpart Organizations

Faculty of Medicine and Health Sciences
Universiti Malaysia Sabah,
Sabah Wildlife Department,
Sabah State Health Department,
Ministry of Public Health Thailand,
Faculty of Forestry Kasetsart University,
Mahidol - Oxford Tropical Medicine Research Unit

Geographic Coverage(cities and or countries)

Malaysia, Thailand, Indonesia

Reporting Period:

October 15, 2013 - February 28, 2019

[COR/AOR] Name:

Daniel Schar

Submitted by:

Peter Daszak, Chief of Party
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**EcoHealth
Alliance**

USAID-00475



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LIST OF ACRONYMS

INFECTIOUS DISEASE EMERGENCE AND ECONOMICS OF ALTERED LANDSCAPES (IDEEAL)

BOE DDC MPH

Bureau of Epidemiology,
Department of Disease Control,
Ministry of Public Health Thailand

BCI

BC Initiative

BMHRC

Borneo Medical and Health
Research Centre

BVD

Bureau of Vector Borne Diseases,
Ministry of Public Health Thailand

CBD - COPI3

Convention on Biological Diversity-
Conference of the Parties

CEO

Chief Executive Officer

COP

Chief of Party

DHRU

Development and Health Research
Unit

DFHC

DEEP FOREST Human Contact

DGFC

Danau Girang Field Centre

DVS

Department of Veterinary Services
Malaysia

DWNP

Department of Wildlife and National
Parks Peninsular Malaysia

DNPWPC

Department of National Parks,
Wildlife and Plant Conservation,
Thailand

DCOP

Deputy Chief of Party

EHA

EcoHealth Alliance

EID

Emerging Infectious Disease

EM

Economic Modeler

FBE UMS

Faculty of Business and Economics,
Universiti Malaysia Sabah

FMHS UMS

Faculty of Medical and Health
Sciences, Universiti Malaysia Sabah

GDP

Gross Domestic Product

ICID

International Congress on
Infectious Diseases

IPBES

Plenary of the
Intergovernmental Science-Policy
Platform on Biodiversity and
Ecosystem Services

IRB

Institutional Review Board

J&J

Johnson & Johnson

KKPHL

Kota Kinabalu Public Health
Laboratory

KU

Kasetsart University

M&E

Monitoring and Evaluation

MOH

Ministry of Health

MOPHT

Ministry of Public Health Thailand

MORU

Mahidol - Oxford Tropical
Medicine Research Unit

MPOC

Malaysian Palm Oil Council

MPOB

Malaysian Palm Oil Board

NASA

National Aeronautics
and Space Administration

NGO

Non-Governmental Organization

PACOS

Partners of Community
Organisations Sabah Trust

PMAC

Prince Mahidol Award Ceremony

RDMA

Regional Development Mission
for Asia

RSPO

Roundtable on Sustainable
Palm Oil

RTM

Radio Television Malaysia
(Broadcast Channel)

SCL

Stakeholder Coordination Lead

SEDIA

Sabah Economic and Development
and Investment Authority

SFD

Sabah Forestry Department

SLSD

Sabah Land and Survey
Department

SM

Senior Modeler

SSHD

Sabah State Health Department

SWD

Sabah Wildlife Department

TEEB

The Economics of Ecosystems
and Biodiversity

TRC-EID

Thai Red Cross Emerging Infectious
Diseases - Health Science Centre

UMS

Universiti Malaysia Sabah

USAID

United States Agency for
International Development

USGS

United States
Geological Survey

UITM

Universiti Teknologi MARA

WRU

Wildlife Rescue Unit

WWF

World Wide Fund for Nature



EXECUTIVE SUMMARY

EcoHealth Alliance's Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL) project began in October 2013. The primary objective of IDEEAL was to quantify the economic costs of the impact of deforestation on malaria outcomes in Sabah, Malaysia, and determine the optimal amount of land to be converted to agriculture that minimized these costs. In the second phase of the project, research expanded to Peninsular Malaysia, Thailand, and in a limited capacity, Indonesia and Sarawak (on Malaysian Borneo). Local communities, private entities, and local and international governments were involved throughout the project, and informed about the project process and outcomes over the course of the project. Baseline and end line surveys were collected to determine knowledge about relevant topics in conservation and health.

IDEEAL examined how different ecological and land use change variables impacted the number of malaria cases in each location. The results showed that these variables differed across regions and timescales, ranging from precipitation to amount of flood, forest, or cropland. When considering the link between deforestation and malaria, the IDEEAL economic model indicates that Sabah, Malaysia has exceeded the optimal amount for forest to agricultural land conversion. The economic loss from the overdeveloped amount of forest cover from the social optimal today exceeds US\$21M annually. In all sites in South East Asia, including health costs in land use planning substantially lowered the optimal level of converted land.

The IDEEAL project also supported the founding of the Development and Health Research Unit (DHRU) at the Universiti Malaysia Sabah. The DHRU functions as a center of excellence for research and education on the intersection of health, land use change, and economics. Furthermore, IDEEAL supported three Master's students and the training of 156 stakeholders on the following topics: R, a statistical program; GIS mapping techniques;

and our IDEEAL Interactive Web Modeling App. 42% of these were women. To support the dissemination of the results, a Position Paper summarizing this research has been developed and will be presented to the Sabah Cabinet on behalf of Sabah Wildlife Department and Sabah State Health Department. Additionally, the IDEEAL project and its results have been presented by scientists at 12 conferences and in two peer-reviewed journal articles.





BACKGROUND & CONTEXT

Emerging Infectious Diseases and Land Use Change

Over the past three centuries, land-use change has grown exponentially to keep pace with human population growth and the subsequent demand for natural resources¹⁻³. Intact forests provide invaluable benefits to people and our planet, including water filtration, carbon storage and sequestration, flood prevention, biodiversity conservation,

and the maintenance of human health and welfare. Although changes in land-use practices have benefited people through economic and social development, they have also led to long-term negative impacts on human health and the provision of ecosystem services. Critically, there is increasing evidence that land-use change is a major driver of emerging infectious diseases (EIDs)^{4,5}. Previous analyses demonstrate that over 30% of the EIDs affecting people are causally linked to land use change (**FIGURE 1**)^{6,7}. This includes deadly diseases such as HIV/AIDS, Ebola, and Zika Virus; all of which originated in

PRIMARY DRIVERS OF PAST DISEASE EMERGENCE

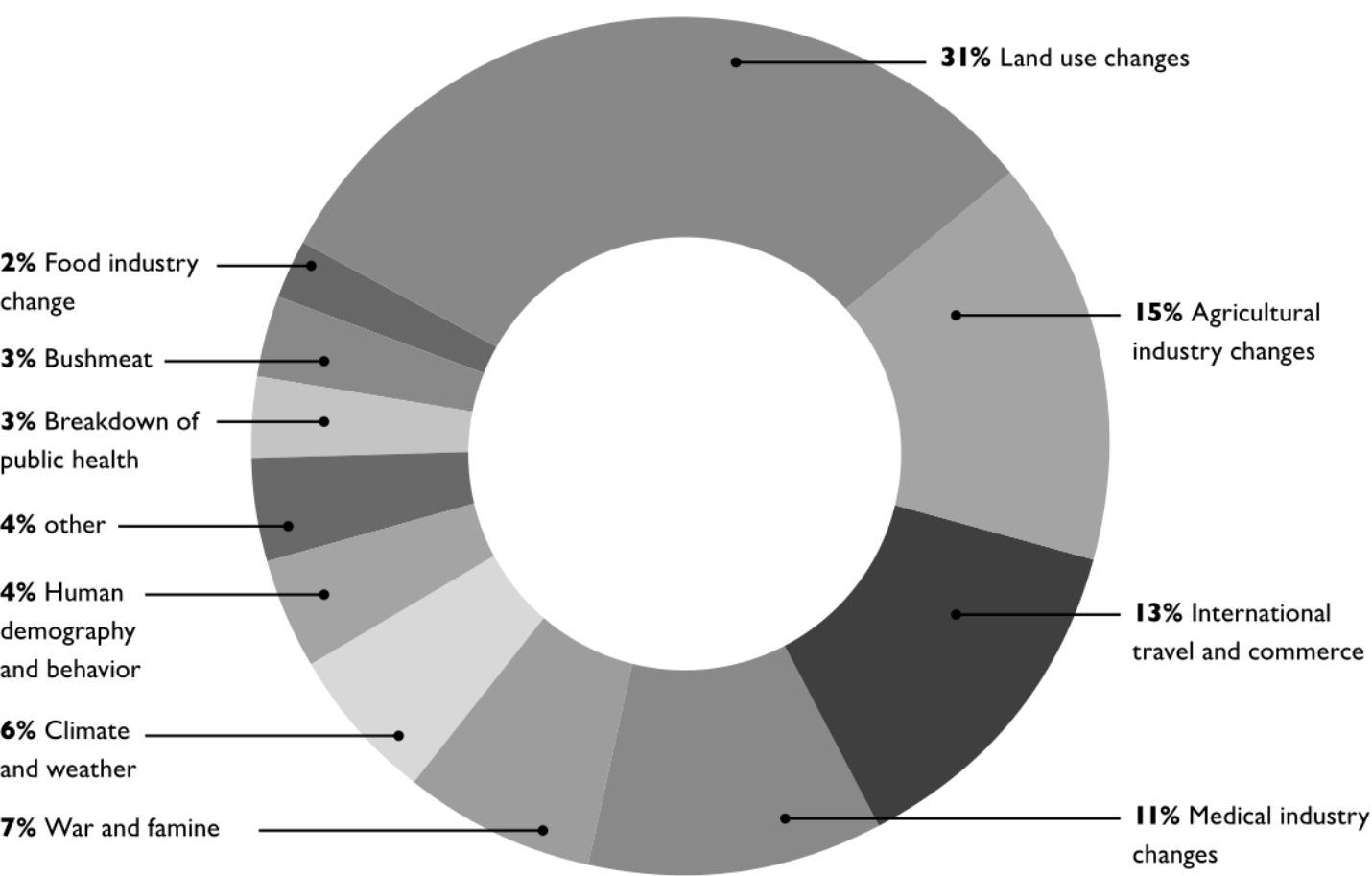


FIGURE 1: Approximately 31% of the infectious diseases that have originated in wildlife since 1940 have been related to some form of land use change. Primary drivers of past disease emergence. Land use change is the most important driver. Derived (6, 7)

altered forest landscapes. The impact of EIDs on human and livestock health is significant, with single outbreaks (e.g. HIV/AIDS, West African Ebola) leading to substantial mortality and morbidity, and some causing significant economic impact (e.g. the 2003 SARS outbreak which led to ~US\$10-30 billion economic damages at 2003 values)⁸. These impacts are in addition to the public health burden of endemic diseases, many of which (e.g. leptospirosis, malaria) are linked to altered forest landscapes or have heightened impact on communities living in them⁹⁻¹².

**THESE FINDINGS UNDERPIN
THE RATIONALE FOR THE
IDEEAL PROJECT.**

**If land use change is associated
with increased impact from
endemic and emerging infectious
diseases, then the economic
damages from these diseases
should be considered in assessing
the natural capital of intact
forests, and the ultimate cost
of land use change.**



FIGURE 2: *Geographic focus of the IDEEAL Project.*

Area of Focus: Southeast Asia

The IDEEAL project initially focused on Sabah, Malaysia as a pilot site, then expanded to Peninsular Malaysia and Thailand, with limited engagement in Sarawak and Indonesia during the project extension (**FIGURE 2**)¹³. Sabah was selected because it is an emerging disease hotspot and a location with high biological diversity and substantial land use change^{13,14} (**FIGURE 3**). Much of the recent land transition in Sabah was in the form of deforestation of pristine forests for palm oil plantation development. In **FIGURE 4** we can see that palm oil plantations have increased considerably since 2000. The cultivated land area of 1.4M ha in 2011 in Sabah. This type of land use change informed the bulk of our modeling approach. Expansion to Thailand, Indonesia and other regions was guided by similar principles — determining areas with land use change where the potential for novel disease emergence is high. In high engagement sites (Sabah, Peninsular Malaysia, and Thailand), links between land use change and health were analyzed, models assessing the economic impact of land use change on malaria and emerging infectious diseases were created, and capacity building and community engagement activities were carried out. In limited engagement areas (Sarawak, Malaysia and Indonesia), activities were limited to selected modeling.

HOTSPOTS MAP

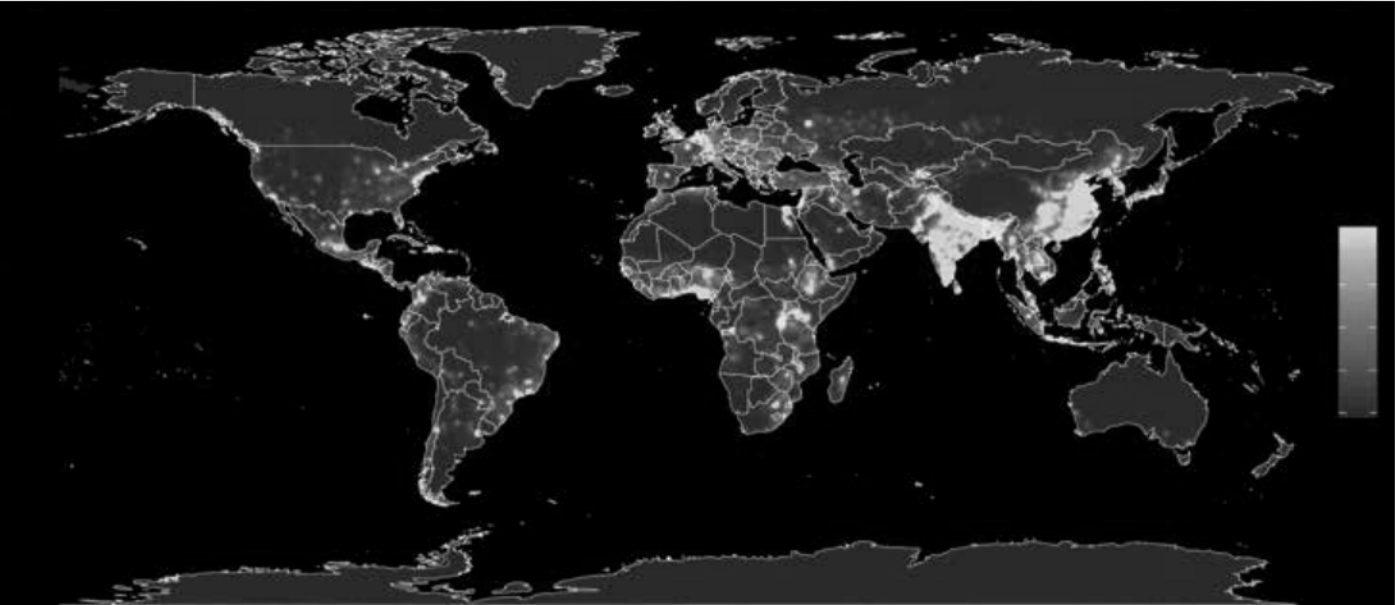


FIGURE 3: Global distribution of the relative risk of an emerging infectious disease event for wildlife zoonoses.¹³

HISTORIC SABAH OIL PALM PLANTATIONS (1975–2011)

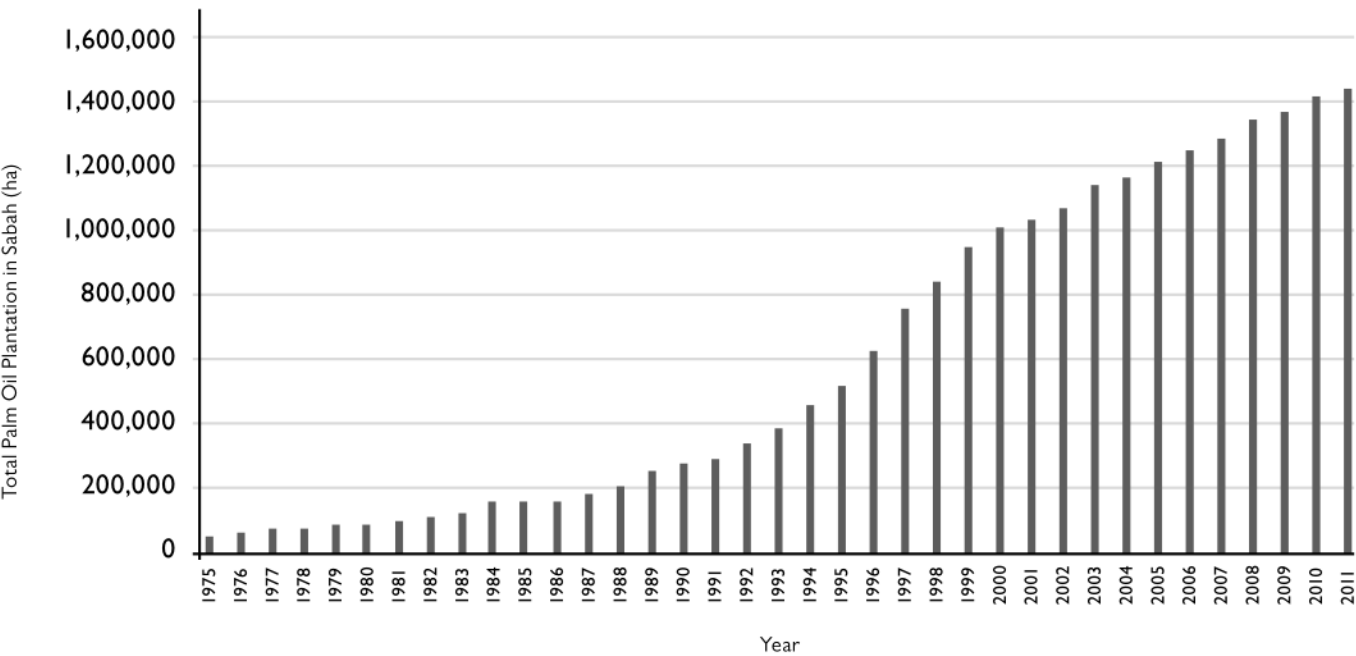


FIGURE 4: Number of hectares of oil palm plantation in Sabah between 1975 - 2011.



TASK I:

▶ QUANTITATIVE MODELS:
INFECTIOUS DISEASES
AND LAND USE CHANGE

Modeling Overview

KEY MODELING OUTPUTS

► **Assessed the potential links between malaria and land use change** in Sabah, Peninsular Malaysia, Sarawak, and Thailand.

- Our findings suggest a strong link between land conversion and malaria incidence. However, the primary drivers are different across countries in Southeast Asia and also vary depending on the year.
- In Sabah (a state in Malaysian Borneo), high caseloads of malaria were associated with increased forest fragmentation, decreased forest cover, and precipitation.
- This differed in Sarawak (a state in Malaysian Borneo), where, in addition to precipitation, malaria drivers are associated with water availability such as the presence of water bodies or flood-prone areas.
- Peninsular Malaysia malaria cases are associated with modification of habitat for agriculture, such as presence of irrigated croplands, urban areas, patch density of shrubs, and patch density of irrigated croplands.
- In Thailand, malaria is linked to changes in total forest cover and density of shrub and croplands.

► **Estimated Southeast Asia specific ecosystem service values** for carbon sequestration for Malaysia, Thailand, and Indonesia.

- We determined that the net present value loss between 2015 and 2030 will exceed \$4.35 trillion USD if deforestation continues at business-as-usual rates based on a social cost of carbon value of \$100 USD.

► **Identified areas** in Sabah most **suitable for palm oil expansion** accounting for protected areas, key river systems, forest connectivity and accessibility.

- Found that while most development occurred in optimal areas for expansion, plantation development has spread beyond those areas.
- Showed that different scenarios of fragmentation lead to different optimal conversion patterns.

► **Developed regional dynamic optimal control models** to determine the economically optimal rate of palm oil plantation conversion from forests over a 30-year span in Sabah, Peninsular Malaysia, and Thailand considering oil palm yield, oil palm prices, production costs, ecosystem services, and the cost of prevention, control, and public health from malaria in the region.

- Considering ecosystem service values and malaria costs in Sabah, actual rates of development have already outpaced the economically optimal rate of forest conversion to palm oil plantation, leading to an economic loss. Even when considering only private costs (excluding ecosystem services), development has occurred too quickly. When ecosystem services and the costs of infectious disease are included, this effect is even stronger and indicates that the current level of land conversion (> 25%) is approaching double the social optimum (~15%).
- In Peninsular Malaysia, consideration of infectious diseases costs and the value of ecosystem services reduces the optimal level of land conversion by 20%.
- In Thailand, the inclusion of health and ecosystem service values in the calculation of optimal land conversion suggests that the social optimum is much lower than the private optimum. Thailand's palm oil yields per hectare are lower than Malaysia's yields. The high costs from increased malaria rates, loss of ecosystem services, and comparatively low palm oil yields indicate that 25% less land should be developed.

LESSONS LEARNED:

DATA ACQUISITION

▶ One challenge the IDEEAL team encountered in the project was obtaining the data necessary for modeling, despite strong engagement from stakeholders across sectors with access to the data. Receiving approvals and data itself was more time-consuming than planned and led to some delays due to: data formatting (e.g. only paper copies or non-editable PDFs available); data availability with data for some years or regions data was not available; a lack of metadata, including missing variables needed to interpret or analyze the data (e.g. column definitions or spatial projection); data storage issues due to original data files stored across several different locations or lost entirely with no centralized repository or backup; and data permission issues where formal agreements and approvals were needed from multiple organizations or people prior to sharing the data. For example, in order to obtain detailed health and economic data on disease trends and disease treatment, members of the IDEEAL modeling team traveled to a hospital in Sabah to physically collect information directly from the paper records which were stored there and could not be moved or photocopied. Formal data sharing agreements and approvals often took longer than expected to process. Given the One Health nature of this study, there was sometimes little precedent for sharing data for this type of modeling. As a solution, the IDEEAL modeling team created an extensive list of the ideal datasets needed with information on the desired format, units and fields for the data, and any required metadata. The team then put together a simplified list of the *minimum* data required to conduct the modeling activities, with the aim of clarifying for partners what data was needed and how it would be used. We recommend that the process for any secondary data sharing begin as early as possible during future projects.

▶ Estimated the global economic loss from **potential EID outbreaks due to excessive** forest land conversion into agriculture

- The global annual economic loss from EIDs due to excessive forest land conversion was estimated between US\$18 and US\$52 billion annually (US\$4.2-US\$11.1 ag ha/year). That is equivalent to a present value of US\$602 (US\$536 - US\$1,553) billion in additional costs for the global economy over the next 30 years.

Data Acquisition

LITERATURE REVIEW

We performed a systematic literature review to understand the role of different factors related to the emergence and spread of malaria in our study area. Land use change has been directly linked to the emergence of infectious diseases¹⁵. However, there is an ongoing debate on the specific mechanisms that could explain the emergence of unknown diseases. Overall, our review showed that to assess the risk of infectious diseases it is necessary to understand three dynamic processes¹⁶: 1) environmental drivers, including land conversion; 2) vector and host biology such as the vector activity; and 3) human behavior and population.



Palm oil plantation.

DETERMINING DISEASES AND COMMODITIES OF INTEREST: MALARIA AND PALM OIL

Our literature review showed that multiple factors could be related to the incidence and spread of infectious diseases, but at the time of the review, there were no specific studies in Sabah. Therefore, we sought to specifically quantify the link between land use change and disease by selecting an infectious disease and examining its

relationship with land conversion after controlling for other factors hypothesized to be related to its occurrence such as climatic events and socioeconomic factors.

During the first year of the project, the IDEEAL modeling team met with key stakeholders in government, NGOs and academia to create a list of priority diseases in the region which had been linked or which had suspected links to land use or land use change (**TABLE 1**). This list was used as the potential list of diseases to use to quantify

TABLE 1:

DISEASES
Chikungunya
Cholera
Filiarisis
Japanese Encephalitis
Leprosy
Leptospirosis
Malaria
Melioidosis
TB

the links between land use change and health. Malaria was ultimately selected for a variety of reasons: several diseases (e.g. Japanese Encephalitis) were excluded because case counts were too low to sufficiently model over space and time; other diseases (e.g. cholera) had more limited practical or theoretical evidence bases linking them to land use change; and finally, many diseases did not have available case data at the spatial and temporal scales necessary to model.

Palm oil was the primary commodity of focus for IDEEAL's modeling and analysis. The bulk of forest transition in Malaysia in the past several decades has been due to development of oil palm plantations¹⁷. Past studies have examined the environmental impact of the palm oil industry as well as the positive economic benefits of development, making this the ideal system in which to examine how health and ecosystem services contribute to the economic benefits of this rapid development^{12,18,19}. All of the expansion regions are areas with palm oil plantations, though systems differ across regions (e.g. Thailand has a higher proportion of smallholder production systems). In the expansion regions beyond Sabah, additional commodities such as rubber were considered; however, palm oil remained the primary commodity for modeling.

PART A:

Analysis of Link Between Malaria and Land Use Change and Quantifying Ecosystem Services in the Region

RESULTS:

LAND USE CHANGE AND MALARIA

Previous research indicates an association between deforestation and increased malaria incidence^{10,20}. Here we analyzed links between malaria incidence and land use change (including deforestation) in Thailand, Peninsular Malaysia, Sabah, and Sarawak. We then used the results as biological parameters for the IDEEAL economic modeling.

We obtained data on malaria incidence from 2000 to 2014 from the Centers for Disease Control at Sabah State Health Department, from publicly available data for Peninsular Malaysia and Sarawak, and from the Bureau of Vector Borne Diseases Ministry of Public Health and the Mahidol - Oxford Tropical Medicine Research Unit in Thailand. These datasets were geocoded at the district level in Malaysia and at the province level in Thailand. We calculated an Incidence Index as the number of expected incidences of malaria proportional to the population in a given area for a given year controlled by human population size.

$$\text{Incidence Index} = \text{total incidences} * \frac{\text{population local}}{\text{population total}}$$

* Where total refers to the total number of cases in each Thailand, Sabah, Sarawak and Peninsular Malaysia. Local indicates the subdivisions associated with each aforementioned region.*

We identified three key factors from our literature review that could explain the observed patterns of malaria in the region: 1) land conversion and degradation; 2) human

THAILAND MAP 2012 (APPENDIX 3)

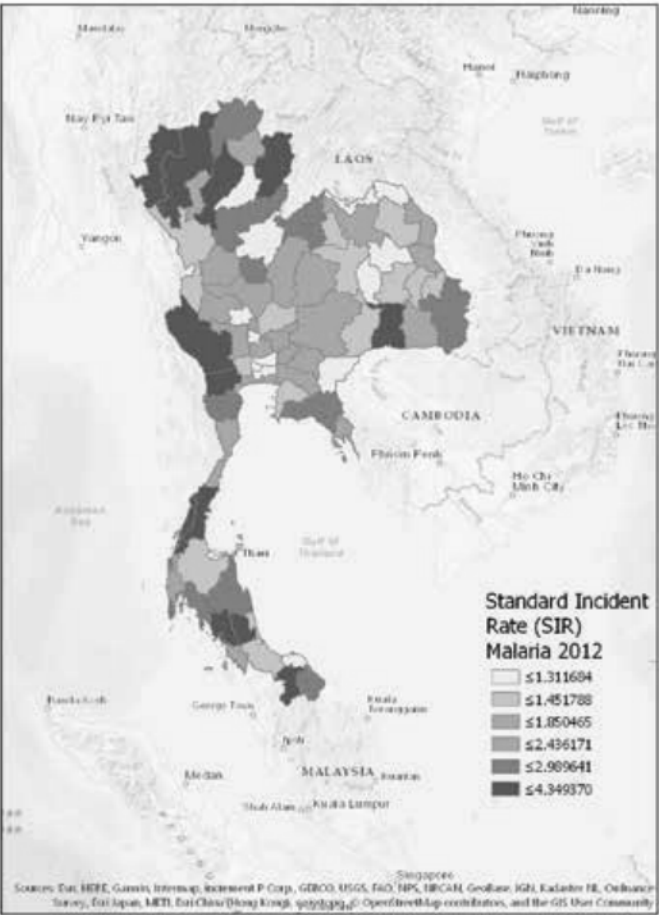


FIGURE 5: State level malaria risk in Thailand based on drivers of land use change in 2012.

demography; and 3) climatic variables. We used annual land cover maps produced by the European Space Agency (ESA) from 1992-2015 with a 300 m spatial resolution. We classified land cover following the Intergovernmental Panel on Climate Change (IPCC) categories. To incorporate ecologically relevant factors other than change in land use cover, we estimated a series of fragmentation metrics including the number of patches of land use cover in a state or district and the density of land use patches in a state or district.

We explored different statistical models to identify the drivers of malaria incidence, including Spatial Autoregressive Regressions (SAR), Random Forests and generalized additive models. Each statistical method has

LAND USE CHANGE AND MALARIA IN SABAH

The most important factors that drive malaria incidence in Sabah, Malaysia are related to land conversion and degradation. Specifically, reduction of the tree cover (broadleaved evergreen forest) and the increased density of patches of a mosaic of cropland and natural vegetation were consistently identified as the most important variables that could explain malaria incidence. Additional drivers, in decreasing importance, were precipitation and both the patch density and proportion of tree or shrub cover. Our results also showed that malaria risk varies over time, likely because development for palm oil plantations, and therefore the presence of deforested areas change every year. For example, the District of Beluran had consistently the highest risk of malaria between 2001 to 2003, whereas the Pensiangan District was the area with the highest risk of malaria from 2005 to 2008 (**FIGURE 6**).

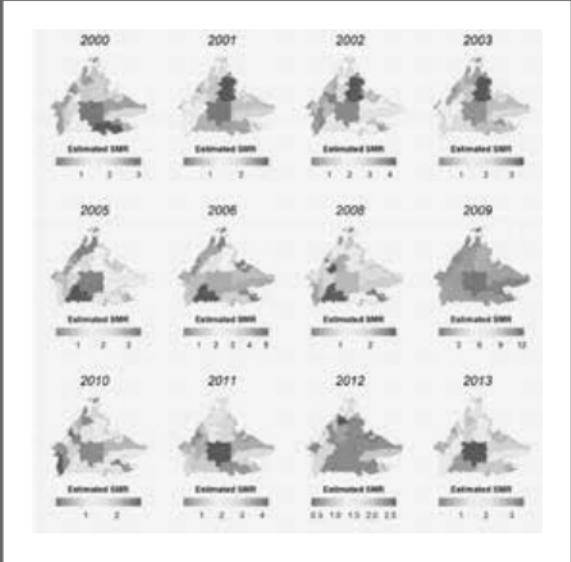


FIGURE 6: Modeled malaria incidence in Sabah, Malaysia. Red areas represent a high comparative risk of contracting malaria. For example, in 2001, people in the Beluran District (red) in north east Sabah were 3 times as likely to have malaria as those in Tongod District (blue) in central Sabah.

different assumptions and limitations, particularly with the interpretation of the results. Our final models made use of Random Forests, which is a machine learning algorithm that creates multiple random, uncorrelated decision trees to find the best possible answer. Our results showed that the land use change is an important factor explaining malaria incidence in the region. However, these factors differ between geographic areas of interest and over time. For example, while reduction in forest and increased fragmentation are the main drivers in Sabah, precipitation and water availability are more relevant in Sarawak. This is perhaps due to different deforestation history in these regions. Deforestation for palm oil plantations in Sarawak started in the 1970s, but is less extensive than in other parts of SE Asia. The effects of deforestation on malaria incidence might be in their early stages. Details on the modeling are shown in sidebar (**SEE PAGE 17**).

The risk of malaria varies across space and time. It is related to the extent of deforestation and fragmentation in each district, as well as the prevention measures adopted by each district (e.g. fumigation).

In Thailand, the short time span of available data made it difficult to identify trends for areas at risk for malaria.

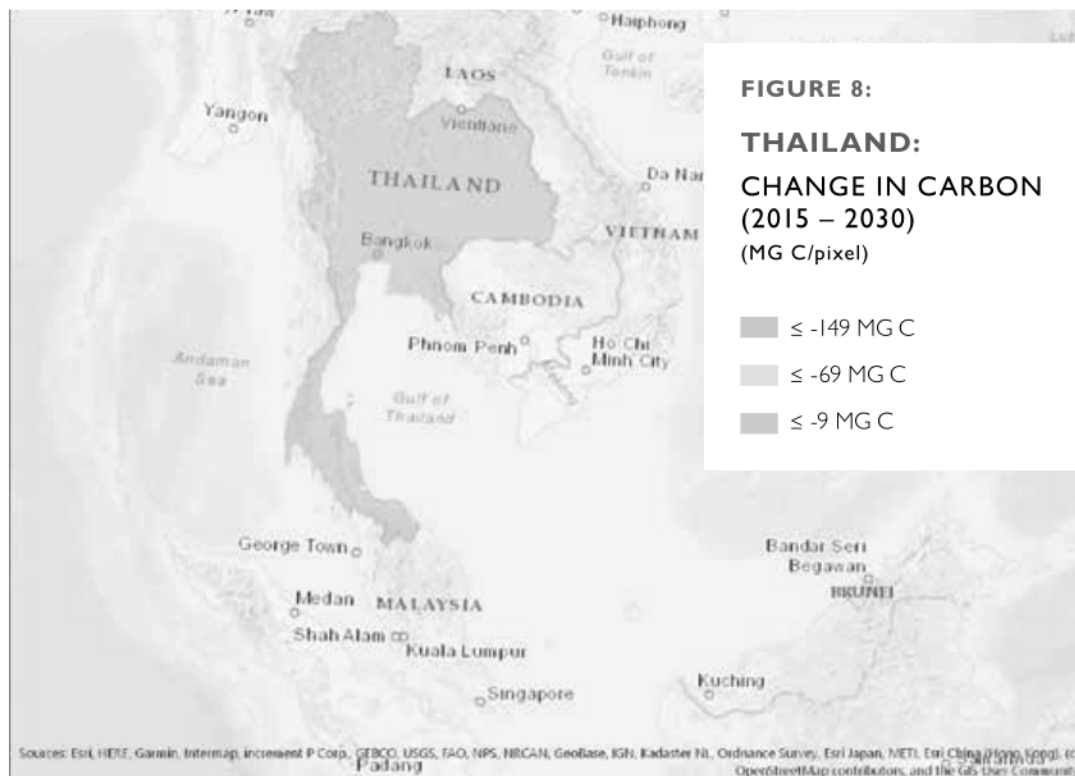
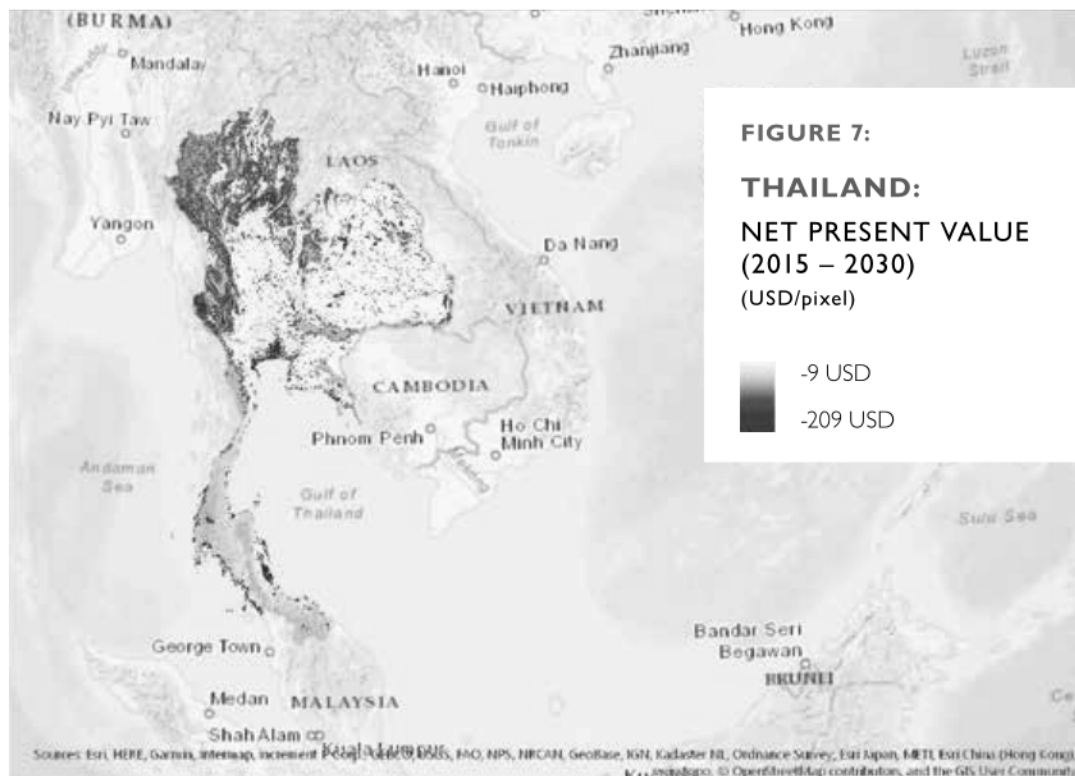
However, eastern and western regions seem to be at greater risk. Land use drivers most associated with malaria cases in Thailand include presence of predominantly deciduous forests, evergreen forests, density of urban areas and of irrigated cropland. **REFER TO APPENDIX 3 ON PAGE 74.**

The rate of deforestation in the state of Sarawak, Malaysia is lower than in Sabah. By 2011, around 11% of Sarawak had been converted to palm oil plantations, compared to the 27% of land in Sabah. Risk of malaria across Sarawak varies every year, likely because of prevention methods employed. Drivers of malaria incidence were related to climate and water availability, specifically to precipitation, salt water flood regions, water bodies and irrigated cropland. **REFER TO APPENDIX 3 ON PAGE 79.**

In Peninsular Malaysia, the risk of malaria appears to be greatest in the states of Perlis and Selangor, fluctuating by year. Land use types most associated with these risks include fresh water flood areas, urban regions, water bodies, tree shrubs, and irrigated cropland. **REFER TO APPENDIX 3 ON PAGE 79.**

GRADUATE STUDENT TRAINING

Developing future research talent in the field of public health, environmental science, and economics was a key aim of the IDEEAL project. Throughout the course of the project the IDEEAL team engaged more than a half dozen undergraduate, graduate interns, and research assistants and interns and sponsored an additional three masters students at the DHRU. These students applied skills across multidisciplinary fields learning about data cleaning, data analysis, health economics, survey analysis, spatial modeling, ecosystem services assessment and other topics. One such student was Katie Lee who worked closely with the IDEEAL team in developing the initial economic frameworks for preliminary analyses and assisting with the spatial algorithms used to determine the optimal areas of land for conversion. Dr. Lee currently works as an Assistant Professor at the Department of Agricultural Economics and Rural Sociology at University of Idaho.



FIGURES 7 & 8: Figure 7: The net present value of carbon in Thailand from a loss of \$9USD to \$209 USD per hectare. This is reflected in Figure 8, where the expected loss of carbon by 2030 ranges from 150 metric tons (orange) to 9 metric tons (purple).

RESULTS: INVEST ECOSYSTEM SERVICE MODELING

Carbon storage and sequestration are key ecosystem services which can further quantify the economic burden from land use change and have direct links to disease mitigation. An ecosystem service evaluation of future carbon loss was conducted to better understand the economic impact of deforestation in Southeast Asia. We used the InVEST Natural Capital tool to identify areas of future deforestation based on designated trends, as well as the net present value of carbon lost (**FIGURES 7 AND 8**). Areas closest to previously deforested areas were identified as the most likely to be removed. The loss of carbon from deforestation activity was then calculated from above- and below-ground, soil and leaf litter based on IPCC guidelines²¹. The net present value lost allows us to identify the monetary value of future environmental changes. We expect a net present value loss of \$4.35 trillion USD between 2015 and 2030, if the rate of deforestation in Malaysia, Indonesia, and Thailand continues at 2000 to 2015 rates. Indonesia is at greatest risk with the highest deforestation rate of all three countries, and a net present value loss of over \$4.2 trillion USD. The social cost of carbon is estimated at \$100USD/ metric ton carbon with a social discount rate of 3%²²⁻²⁴. **REFER TO APPENDIX 4: INVEST.**



Dr. Feferholtz presenting on environmental economics, land use change, and pollution.

PART B: Dynamic Optimization Modeling

RESULTS: SABAH AND THAILAND ECONOMIC MODELS

A local economic optimization model of Sabah was parameterized with data on malaria expenditures for 2015 collected from the Sabah State Health Department, data from Sime Darby production costs in Sabah, the ecosystem service value from the TEEB report, the results from our own analysis based on remote sensing data, and local datasets from Sabah, Malaysia between the years 2000 and 2014.

The data used in the economic model included 30 years of historical prices of crude palm oil (CPO) per metric ton and kernel price per metric ton as the average price for our model. Estimates of CPO, kernel oil, and yield per hectare, were provided by Sime Darby under a non-disclosure agreement and therefore not reported here, although those estimates were used for the modeling. Data on malaria treatment, including number of cases and direct costs, were directly obtained from the Sabah State Health Department.

The average total cost per patient was equal to US\$5,350 or US\$2.7 per capita (3.54 million inhabitants). This cost includes malaria treatment, vector control, operating budget dedicated to malaria control and prevention, wages, and education material. The economic impact of malaria is measured as a function of the total number of malaria cases and their direct cost plus the opportunity cost of public funds per malaria case in each district. Overall, the direct cost of US\$219 per patient represented only a 4% of the total cost of malaria for the state (US\$ 9.5 million).

Based on 38 studies of 9 ecosystem services from TEEB datasets for tropical forest in Southeast Asia, we estimated an annual average price of ecosystem services per hectare

OPTIMAL PATH OF LAND CONVERSION FOR SABAH

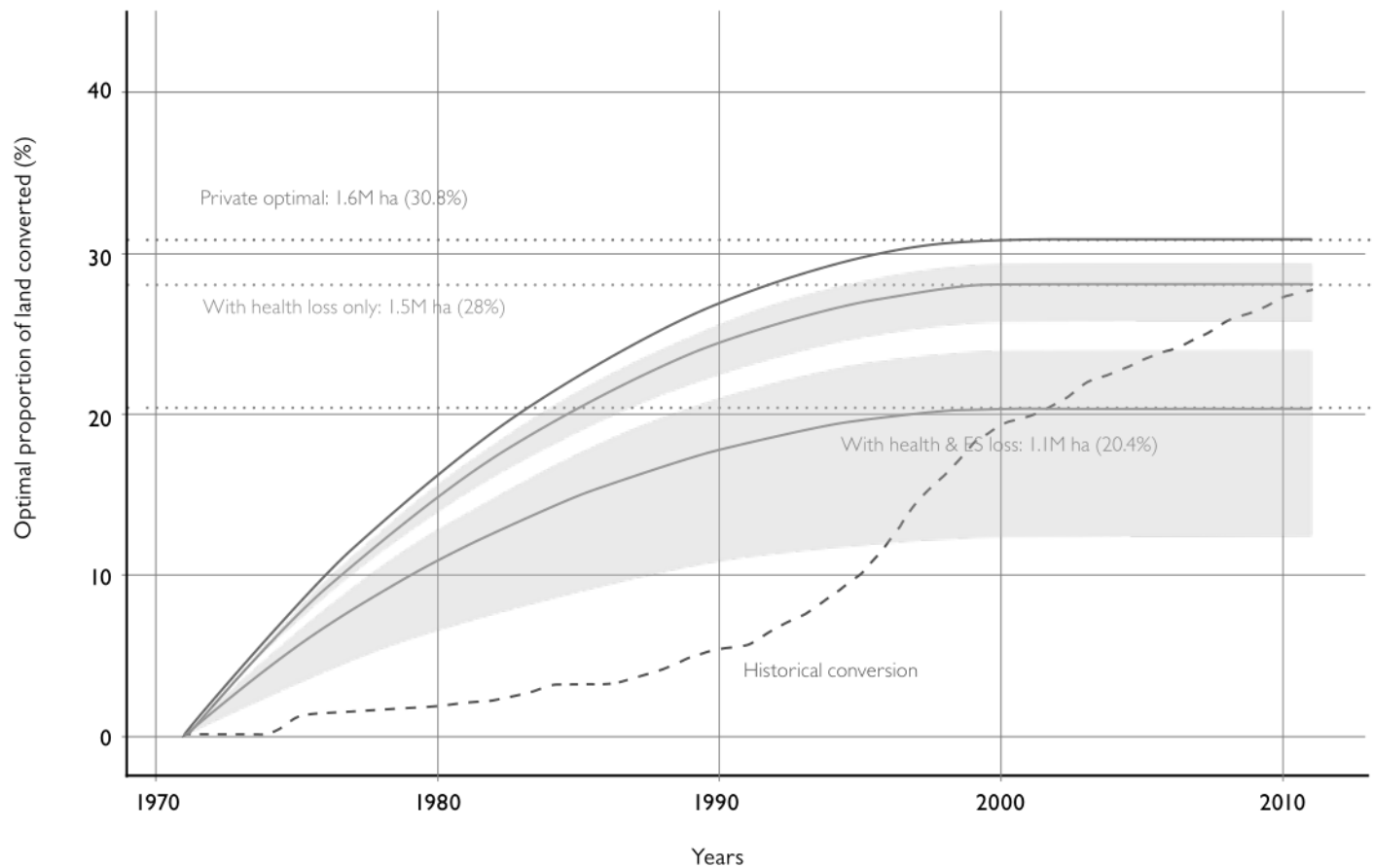


FIGURE 9: Comparison between historical forest land conversion and optimal forest land conversion for Sabah between 1971 and 2011. Red-dashed line: historical forest land conversion. Blue line: private optimal land conversion. Orange line: social optimal land conversion including only health loss. Green line: social optimal land conversion including health loss and ecosystem services loss.

of US\$2,365. Ecosystem services include: climate regulation (US\$677 ha/yr), energy provision (US\$454 ha/yr), erosion regulation (US\$ 365 ha/yr), water provision (US\$ 316 ha/yr), food provision (US\$ 134 ha/yr), regulation of extreme events (US\$119 ha/yr), provision of raw materials (US\$116 ha/yr), provision of genepool (US\$75 ha/yr), pollination (US\$ 46 ha/yr), provision of recreation (US\$ 33 ha/yr), water flow (US\$ 17 ha/yr), and medicine provision (US\$

15 ha/yr). Of the 4.4 million hectares of tropical forest in Sabah, there were 1.5 million hectares (32%) planted with palm oil in 2015 (US\$6.2 cost of malaria per hectare of palm oil plantation). **FIGURE 8** shows the historical number of hectares planted of palm oil in Sabah from 1975 to 2011 (dashed-red line).

Our model optimizes land conversion throughout the last 30 years, choosing a conversion rate per year based on profits from palm oil production, the economic costs of health impacts from malaria, and monetary loss in ecosystem services. We estimated three optimal paths of land conversion. First, we estimated the optimal private land conversion, which is the optimal number of hectares that should have been converted into palm oil plantations in the last 30 years, if a social planner cares only about private profits (blue line in **FIGURE 9**). Second, we estimated the optimal amount of land that should have been converted given not only private profits but also the social costs of malaria (orange line in **FIGURE 9**). As a social planner incorporates the economic impact of health damages from land conversion into the planning, the amount of land converted each year decreases. The difference between the net present value between these two paths of land conversion reveals **the economic cost of converting an excessive amount of land that does not consider the malaria damages for society**. The third optimal path (green line, **FIGURE 9**) calculates the amount of land to be converted considering private profits, economic cost of health damages for society, and the loss of ecosystem services from the land converted. The number of hectares converted each year should be smaller than the first two cases. The difference between the net present values of health costs between the private decision (black path, **FIGURE 9**) and this third path display the **total economic cost of converting an excessive amount of land greater than the optimal social level when the opportunity cost of losing ecosystem services is included**. This difference does not represent any economic loss of ecosystem services.

As we estimate the optimal path of land conversion to maximize social welfare (including health costs and loss of ecosystem services), the amount of land to convert each year is lower than the private optimal land because now each time a hectare of land is converted, the externality produced by the extra health cost and the loss of ecosystem services is assumed by everyone, and the land

manager takes these costs into consideration to decide how much land to convert. Because loss of ecosystem services is included, the difference between net present values of economic costs and of land conversion becomes larger.

The present value of converting land into palm oil only considering private profits (blue line **FIGURE 9**) is estimated at US\$ 1.1 billion, and the present value of converting land into palm oil considering also the social costs of malaria and loss of ecosystem services is US\$352 million (green line). The difference between these two present values is considered the economic loss due to increased malaria incidence through excessive land conversion in the past 30 years, and it is estimated at **US\$748 million or an average of US\$25 million annually. This loss corresponds to a 0.13% of Sabah's GDP or US\$18 per hectare per year.**

In the private optimization (maximizing private profits), we estimate that in the steady state, approximately 1.6 million hectares (30.8 % of total land available) should be converted into palm oil. When social costs are included, it is estimated that only 1.1 million hectares should be converted into palm oil (20.4% of total land available). The difference of approximately 500,000 hectares is due to the over-conversion of forest land to palm oil.

RESULTS: SPATIALLY EXPLICIT MODELING

The previous modeling section addressed the question of how much land could be developed given environmental and economic constraints. An additional modeling component was developed to answer the question:

Where should the recommended amount of land conversion have occurred? Potential development areas on a landscape are not homogeneous in development value because landscape characteristics (elevation, slope, proximity to roads or urban areas) vary across location. Suitable areas for palm oil development were modeled based on key landscape characteristics such as land cover, slope, current

SPATIALLY EXPLICIT MODEL

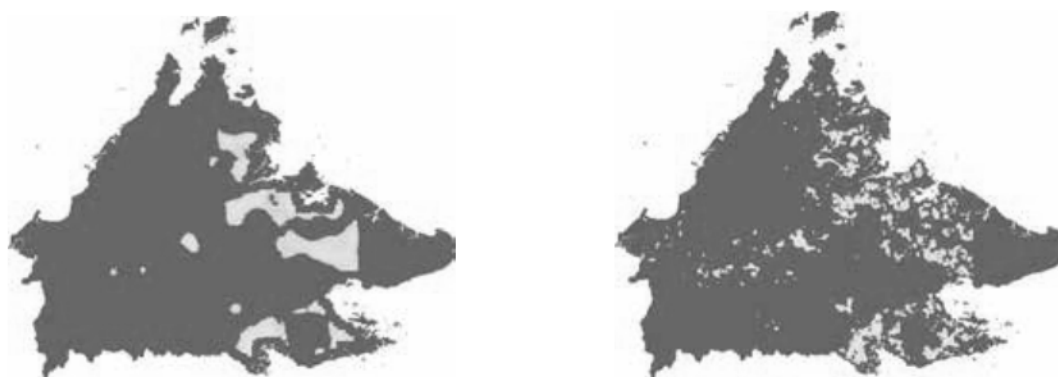


FIGURE 10: Suitable areas for land development in Sabah, Malaysia. A spatially explicit algorithm was developed to determine suitable areas for the same land use (i.e. palm oil plantations) in its neighborhood. For example, if an area is suitable for agriculture and it is close to other areas that are suitable for agriculture, it will be selected for future development. The map on the left is based on a model that penalizes development areas that are separated, favoring areas that are proximal. The model that generated the map on the right does not include any penalization method allowing highly fragmented land use planning.

distribution of plantations (palm oil and other timber plantations), as well as accessibility. We then used these suitable habitat characteristics to develop a spatially explicit model to determine areas on the landscape with: 1) the highest potential conversion value; 2) high connectivity to other high conversion value land plots; and 3) locations that minimize natural habitat fragmentation. **REFER TO APPENDIX 5: SPATIALLY EXPLICIT MODEL.**

RESULTS: GLOBAL ECONOMIC MODEL

A global, country-level model was developed to estimate the total economic loss of future EIDs due to excessive global land conversion over the next 30 years. Similar to the model for Sabah, a land manager chooses the amount of forest land to convert into agriculture production each year to maximize the net present value of private profits and social costs (expected costs from EIDs and loss of ecosystem services) for each country.

We collected global data on total forest land, total agricultural land, health expenditures, and the average growth rate of gross domestic product (GDP) per country between 1961 and 2015 from the World Bank open database for 163 countries. We used the change in GDP for each country to project health expenditures for the next 30 years. We assumed that the probability of EID outbreak for each country will grow at a conservative rate of 4% each year⁸. The total land of the 163 countries studied (12.5 million hectares), represents 84% of the global land (14.9 million hectares) and the sum of forest area and agricultural area globally (8.6 million hectares) is equal to 70% of total available land area for all the countries or 58% of total global land. Global forest land represents 45% of total available land (forest land plus agricultural land). Using the total agricultural value added and the number of hectares dedicated to agriculture, we estimated the agricultural value added per hectare. The average value added per hectare is equal to US\$2,746 with a standard deviation of US\$12,334.



The fragmentation landscape of Kinabatangan Sabah.

The main differences between the methodology for global analysis and the Sabah analysis are:

1. We used data per country from an open dataset to parametrize the model instead of specific data collected from Sabah. **REFER TO APPENDIX I: DATA SOURCES FOR PARAMETERS USED IN THE GLOBAL ANALYSIS.**
2. The starting point for land conversion was the current deforestation level for each country instead of a starting point of all pristine forests like Sabah in 1971. This allows us to estimate the projection from the present into the next 30 years, instead of the historical cost from forest land conversion.
3. The marginal value of forest land developed is the average value added per hectare of agricultural production instead of palm oil prices. We assumed that forest land is converted into a land that yields an average production of all crops in the country.
4. We assumed that the marginal cost of forest land conversion, per hectare, is a function of the annual minimum wage for the agricultural sector per country multiplied by the number of workers per hectare in each country, plus fertilizer expenditures per year and per hectare in each country in the agricultural sector instead of palm oil production costs.

5. We also assumed that the marginal economic loss per country from EID outbreaks is based on the likelihood of future EID events due to land use change multiplied by the ratio of expenditures in EID prevention and control over the total health expenditures per country. Approximately 31.5% of the EIDs since 1940 have been related to land use conversion (e.g. agricultural intensification)²⁵.
6. We also assumed that all countries use the same proportion of health expenditures dedicated to EID control and prevention (0.3%). It is assumed that there are on average 2.6 novel EID outbreaks per year¹³. We also assumed a discounted rate of 3% per year, a natural growth rate of pristine forest of 2% per year, an effectiveness rate of land conversion of 100%, and 80% of tax revenues returned to the public as direct transfers²⁶.

The global annual economic loss from EIDs due to excessive forest land conversion was estimated between US\$18 and US\$52 billion annually (US\$4.2-US\$11.1 ag ha/ year). That is equivalent to a present value of US\$602 [536 - 1,553] billion in additional costs for the global economy over the next 30 years. This cost is unevenly distributed among countries, with China and the United States having the highest economic burden (25% and 19% respectively) though these countries do not have the highest risk of EID outbreaks. The average loss per hectare of agricultural land is estimated at US\$646. In general, countries with both high GDP and health expenditures are the ones most likely to lose from the impact of infectious diseases emerged from countries with high levels of land conversion and high risk of EID outbreaks. According to our analysis, in order to minimize the economic impact of EIDs due to forest land conversion to a social optimal level, the world as a whole needs to reduce 769 million hectares (8.9% of total global available land) of agricultural land and reconvert it to forest land.



TASK 2:

→ POLICY AND OUTREACH

PART A: Stakeholders and Development and Health Research Unit (DHRU)

STAKEHOLDER ENGAGEMENT

Engagement with government, academia, industry, and NGO stakeholders was a key element of IDEEAL from its inception. Throughout the project, EcoHealth Alliance emphasized collaboration with all stakeholders to develop solutions that are business friendly, and beneficial to health and the environment. Over the lifetime of the project, IDEEAL engaged over 1000 individual stakeholders from more than 40 stakeholder groups including: local communities, government departments, universities, private sector industries, and local and international NGOs.

As a part of this engagement, EcoHealth Alliance developed a stakeholder working group and held quarterly stakeholder meetings in partnership with the Universiti Malaysia Sabah to discuss data sources, modeling methods, policy approaches, and community engagement and outreach. This included sharing preliminary results with stakeholders, engaging partners in critical analysis of modeling approaches and plans, discussing best practices in creating wide-reaching policy deliverables, and sharing research and ideas on land-use change and health across Southeast Asia. For example, the preliminary Sabah economic model was refined after input from stakeholders on the influence of taxes on economic gains during the first Industry Outreach meeting. After the project expansion within Southeast Asia, additional stakeholders from Indonesia, Thailand, and Peninsular Malaysia were included, with smaller and less formal stakeholder meetings held in these regions (**TABLE 2**). Stakeholders within IDEEAL played an instrumental role in acquiring, sharing, and commenting on data and data availability, and suggesting



DCoP Tom Hughes briefs stakeholders on progress with Industry engagement and the Position Paper at 8th DHRU stakeholder meeting.

TABLE 2:

STAKEHOLDER MEETINGS			
Stakeholder Meeting		October 2013	Malaysia
Stakeholder Meeting	1st Stakeholder Meeting	December 2013	Malaysia
Stakeholder Meeting	2nd Stakeholder Meeting	July 2014	Malaysia
Stakeholder Meeting	3rd Stakeholder Meeting	December 2014	Malaysia
Stakeholder Meeting	4th Stakeholder Meeting	May 2015	Malaysia
Industry Outreach Meeting	1st Industry Outreach Meeting	October 2015	Malaysia
Stakeholder Meeting	5th Stakeholder Meeting	October 2015	Malaysia
Industry Outreach Meeting	2nd Industry Outreach Meeting	November 2015	Malaysia
Stakeholder Meeting	6th Stakeholder Meeting	August 2016	Malaysia
Stakeholder Meeting	7th Stakeholder Meeting	September 2017	Malaysia
Roundtable Meeting	Developing A Blueprint For Land Use Change In Sabah	December 2017	Malaysia
Stakeholder Meeting	8th Stakeholder Meeting	August 2018	Malaysia
Stakeholder Meeting	9th Stakeholder Meeting	February 2019	Malaysia



Peter Daszak (COP) attending stakeholder meeting in Sabah, Malaysia.

useful resources. Stakeholders were also instrumental in advising the core IDEEAL team on applications of the research and how to ensure that outputs were of practical value to government, industry, and public and private sector groups.

EcoHealth Alliance officially joined the Roundtable on Sustainable Palm Oil (RSPO) as an NGO member in 2015. The RSPO is a not-for-profit group which brings together companies across the industry (producers, purchasers, retailers) as well as NGOs to create an international standard for “Certified Sustainable Palm Oil”. The EcoHealth Alliance IDEEAL team was able to bring a health and economic perspective to RSPO, complementing other NGOs and industry programs within RSPO. IDEEAL attended the RSPO’s annual conference the Roundtable on Sustainable Palm Oil in 2015 and 2016 to meet and network with potential industry partners. IDEEAL also held site meetings as a part of this event to gain insight on the IDEEAL modeling and program outreach. As an NGO member of RSPO we were able to reach palm oil industry representatives from across the supply chain and the globe, and raise the profile of the project.

**REFER TO APPENDIX 2:
LIST OF STAKEHOLDERS**

PART B: Policy and Scientific Outreach

POLICY

Policy Engagement

Policy engagement has been a key focus of IDEEAL from the start. Policy makers across the local, subnational, and national levels were engaged from the beginning of the project as key project stakeholders and their input was used to ensure that analyses and project aims were practical and relevant in the local context. Their support allowed the IDEEAL project to engage with local communities and international organizations (e.g. RSPO). Partners included the Sabah State Health Department, Sabah Wildlife Department, Ministry of Health Malaysia, BC Initiative, Bornean Rhino Alliance, Biotechnology Research Institute, Universiti Malaysia Sabah, Faculty of Medicine and Health Sciences Universiti Malaysia Sabah, Borneo Medical and Health Research Centre Universiti Malaysia Sabah, Faculty of Humanities, Arts and Heritage Universiti Malaysia Sabah, Danau Girang Field Centre, Department of Wildlife and National Parks Peninsular Malaysia, Forest Research Institute Malaysia, Living Landscape Alliance, Malaysian Palm Oil Council, Proctor and Gamble, PACOS, Sabah Economic and Development and Investment Authority, Sabah Forestry Department, Sabah Land and Survey Department, Sabah State Economic Planning Unit, Sime Darby, Wilmar, WWF, Sabah Wildlife Health Unit (WHU), Sabah Wildlife Rescue Unit (WRU), Kinabatangan Orangutan Conservation Programme (HUTAN), Ministry of Public Health Thailand Department of Disease Control Bureau of Vector Borne Diseases and Bureau of Epidemiology, Faculty of Forestry Kasetsart University (FFKU), Department of National Parks, Wildlife and Plant Conservation, Thailand and Mahidol-Oxford Research Unit (MORU) Faculty of Tropical Medicine, Mahidol University were key partners.

POLICY POSITION PAPER BRIEFING NOTE

FEBRUARY 2019

► Policy Position Paper in the Form of a Draft Cabinet Paper (December 2018)

TITLE: Infectious Disease Emergence and the Economics of Altered Landscapes (IDEEAL)

BACKGROUND: Infectious diseases caused by wildlife viruses and bacteria have an important impact on the economy. Recent viruses (SARS Coronavirus, Nipah virus, and most recently Zika and Ebola virus) originated from wildlife and cost the global economy more than USD\$60 billion (1). Nipah virus alone cost the Malaysian economy USD\$550 million (2). Deforestation, intensive agriculture practices and increased contact between people and wild animals heighten the odds of virus and bacteria spillover and its corresponding negative impacts to local and global economies.

AIMS: The Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL) project, investigates how human activity (e.g. deforestation) contributes to disease outbreaks and aims to 1) Estimate the economic benefits of conserving forest to regulate disease; 2) Estimate the total economic costs (private and public) of converting land; and 3) Provide a tool to inform land-use planning.

RESULTS: Malaria has already cost Sabah more than USD\$8.9 million (3) per year. Reducing malaria transmission by just 10% comes to approximately USD\$14 million in future savings (4). That is, for each dollar invested in reducing malaria, Sabah's government secures a return of USD\$4 dollars on future savings it can pass to its citizens (5). More broadly, an investment of USD\$500,000 on IDEEAL implementation could save the Malaysian economy at least USD\$2 million (6).

RECOMMENDATION: The impact on human, animal, and environmental health – as well as the potential burden on the local and global economy – should be paramount in any decision about land management. This approach could improve industry practices and regulations reducing environmental and health-associated costs to the Malaysian government and its citizens.

In addition to the nine stakeholder meetings held throughout the project, policymakers were engaged via numerous policy dialogue discussions on how to best operationalize IDEEAL's modeling outputs and communicate them to effect meaningful policy change.

Policy Position Paper

As a part of IDEEAL's efforts to engage policy-makers in the IDEEAL project and promote the use of IDEEAL's science and modeling in decision-making, the IDEEAL team has worked with key stakeholders to draft a Policy Position Paper in Sabah to be presented to the Sabah Cabinet. Applying science-based land planning tools, such as the ones created by IDEEAL, will allow the creation of sustainable land management policies, leading to long-term savings and improved well-being. This Policy Position Paper recommends policies promoting the use of science-based land planning tools to determine the optimal rate of forest conversion and protection, while considering the human, animal, and environmental impacts of land conversion in all proposed development projects. It is being jointly presented by SWD and SSHD, highlighting the multi-sectoral support for this project. Collaboration between multiple government agencies following the recommendations of this paper will ensure sustainable economic development for Sabah, while protecting the health of Sabahans and the environment.

BASELINE AND ONGOING SURVEYS

The IDEEAL project collected baseline and updated information from stakeholders (including local communities) on infectious disease and land use topics to assess how visibility and understanding of these topics differed by demographic characteristics and over the period of the project. Brief questionnaires were designed as an informal modeling tool and distributed to key stakeholders during stakeholder and other outreach meetings. Between 2014 and 2017, 1,047 individuals completed the 46-item baseline questionnaire with at least 50 participants completing the questionnaire twice.

GENDER OF SURVEY RESPONDENTS

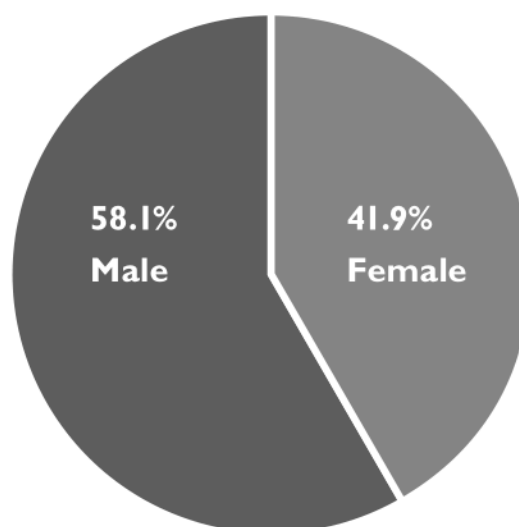


FIGURE 11: Gender breakdown of IDEEAL baseline questionnaire respondents. The IDEEAL project aimed to have equal participation from men and women; however, more respondents (58%) were male than female (42%).

Only 3% of new participants were familiar with the IDEEAL project prior to completing the survey, compared with 94% of those who had previously completed a questionnaire. Results presented below include only the 1,047 baseline surveys to avoid double counting.

The average age of participants was 35 years old. Slightly more men than women completed the questionnaire (55.5% men, 44.5% women). The most common occupations listed were homemaker, harvester, student, self-employed, and farmer. Most questions were multiple choice and focused on three primary areas: perceived disease risk from human-animal-environment contact, land use, and climate change.

Participants were asked to report perceived risk of several scenarios regarding interactions with animals and wildlife. For all questions, the majority of respondents reported at least some perceived risk ("somewhat risky") associated with each action. Participants were also asked if they were aware of diseases linked to agriculture, logging, and hunting. Of those participants who listed a disease, malaria was the most common response across all three interfaces (**TABLE 3**).

TABLE 3: MOST COMMON DISEASES ACROSS ENVIRONMENTS IDENTIFIED BY STAKEHOLDERS

RESPONSE	TOTAL	AGRICULTURE	HUNTING	LOGGING
Malaria	541	123	185	233
Dengue	250	54	84	112
Fever	192	73	45	74
Itchy Skin	139	60	33	46
Skin Diseases	101	36	18	47
Coughing	99	34	7	58
Flu	79	28	18	33
Headache	64	37	4	23
Diarrhea	61	18	7	36
Vomiting	45	20	14	11

MAIN CAUSE OF CLIMATE CHANGE

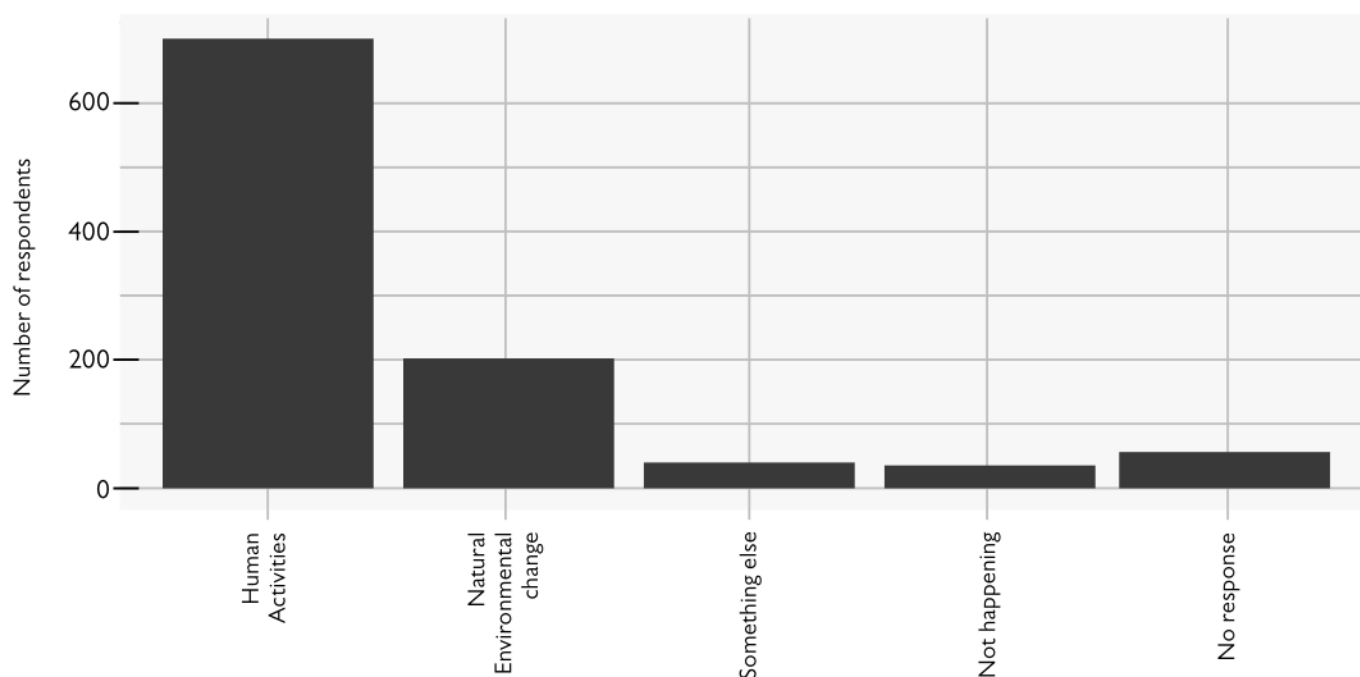


FIGURE 12: Selected IDEEAL baseline response on climate change questions. Respondents were asked “Is climate change happening now?” Most responded “Climate change is happening now.” with fewer than 200 respondents responding that climate change is not happening.

Similarly, participants were asked to list potential uses for disturbed and undisturbed land. Responses were grouped into 10 categories. Agriculture was the most common response for both questions. Extractive activities such as burning and logging was a much more common response in undisturbed land, representing 20.6% (n=444) of responses, than disturbed land, representing 1.58% (n=43) of responses.

The final section of the survey focuses on climate change beliefs and opinions. The majority of survey participants reported knowing at least 'a little bit' about climate change (68.2%, n=683), even more said that climate change is 'happening now' (79.7%, n=794), that 'human activities' are the main cause of climate change (70.8%, n=699), and that they have heard of human activities that cause climate change (88.2%, n=778) (**FIGURE 12**). The most common human activities listed were logging, burning, and deforestation. Participants were overwhelmingly supportive of climate mitigating actions (e.g. instituting strict environmental standards for companies, fuel efficiency in cars, rubbish collection, and chemical fertilizers), with over 80% of the participants 'strongly supporting' these actions. When asked if the government should pay attention to climate change, 92.2% of the respondents said they at least 'somewhat agree'. However, when asked who should play the 'greatest' role in responding to climate change, 10% more respondents chose public than government.

Development and Health Research Unit (DHRU)

During the period of the IDEEAL project, EcoHealth Alliance (EHA) and the Universiti Malaysia Sabah (UMS) launched The Development and Health Research Unit (DHRU) based at the Kota Kinabalu campus of UMS. The DHRU is a platform for multi-disciplinary research, stakeholder meetings, publications and other collaborative activities in the scope of land-use change, disease-emergence and in related social and public health aspects. The DHRU

was formally created at the Universiti Malaysia Sabah (UMS) in November 2014, to serve as an international resource to promote research on the science and policy of land-use change and the cost of disease emergence. EcoHealth Alliance supported its inception through USAID funding to IDEEAL with the aims of promoting scientific research and enhancing the sustainability of IDEEAL. The Faculties of Business, Economics and Accountancy, Medicine and Health Sciences, Humanities, Arts and Heritage, Sustainable Agriculture and the Biotechnology Research Institute, have participated in the DHRU and have had staff members as Research Fellows. The DHRU serves as:

- A venue for partner and stakeholder meetings
- A center for learning and exchange of ideas
- A resource center for postgraduate students and scholars, to include the offer of training through short courses, seminars and outreach programs
- A center for access and dissemination of knowledge to the public
- A platform to act as a forum for state-of-the-art multi-disciplinary think tank composed of experts from the fields of economics, disease ecology, agriculture, forestry, wildlife conservation, and health as well as industry experts involved in land development in Sabah
- A forum for scientific experts and policy makers in the engagement of round table discussions with industry leaders on project findings and current land use practices for the purpose of creating guidelines on how to reduce the risks of disease emergence as a consequence of land use change and development.

Since its founding, members of the DHRU have convened stakeholders from public and private sectors in Sabah and Peninsular Malaysia to develop economic models, strategies, and outreach materials related to the study of land use change, economics, and disease. In May 2015, an MOU was signed which formalized mutual commitment to collaboration and to helping fulfill the aims of IDEEAL. Since then, the DHRU has served as a center for local stakeholders and faculty to convene and discuss IDEEAL outputs. The DHRU has hosted research seminars

for UMS students and served as a forum to develop informational toolkits which have been disseminated to industry, government and rural communities in Sabah (in collaboration with local NGOs that have partnered with EHA and UMS). These toolkits have provided stakeholders --community members, private industries, researchers, government officials, and policy makers — the ability to translate science into action, with particular consideration for gender sensitive issues. In addition to stakeholder meetings and outreach, the DHRU has served as an educational platform for graduate students at UMS. Beginning in 2016, the first three graduate students joined the DHRU to complete a Master's degree on topics related to the IDEEAL project (**SEE DHRU GRADUATE STUDENT SECTION**).

In May 2018, it was decided that the DHRU would move under the umbrella of the Borneo Medical and Health Research Centre (BMHRC). The DHRU will continue to promote research on the science and policy of land use

change and the cost of disease emergence, and to develop economics models, strategies, and outreach materials related to the study of land use change, economics, and disease.

In addition to its role with the DHRU, EcoHealth Alliance will continue to work closely with the BMHRC. This move ensures that the DHRU will continue to operate after the IDEEAL project has ended. The long-term vision for the BMHRC and the DHRU is that it will be recognized beyond Sabah, as an international research center of excellence. Over the next 5 years, the DHRU plans to continue to study the impact of land use change on economics and disease emergence; organize seminars, workshops and conferences in related fields; support students who have related research interests, pursue funding opportunities and research grants; and publish work in indexed and highly-ranked academic journals.

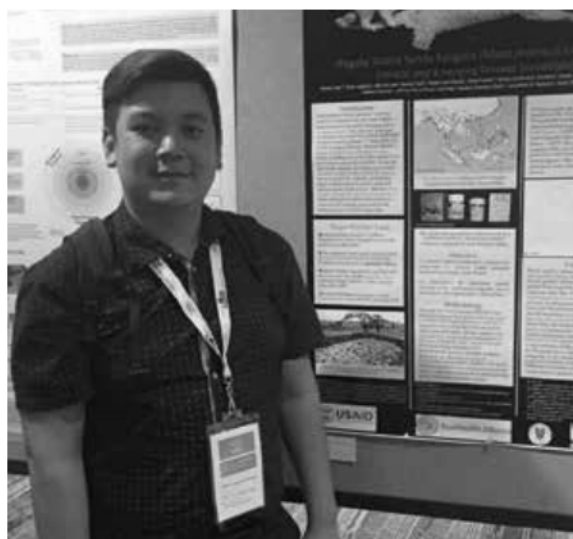
A dedicated website for the DHRU can be found at the BMHRC at <http://www.ums.edu.my/dhru/>.



Community members at Kampong Kalamupun list out various land uses as part of the Toolkit training.

DHRU GRADUATE STUDENTS

In October 2016, three students were selected for the 2-year Master's Research program at DHRU, supported by the IDEEAL project. IDEEAL team members also served as formal scientific advisors and mentors for the three graduate students. The IDEEAL project was also able to support student poster presentations at domestic and international research conferences. These students will help to support the next generation of work on health and land use projects across Southeast Asia.



Jimmy Lee presenting his work on illegal pangolin trade.

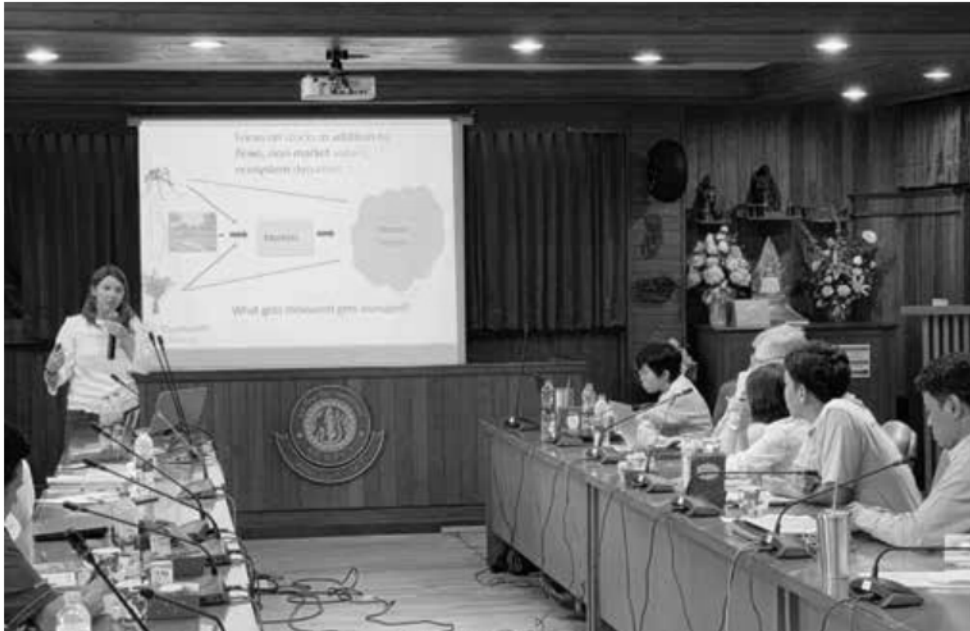
- 1) **Jimmy Lee** – “Zoonotic disease surveillance and microsatellite genetic study for the confiscated and rescued pangolins from Malaysia.” Expected September 2019.
- 2) **Alice Mathews** – “From bush to dinner table: Understanding wild meat preparation and consumption by local communities.” Expected September 2019.
- 3) **Amy Lim** – “Prevalence and associated environmental and social risk factors of worm infection among rural communities of Northern Sabah.” Confirmed Master of Science at the 20th Convocation at UMS on 24th November 2018.

AMY LIM RESEARCH SUMMARY



Amy was a Master's student at the Faculty of Medicine and Health Sciences since February 2015. In October 2016, she was successful in her application to secure funding from IDEEAL to finish her studies. Her study estimated the overall prevalence

of infection with parasitic worms among children in rural communities and the related risk factors of worm infections. The cross-sectional study was carried out from April 2015 until January 2018 in 13 villages involving children aged between six months and 17 years of age in Kota Marudu, Sabah. This study involved assessment of surrounding environment, collection of stool as well as soil and water samples, interviewing villagers using questionnaires to collect baseline data, microscopy, statistical analysis and genetic characterization. The overall prevalence of soil-transmitted helminth (STH) infections in these children was 14.3% with *A. Lumbricoides* at 63.9%, hookworm 18.0% and *T. trichiura* 18.0%. The risk factors found to be associated with these infections were mothers with low or no formal education; household income of less than RM500; use of untreated drinking water; unavailability of toilets; children who usually walk barefoot and not washing feet before entering the house; and the presence of domestic animals in the house. About 35% of the soil samples were found to contain eggs of one or two soil-transmitted helminth (STH) species. Through genetic characterization via Polymerase Chain Reaction, *A. Lumbricoides*, *Necator americanus* and *Ancylostoma* species were recorded. Amy has published one paper, “Worm Infection among Children in Malaysia” (published in the *Borneo Journal of Medical Sciences* (2016) Volume 10, Issue 11 pp: 59-74) and is working on another paper on the risk factors, which has yet to be published.



Samantha Maher presenting on ecosystem evaluations in the IDEEAL framework.

PART C: Capacity Building, Toolkit Development, and Knowledge Communication

CAPACITY BUILDING TRAININGS

Training and sustainability were key focal areas of the IDEEAL project. The DHRU (see above section) site hosted many of the capacity building training conducted as part of the IDEEAL project. In May 2015, the DHRU held a conference titled “The Links between Land Use Change, Development and Health” which was attended by 101 participants from government, industry, non-profit organizations, faculty and students. In addition to this, the DHRU hosted several capacity building trainings and seminars led by members of the IDEEAL team. Training topics were grouped into 4 general subject areas: Modeling (Introduction to R and GIS), Zoonotic disease and economics (DHRU seminar, Promoting One Health through Zoonotic Disease Surveillance), health and land use planning and management (IDEEAL



DHRU SEMINARS AND CAPACITY BUILDING TRAININGS

GENDER BREAKDOWN OF TRAININGS

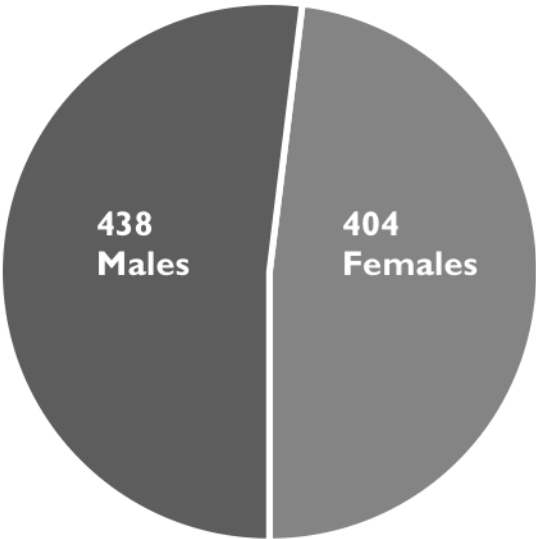


FIGURE 13: Plot of IDEEAL capacity building training participants by gender. Blue color indicates male participants and grey color indicates female participants. IDEEAL project aimed to have roughly equal participation from male and female participants.

TOPIC BREAKDOWN

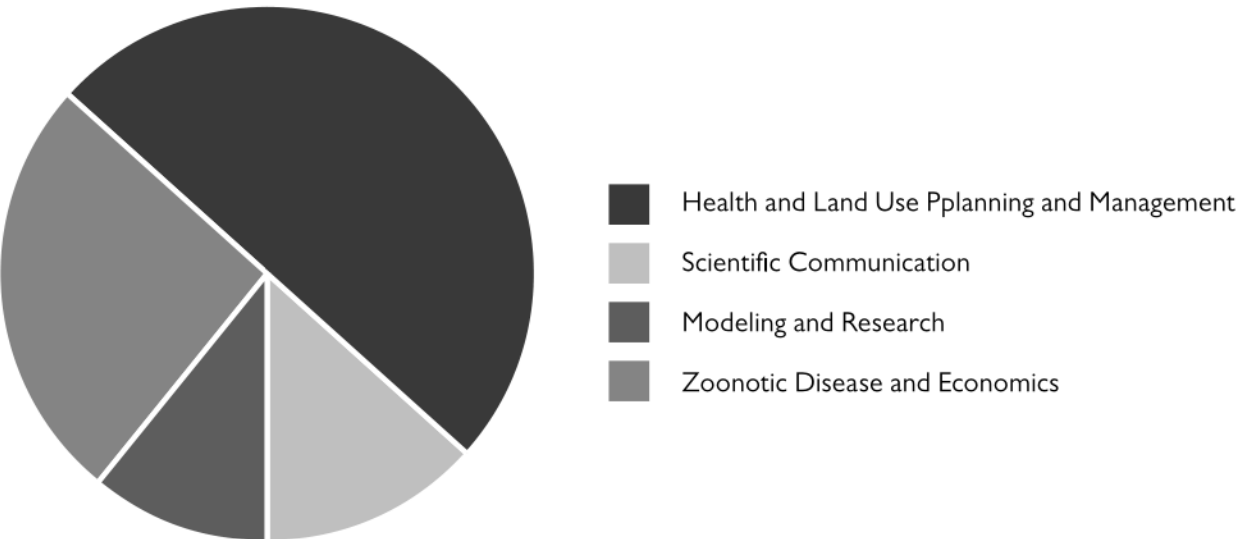


FIGURE 14: Summary of IDEEAL capacity building training by topic area. Training topics were grouped into four general subject areas: modeling (Introduction to R and GIS), zoonotic disease and economics (DHRU seminar, Promoting One Health Through Zoonotic Disease Surveillance), health and land use planning and management (IDEEAL toolkit), and communication skills (funding science and knowledge translation). Participants included government stakeholders, university students and faculty, NGO partners, and community members.

toolkit), and communication skills (funding science and knowledge translation). Participants included government stakeholders, university students and faculty, NGO partners, and community members. During the project expansion, the IDEEAL team also led capacity building

trainings on environmental economics, scientific communication and research skills, and using the IDEEAL web application in Thailand and Indonesia. Over 700 participants attended IDEEAL-sponsored trainings in Malaysia and Thailand over the course of the project.

- July 2016, IDEEAL Chief of Party, Dr. Peter Daszak, conducted a seminar at DHRU on grant writing entitled "Funding Science: Tips on grant-writing and fund-raising for scientific research projects." This seminar was attended by 109 staff and students from UMS.
- October 2016, Allison White, Research Scientist at EcoHealth Alliance, presented on "Toolkit development and implementation with the IDEEAL project," while IDEEAL Chief of Party, Dr. Peter Daszak, gave a seminar entitled "Communicating Science: Publishing your research and maximizing impact." This seminar session was attended by 48 participants from Faculty of Medicine and Health Sciences UMS, Department of State Health Sabah, WWF and BCI.
- Two 'Introduction to R Software' workshops were also conducted at DHRU on February 23rd (attended by 29 participants) and August 18, 2016 (attended by 15 participants).
- December 2017, first Geospatial Information System (GIS) training was held at UMS. This training was conducted by Allison White, Yasha Feferholtz, and Erica Johnson, and was attended by 27 participants.
- May 2018, Tom Hughes, IDEEAL Deputy Chief of Party presented a seminar on "Promoting One Health through Zoonotic Disease Surveillance". This seminar was attended by 18 staff and students of UMS.
- August 2018, IDEEAL Chief of Party, Dr. Peter Daszak, gave a seminar at DHRU on "Ebola, Nipah, Disease X, and the new global strategy to fight emerging diseases." This seminar was attended by 62 participants from UMS.
- February 2019, a full day of IDEEAL Seminars were held in UMS. These seminars sessions were attended by 74 staff and students of UMS.
- February 2019, the second Geospatial Information System (GIS) training was held at UMS. This training was conducted by Allison White and Samantha Maher, and was attended by 25 participants.



Kampung Kalampun community members with team from PACOS and EHA during Toolkit presentation.

TOOLKIT DEVELOPMENT

Effectively communicating and translating IDEEAL's modeling findings has been a key goal of the IDEEAL project throughout the lifetime of the program. One key element of this was developing a toolkit for communicating health impacts of differing land use options, an activity that led to the creation of IDEEAL's Health and Land Use Change Toolkit. These tools highlight the

links between land use change and diseases such as malaria, dengue, and leptospirosis. They provide an interactive and clear way to communicate complex modeling results to communities in remote and low-resource areas and to foster discussions reducing the health impacts and economic costs of land change.



Jimmy Lee presenting toolkit to community from Kampong Kalampun.

SUCCESS STORY:

COMMUNITY TOOLKIT PILOT TESTING

▶ The Health and Land Use Change Toolkit was designed to reach a wide range of stakeholders. Communities were involved every step of the way. The toolkits were developed with close input of



Jimmy Lee from EHA discussing land use change and health as part of IDEEAL Toolkit review with Ketua Kampung (Village Head) Kampong Bilit in Kinabatangan District Sabah.

community members and local stakeholders, translated into Bahasa Malay (from the original English), and tested in rural communities, thus ensuring the toolkits are comprehensible and relevant to diverse audiences. Following several sessions of toolkit development and stakeholder feedback, the IDEEAL team traveled to Kampong Bilit and Kampong Sukau in Eastern Sabah and pilot tested the toolkit to community members and village leaders there, with the specific intent of gaining feedback. Community members highlighted the usefulness of the toolkit, and interest in the novel topic, and provided tangible suggestions on updating the translation to make topics health less technical, and on how to frame some of the discussion topics.

This valuable feedback allowed the IDEEAL team to create a more practical and useful version of the toolkit. Following this pilot testing, community leaders and mobilizers from over 52 villages across Malaysia were trained on the toolkit and the toolkit continued to be updated with feedback from participants throughout the IDEEAL project.



Allison White hosting IDEEAL Toolkit trainings with team from PACOS in Sabah, Malaysia.



Jimmy Lee presenting IDEEAL Toolkit to the team from PACOS.



Jimmy Lee leads a game to illustrate the connectivity of ecosystem services with the community at Kampong Kalampun.

This educational toolkit connects human health with environmental change and development and links research and scientific findings with community action through activities and discussion. The IDEEAL Health and Land Use Change Toolkit was designed for toolkit participants to gain an understanding of the potential health impacts of land use change and to foster discussions on the interaction and interconnectedness of land use and health. The toolkit is participatory and interactive with 3 sections on the following topics: Understanding Land Use Change, Linking Health and Land Use Change, Economic Costs and Mitigation Strategies and is available in English and Bahasa Malaysia, and can be adapted in length and content for use in different audiences.

The development of the Health and Land Use Change Toolkit was a multi-partner iterative process engaging members of the IDEEAL modeling team, faculty and students at the DHRU, members of local government, and representatives from non-governmental and community-based organizations. This toolkit was developed and pilot-tested in collaboration with these stakeholders to ensure the toolkit covered relevant material, was culturally appropriate and gender-sensitive, and did not duplicate existing resources.

Toolkit dissemination: Following pilot-testing, local facilitators from the DHRU, PACOS and other community organizations were trained to facilitate the toolkit. Toolkit facilitators attended 1-2 day training sessions on toolkit contents and facilitation techniques.

The IDEEAL Health and Land Use Change Toolkit was presented in over 52 villages to 702 total participants in Sabah and Peninsular Malaysia. As part of this toolkit dissemination, the IDEEAL toolkit was also shared with RSPO-member industry partners, UITM (Universiti Teknologi MARA) students, and small-holder farmers (see page 40). This toolkit is designed to be used alongside the IDEEAL interactive web modeling application (see page 42).

IDEAL APP

The IDEAL App was designed to translate IDEAL modeling results into a clear and accessible interface for stakeholders. The IDEAL App contains a reduced version of IDEAL's dynamic optimization model, allowing for a broader understanding of IDEAL's modeling results. This application is available on the web accessible by desktop browsers or mobile devices at <http://ideeal.eha.io/>. While the application is not designed to replace the more refined optimization models created for Malaysia and Thailand, it provides a basic economic justification for promoting sustainable land use and, more specifically, incorporating health and ecosystem services values into land development planning. The underlying model in the application is simplified to make it readily usable and interpretable at any scale with various agricultural commodities or diseases.

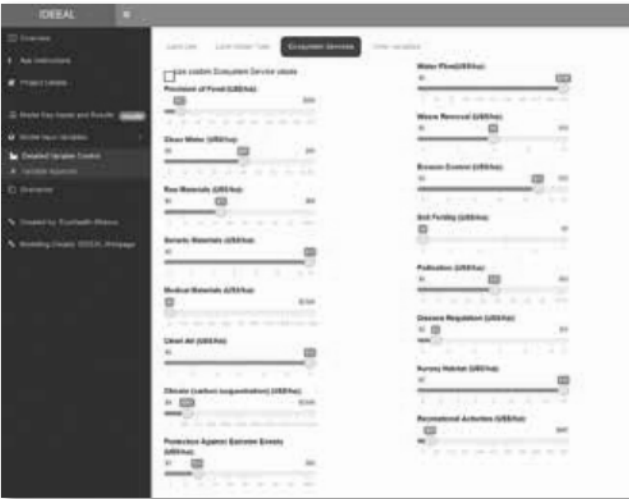


FIGURE 15: Screenshot of the IDEAL App in use.

More specifically, the IDEAL app can be used for:

- 1) **Scenario analyses**, allowing decision-makers to compare different potential courses of action,
- 2) **Sensitivity analyses**, to determine which parameters affect model results most (and thus identify areas where accurate data is most important), and
- 3) **Descriptive visualizations**, to communicate the economic impacts sustainable land utilization in a clear and intuitive way.

These evidence-based analyses can be used by policy-makers, local governments, industry representatives, and community leaders to broadly examine the interplay of these factors and promote reduced-impact land utilization among their counterparts and other stakeholders.



SCIENTIFIC OUTREACH

There were two components to IDEAL's scientific outreach: 1) Working directly with stakeholders to communicate the modeling techniques and results and 2) Presenting IDEAL's science through peer-reviewed publications and conference posters and presentations.

The IDEAL stakeholder meetings were attended by government representatives, university faculty, and community and nonprofit leaders.

There are currently five planned peer-review publications on the IDEAL project outputs in the preparation stage, and IDEAL research and modeling results have been presented at 12 academic conferences (**TABLE 4**). Target journals for these publications include a range of high-impact journals from across scientific disciplines (e.g. health, biological sciences, policy, ecology), highlighting the multidisciplinary and One Health nature of this work, and increasing its scientific impact. Conference posters and talks were presented on three continents across multiple countries, ensuring a wide reach of the IDEAL program among fellow scientists. The conference presentations allowed the IDEAL team to increase the research profile of land use and health issues, gain valuable feedback on the modeling process, and foster collaboration for future research.

TABLE 4: CONFERENCE POSTERS AND PRESENTATIONS

MEDIUM	TITLE	CONFERENCE	DATE	AUTHOR/ SPEAKER	LOCATION
Oral Presentation	Hendra virus – an Emerging Zoonoses linked to demographic Shifts in Eastern Australia	The Links for Land Use Change, Development and Health	May 2015	Dr. Hume Field	Malaysia
Oral Presentation	Land Use Change and the Economic Cost of Emerging Diseases	27th International Congress for Conservation Biology	August 2015	Dr. Carlos Zambrana-Torrel, VP of Conservation and Health EHA	France
Oral Presentation	Land Use Change And The Economic Cost Of Emerging Infectious Diseases	Conservation of Biological Diversity Conference SBSTAA	2016	Dr. Carlos Zambrana-Torrel, VP of Conservation and Health EHA	Mexico
Oral Presentation	Land Use Change, Conservation and Health	The Links for Land Use Change, Development and Health	May 2016	Dr. Peter Daszak, President EcoHealth Alliance	Malaysia
Poster Presentation	Zoonotic Viruses Surveillance for the Confiscated Pangolins in Malaysia	One Health Eco Health Conference, 2016 - Melbourne, Australia	December 2016	Jimmy Lee, DHRU Masters Student	Australia
Poster Presentation	Soil –Transmitted Helminths Among Rural Indigenous Children in Kota Marudu, Sabah			Amy Lim, DHRU Masters Student	
Oral Presentation	Analyzing the health value of a tropical forest – New strategies to mitigate pandemic prevention			Tom Hughes, DCoP	
Poster Presentation	Zoonotic Viruses Surveillance for the Confiscated Pangolins in Malaysia	Linking Public Health and Ecosystem Management: a One Health Approach at the Conference of the Parties - Convention on Biological Diversity	December 2016	Jimmy Lee, DHRU Masters Student	Malaysia
Poster Presentation	Soil - Transmitted Helminths Among Rural Indigenous Children in Kota Marudu, Sabah			Amy Lim, DHRU Masters Student	Malaysia

continued...

TABLE 4: *continued from page 43*

MEDIUM	TITLE	CONFERENCE	DATE	AUTHOR/ SPEAKER	LOCATION
Webinar	The Economic Costs of Emerging Infectious Diseases of Land, a OneHealth Perspective	Yale Center for for Business and the Environment	March 2017	Allison White and Yasha Feferholtz	US
Oral Presentation	Promoting One Health & Conservation through Zoonotic Disease Surveillance: The PREDICT & IDEEAL Projects in Malaysia	3rd Borneo Tropical Medicine and Infectious Disease Congress 2017	May 2017	Tom Hughes, DCoP	Malaysia
Panel	Bringing Solutions into Focus: Harnessing the Power of an Economic Lens	PMAC: Prince Mahidol Award Conference	February 2018	Carlos Zambrana-Torrel, Ramanan Laxamirayan, Gavin Yamey, Nita Madhav, Victoria Fan	Thailand
Seminar	Ebola, Nipah, Disease X, and the new global strategy to fight emerging diseases		August 2018	Dr. Peter Daszak, President EcoHealth Alliance	Malaysia
Poster Presentation	Analyzing the importance of land conversion as a driver of Disease emergence in tropical forests		February 2018	Tom Hughes, DCoP	Thailand
Poster Presentation	Surveillance of Zoonotic Viruses and Population Gen/etics of Confiscated Sunda Pangolins (<i>Manis javanica</i>) from Malaysia	International One Health Congress in Saskatoon	June 2018	Jimmy Lee, DHRU Masters Student	Malaysia
Oral Presentation	Quantifying the Health, Economic, and Ecosystem Impacts of Land-use Change as a Driver of Diseases Emergence in Southeast Asia			Allison White, Community Outreach Coordinator	Malaysia

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TABLE 4: *continued from page 44*

MEDIUM	TITLE	CONFERENCE	DATE	AUTHOR/ SPEAKER	LOCATION
Poster Presentation	Valuation of Ecosystem Services in South East Asia: Malaysia, Indonesia and Thailand	American Museum of Natural History: Student Conference on Conservation Science, New York	October 2018	Sonia Dattaray, Research Assistant EcoHealth Alliance	US
Oral Presentation	Borneo Quality of Life	Promoting One Health & Conservation through Zoonotic Disease Surveillance: The PREDICT & IDEEAL Projects in Malaysia	January 2019	Tom Hughes, DCoP	Borneo Malaysia

PUBLICATIONS

The IDEEAL project has led to the publication of two scientific publications: *One Health Economics to Confront Disease Threats* in Transactions of the Royal Society of Tropical Medicine and Hygiene and *Incorporating Health Outcomes into Land Use Planning* in EcoHealth Journal.

An additional paper, *Global Costs of Emerging Infectious Disease* will be submitted in 2019. In addition to this, three scientific manuscripts and an editorial are in preparation on modeling land use change and their impacts on health.

INDOHUN/PREDICT COLLABORATION

The IDEEAL team supported Indonesia's One Health Network (INDOHUN) in a disease, land use change and economics program in Indonesia, called DEAL. Members of the IDEEAL modeling team provided direct technical assistance to INDOHUN researchers from the University of Indonesia in spatial analysis, economics, and epidemiology, statistical programming software, and other research skills. This was accomplished via a cumulative 6 weeks of hands-on training, including workshops on R software analyses and economic modeling, in-depth assistance to the 5 person INDOHUN research team, and regular calls to provide additional insight based on successes and challenges from the IDEEAL project, and economic modeling frameworks developed as part of the IDEEAL project. This collaboration, which was supported by a separate funding source, will allow researchers at INDOHUN to continue to conduct land use change and health work, and economic modeling in the future and help to ensure the sustainability of the program in the region.





MONITORING & EVALUATION

Monitoring and Evaluation

TABLE 5: OUTPUT AND OUTCOME INDICATOR PROGRESS

	TARGET	ACTUAL	PROJECTED
Development context indicator: Percentage of developable land that will remain undisturbed: No current land planning updates have been made since the time of performance. We plan to monitor, over time, the percentage of land in the target countries which remains undisturbed using remote satellite imagery and government and industry commitments to preserving valuable forest areas.			
IR 1: Created quantitative models capturing gender sensitive EID- related health savings as a function of land-use.			
Outcome Indicator 1: Number and percentage of DHRU partners and stakeholders who are able to utilize the model in land-use planning	30% of partners and stakeholders	0% of partners and stakeholders	
Sub-IR 1.1: Gathered required data to run the quantitative model.			
Output indicator 1.1.a: Number of datasets acquired, cleaned and formatted (recorded in MB)	N/A	31 datasets, 1154 MB	25 datasets, 1000 MB
Sub-IR 1.2: Developed portfolio of modeling and analysis activities assessing EID spillover likelihood and cost as a function of land-use development.			
Output indicator 1.2.a: Number of model test runs that facilitate validation to regional and local levels	N/A	8 modeling frameworks created and explored, over 1000+ test runs across all frameworks. Statistical validation performed splitting data in training and validation	8 modeling frameworks created and explored, over 1000+ test runs across all frameworks

continued...

TABLE 5: *continued from page 47*

	TARGET	ACTUAL	PROJECTED
IR 2: Improved multi-channel availability of EID-focused quantitative resources amongst civil society advocates and government policy makers.			
Outcome indicator 2: Number of policy dialogues using evidences generated by the IDEEAL project	7	9 stakeholder meetings, 1 roundtable (blue print on land use change meeting) , 2 industry conferences,	9 stakeholder meetings, 1 roundtable, 2 industry conferences
Sub-IR 2.1: Established the DHRU for additional research, analysis and cross-disciplinary partnerships.			
Output indicator 2.1.a: Organizational capacity of the DHRU	N/A	See narrative below	
Output indicator 2.1.b: Number of graduate students trained* <i>*Includes only DHRU Masters students; additional students were trained as part of IDEEAL capacity building activities</i>	5	1 student graduated*	3 (1 graduated, 2 students expected graduation Fall 2019)
Output indicator 2.1.c: Number of scientific knowledge products (e.g. posters, presentations, manuscripts, etc.) produced as a result of USAID-support	10	16 (1 manuscript; 9 conference presentations; 6 poster presentations)	22 (7 manuscripts (6 currently in prep); 9 conference presentations, 6 poster presentations, 2 planned conference presentations)
Sub-IR 2.2: Developed toolkit for communicating the health impacts of differing land-use options.			
Output: 2.2.a: Gender-sensitive health impact toolkits for promoting best practice approaches and translate project findings to ensure gender equality benefits developed		One Health impacts of land use change toolkit developed for all audiences	One Health impacts of land use change toolkit developed for all audiences

continued...

TABLE 5: *continued from page 48*

	TARGET	ACTUAL	PROJECTED
Sub-IR 2.3: Generated outreach activities and communication channels of resources to policy makers and civil society.			
Output 2.3.a: Scientific outreach and communication toolkits that translate research and modeling results for key stakeholders developed		One Health impacts of land use change toolkit developed for all audiences; 1 interactive web application to translate modeling created	One Health impacts of land use change toolkit developed for all audiences; 1 interactive web application to translate modeling created
Output 2.3.b: Economic justification for promoting reduced impact of land utilization strengthened		Policy position paper summarizing social benefits due to reduction in land conversion developed	Policy position paper summarizing social benefits due to reduction in land conversion developed
Output 2.3.c: Program-generated, evidence-based analyses accessed and employed by stakeholders to promote reduced impact land utilization		Policy position paper jointly agreed upon for submission by SSHD and SWD	Policy position paper jointly agreed upon for submission by SSHD and SWD to Chief Minister and Cabinet to inform policy guidelines

IDEAL Project Activity Narrative

STRATEGIC OBJECTIVE:

To develop and provide quantitative models and build multisector partnerships around the economics of altered landscapes and infectious disease emergence so as to contribute to sustainable land-use decision-making.

IR I:

Created quantitative models capturing gender sensitive EID- related health savings as a function of land-use.

Outcome indicator: I.I Number and percentage of DHRU's partners and stakeholders who are able to utilize the model in land use planning

SUB-IR I.I:

Gathered required data to run the quantitative model.

Outputs: I.I.a: Comprehensive literature review conducted; I.I.b: Requisite datasets mapped, collected and validated

Output indicator: I.I.a: Number of datasets acquired, cleaned and formatted

KEY ACTIVITY IR I.I:

Required data gathered to run the quantitative analysis

Activity I.I.I:

Meet with relevant partners to identify data availability

The IDEAL team engaged with partners throughout the lifetime of the project to gain data for the modeling portion of the project. During Year 1 of the project, we met with key government, industry, and NGO, and academic partners from multiple sectors to gain an understanding of the existing publicly available data, private collected data, and data sharing and records processes (e.g. how disease surveillance works for different categories of diseases and how these records are aggregated and stored). Broadly, we gathered information on 1) remote sense data (e.g., land cover data over different time periods), 2) demographic information (e.g., human population) and 3) human disease data (e.g. case counts) 4) economic damages related to infectious diseases, and 5) economic benefits of development (e.g. profits from palm oil plantations). We also explored the scale and resolution of the available data in order determine the appropriate modeling methods. In later years of the project, we

continued to meet with partners regarding data availability, both in the expansion regions and in the main project regions, allowing us to update the input variables and update our model accordingly (e.g. obtaining better estimates of oil palm yield per hectare).

Activity 1.1.2:

Obtain available temporal, geospatial data of land use/land-cover and disease data for the new area of the project

We gathered land use/land cover data for regions of interest that include natural and altered landscapes. Sources of data were: FAO, HYDE-IMAGE, GLOBIO3, European Space Agency, USGS, NASA, and Global Forest Watch, NOAA CPC (precipitation). These datasets are highly variable in spatial resolution, ranging from country level to 500 m of resolution (e.g., classified land cover MODIS-Terra) to approximately 50 km for precipitation data. We aggregated the data to the adequate resolution for analysis (downscaling process) taking into account the mechanistic processes that might be at play for malaria transmission. Local institutions, such as Faculty of Forestry Kasetsart University, assisted in gathering regional geospatial at finer resolutions from relevant authorities (e.g. Department of National Parks). Likewise, industry partners provided information on plantations to inform and refine our current land cover data. We also obtained health case count and disease treatment data from government partners in Malaysia and Thailand and obtained relevant ethical approvals or exemptions for use of this de-identified data.

Activity 1.1.3:

Obtain available demographic and land planning data from relevant government sources and partners

Data on human demography was obtained from global and in-country databases. For example, WorldPop (www.worldpop.org) maintains a spatial database on human population distribution, including temporal data for five time-points between 2000 and 2020 at five-year intervals and was used a population data for most analyses. In addition, publicly available census data for Sarawak and Thailand was used for local modeling.

Activity 1.1.4:

Obtain available economic parameter/indicator data

Data on economic parameters was obtained from several sources including literature reviews (e.g., ecosystems services), existing databases such as World Bank (<https://data.worldbank.org/>), and private sources such as Sabah State Health Department or palm oil companies. Some parameters such as the total area dedicated to oil palm plantations or total area of intact forest in the study area was estimated by processing the remote sense data described above (Planned Activity 1.1.2). Annual costs related with health burden were estimated by using data provided by the local government combined with ground-truthed data collected by visiting a regional hospital. We gathered data on a variety of indicators that contributed to the overall economic burden of the disease (e.g. treatment costs, control and prevention measures). Finally, data on benefits and costs of land development (e.g. palm oil price) was obtained from open databases (e.g., www.indexmundi.com) as well from palm oil companies operating in the region (e.g., Wilmar and Sime Darby). A significant portion of time was dedicated to data cleaning for analysis, in a way that the data was easy to manipulate, analyze, use, and visualize.

SUB-IR 1.2:

Developed portfolio of modeling and analysis activities assessing EID spillover likelihood and cost as a function of land-use development.

Outputs: 1.2.a: Modeling methodology developed; 1.2.b: Model applicability to field conditions demonstrated

Output indicators: 1.2.a: Number of model test runs that facilitate validation to regional and local levels

KEY ACTIVITY IR 1.2:

Portfolio of quantitative analyses assessing EID spillover likelihood and damages as a function of land use change

Activity 1.2.1:

Estimate the incidence of diseases linked to land use change

Creating models for malaria incidence due to land use change was an iterative process. We generated generalized linear models, spatial models (simultaneous autoregressive models and conditional autoregressive models), and machine learning methods for 3 regions in Malaysia (Sabah, Sarawak, and Peninsular Malaysia) and Thailand. The final models combined machine learning random forest and spatial simultaneous autoregressive models to estimate incidence of disease in a given year associated with fragmentation and total area of land uses, such as crop irrigated and broad leaf evergreen forests.

Activity 1.2.2:

Determine the damages from increased disease incidence due to land use change

The economic impact of a disease outbreak often extends beyond losses from morbidity and mortality to other damages like expenditures in prevention and control of new diseases. After the model calculated the optimal amount of land conversion for each period using the data collected, we calculated the total expected monetary damage from emerging infectious diseases globally and determined a total burden of \$7.3 trillion US dollars from

converting forest land at rate that only considers private profits and not social costs.

Activity 1.2.3:

Develop an economic analysis to measure change in welfare from land use change

Our economic model studies the optimal allocation of a fixed amount of land between agricultural production (palm oil and rubber in this case) and intact forest. To determine this optimal allocation, we incorporate into the model, the value from agricultural production from the portion of land allocated to agriculture, the value of ecosystem services from the portion of land allocated to forest, the costs of converting land from forest to agriculture, and the health damages from the increased risk from the marginal reduction in forest allocation. After including all the costs and benefits into the model, and calculating the optimal allocation of agriculture and forest for each period, we compared the monetary net present value from a scenario with optimal amount of land conversion with the monetary net present value from a scenario with the existing amount of land conversion and future projections. We showed the loss/gain in social welfare from comparing these two scenarios for each of the chosen regions. Globally US\$602 billion is lost when comparing the private versus the social optimal.

Activity 1.2.4:

Investigate incorporation of economic model into a total ecosystem services approach

The results generated from our economic valuation and modeling approach represent a significant addition to the state of the knowledge on the value of ecosystem's services, particularly the disease regulation value. We calculated region specific ecosystem services values for carbon and incorporated total ecosystem services valuation from TEEB into our economic optimization model. By include disease regulation as a discrete ecosystem value (either for malaria or EIDs) we are able to compare the difference in the optimal amount of land converted between the private optimum, a traditional ecosystem services social optimum, and a social optimum including ecosystem services and disease regulation. This

allows for the incorporation of disease regulation into ecosystem services and the potential to include this in land planning decisions.

Activity 1.2.5:

Develop spatially explicit models

We created two primary types of spatial models: 1) spatial model(s) that link land use change and malaria incidence in the study regions and (discussed under 1.2.1) and 2) spatial model(s) that optimally select suitable areas for conservation and areas suitable for land development. Suitable areas for palm oil development in Sabah were modeled based on key landscape characteristics such as land cover, slope, current distribution of plantations (palm oil and other timber plantations), as well as accessibility. We then used these suitable habitat characteristics to develop a spatially explicit model to determine areas on the landscape with: 1) the highest potential conversion value; 2) high connectivity to other high conversion value land plots; and 3) locations that minimize natural habitat fragmentation.

Activity 1.2.6:

Simulate economic scenarios for EID events and land-use change using available estimates in other geographic locations

Output of this modeling exercise will represent estimates of the economic impacts from land use related disease burden. In addition, our interactive web modeling app includes generalized scenarios to estimate the optimal amount of land conversion given different inputs and prices. These scenarios allow users to see how the difference between private and social optimal values change by adjusting: 1) palm oil prices and yield 2) disease cases and costs and 3) ecosystem service values, across a scale based on historical trends and values from study regions. This allows users from other areas to input appropriate values from their region and explore, in generalized terms, how these models might apply to land planning in those settings.

Activity 1.2.7

Document and validate the quantitative models at the regional and local level

Modeling linking land use change and malaria was statistically validated by randomly partition the data in two datasets. One subset was used to create the model (model training) and the other set was used to assess prediction success. In addition, machine learning algorithms (e.g. random forests) ran hundreds of simulations using different sets of independent variables to assess the relative importance of the predictor variables. We used a sensitivity analysis for all economic models, where the price per area of ecosystem services and the sum of all the costs related to malaria treatment, prevention and control were varied based on the range of values obtained from the scientific literature and field work.

IR 2:

Improved multi-channel availability of EID-focused quantitative resources amongst civil society advocates and government policy makers.

Outcome indicator: 2 Number of policy dialogues using evidences generated by the Project

SUB-IR 2.1:

Established the DHRU for additional research, analysis and cross-disciplinary partnerships.

Outputs: 2.1.a: Institution best suited to serve as a resource center identified; 2.1.b: Key channels and priority products for enhancing dissemination of model outputs and analyses identified; 2.1.c: DHRU established and functional

Output indicators: 2.1.a: Organizational capacity of the DHRU; 2.1.b: Number of graduate students trained; 2.1.c: Number of scientific knowledge products (e.g., posters, presentations, manuscripts, and etc.) produced as a result of USAID-support

KEY ACTIVITY IR 2.1:

Develop the DHRU from a unit to a Research Centre at UMS and into a regional center of excellence for additional research, analysis, and cross-disciplinary partnerships

The Development and Health Research Centre at the Universiti of Malaysia Sabah served as a central hub for many of IDEEAL's activities in the region. Throughout the course of the project, the DHRU hosted 1 roundtable and 9 stakeholder meetings attended by stakeholder groups from across government, NGO, industry, private sector, and academic. As a multi-departmental center, the DHRU was able to engage faculty from across disciplines who provided valuable insight on both modeling and outreach activities for IDEEAL. 156 faculty and students from UMS were trained as part of capacity strengthening activities

held by IDEEAL and hosted at the DHRU. In May 2017, trained facilitators from the DHRU (faculty and graduate students) traveled to Peninsular Malaysia to deliver to the Health and Land Use Change Toolkit to smallholder farmers. UMS, with support from the DHRU also hosted the Borneo Quality of Life Conference in January of 2018. The final IDEEAL seminar and workshop hosted by the DHRU in February 2019 included stakeholder attendees invited from the project expansion regions of Peninsular Malaysia and Thailand. To ensure the sustainability of the DHRU, it has moved under the established Borneo Medical Health Research Centre where it will continue to serve as a hub for multidisciplinary research. A 5-year plan for the BMHRC and the DHRU has been established which includes plans to grow the DHRU and secure additional funding.

Activity 2.1.1:

Expand the engagement of the Development and Health Research Unit (DHRU) at the Universiti Malaysia Sabah (UMS)

We identified partners in Peninsular Malaysia and in Thailand to engage as additional academic partners for the IDEEAL project. The DHRU also invited and hosted stakeholder partners from expansion regions (Indonesia, Thailand, and Peninsular Malaysia) at its stakeholder meetings. DHRU helped to organize and facilitate the international Borneo Quality of Life conference focusing on economic development, health, and the environment, providing the DHRU regional and international exposure and connectivity to a network of scholarly institutions.

Activity 2.1.2:

Select local or regional graduate students for involvement

Three Masters' students were selected and enrolled at UMS via the DHRU. At project completion, one student had completed their Masters' project and the two remaining students are expected to complete theirs by September 2019.

Activity 2.1.3:

Develop and oversee student projects to promote use of spatial analysis, health outcome and economic models

DHRU Masters students were assigned UMS faculty advisors and EcoHealth Alliance/IDEEAL team co-supervisors to develop research that includes the use of spatial analysis, health outcomes, and economic models. Upon completion of the student's research, they are required to publicly disseminate his or her findings to stakeholders via oral presentation and publication in peer review journals.

Activity 2.1.4:

Identify stakeholders for participation in the DHRU

Throughout the project EHA sought to engage new local stakeholders in DHRU activities, from across sectors and geographic regions. A complete list of IDEEAL project stakeholders can be access in Appendix 2.

Activity 2.1.5:

Hold stakeholder meetings to promote research exchange and public dissemination of materials and information

IDEEAL Stakeholder meetings were hosted at the DHRU on approximately a quarterly basis (Table 2). During the project expansion, stakeholders from Peninsular Malaysia were invited to attend DHRU stakeholder meetings and meetings were also held via FFKU in Thailand, expanding the research base for the project.

Activity 2.1.6:

Deliver workshops/seminars around IDEEAL themes to stakeholders

Several workshops and seminars were hosted at the DHRU, included multi-day GIS trainings and Intro to R trainings, and several seminars on scientific writing and research. These activities were attended by both faculty and students at UMS as well as invited outside parties from local institutions and 156 individuals were reached over the course of these trainings.

Activity 2.1.7:

Produce course syllabi for short courses and seminars

Course materials and activities and seminar content were shared with participants and core materials were made available online.

Activity 2.1.8:

Formally connect individuals from academia, private and public sector institutions in IDEEAL expansion regions to the DHRU

We identified key academic partners in the IDEEAL expansion regions; however none were connected formally with the DHRU due to logistic, programmatic, and budgetary constraints.

SUB-IR 2.2:

Developed toolkit for communicating the health impacts of differing land-use options.

Outputs: 2.2.a: Gender-sensitive health impact toolkits for promoting best practice approaches and translate project findings to ensure gender equality benefits developed

The IDEEAL Health Impacts of Land Use Change Toolkit and complementary Interactive Web Application were developed with close input of community members and local stakeholders. The Health Impacts of Land Use Change Toolkit was translated into Bahasa Malay (from the original English) and designed specifically to be relatable in the local context. It was pilot tested in rural communities, ensuring the toolkits are comprehensible and relevant to diverse audiences, and underwent several sessions of toolkit development and stakeholder feedback. 702 individuals from over 52 communities were reached with the IDEEAL Health Impacts of Land Use Change Toolkit and 15 local facilitators were trained with the goal of ensuring the sustainability of the toolkit.

Activity 2.2.1:

Liaise with the DEEP FOREST Human Contact project (DFHC) to inform toolkit development and dissemination strategies

The DFHC team was engaged in the toolkit development and dissemination process. Demographic data from the DFHC project was considered in designing the toolkit for different audiences and lessons learned from DFHC research were applied in engaging with communities for toolkit dissemination. Communities near where DFHC surveys were conducted were engaged to pilot test the toolkit, since they were familiar with some members of the research team.

Activity 2.2.1:

Integrate findings from quantitative models and additional data

A key component of the final toolkit of IDEEAL products is the Interactive Web Application which directly incorporates data collected throughout the project as well

as the economic model into the application for scenario building and evaluation. Additionally, health data and statistics gathered throughout the project, as well as the regional economic model were incorporated into other sections of the toolkit.

Activity 2.2.3:

Conduct training of facilitators and trainers for toolkit

Facilitators from the IDEEAL team as well as local community-based organizations and the DHRU were trained in presenting the health impacts toolkit to various audiences to ensure that the toolkit is widely accessible to communities. Over a dozen toolkit facilitators were trained throughout the life of the project. In collaboration with PACOS, a local CBO, we held a facilitator's and training of trainers session for several of their staff as well as identified community mobilizers, allowing the toolkit to be used in many local contexts. Two of these community mobilizers later presented the toolkit during outreach to villages in Sabah.

Activity 2.2.4:

Pilot test, review, and revise toolkit with target audiences

The developed health impacts of land-use change toolkit was pilot tested in Kampung Bilit and Kampong Sukau in Eastern Sabah with community members and village leaders there, with the specific intent of gaining feedback. Community members highlighted the usefulness of the toolkit, and interest in the novel topic, and provided tangible suggestions on updating the translation to make topics health less technical, and on how to frame some of the discussion topics. This valuable feedback allowed the IDEEAL team to create a more practical and useful version of the toolkit, which was then rolled out more widely.

Activity 2.2.5:

Disseminate health impacts toolkit to policy makers, industry and private partners, local partners and stakeholders, direct beneficiaries, and the general public

A toolkit dissemination strategy was developed prior to toolkit rollout and incorporated lessons learned from past work in the region as well as toolkit and outreach conducted in other contexts. A multi-year iterative plan

for toolkit development, dissemination, feedback and revision was created. Following pilot testing, community leaders and mobilizers from 52 villages across Malaysia were trained on the toolkit and given the resources to present the toolkit in their communities. The toolkit was also presented to industry representatives attending RSPO and to IDEEAL stakeholders, including government representatives, via stakeholder meetings. During the project extension trained facilitators from Sabah and IDEEAL team staff further disseminated the toolkit in Peninsular Malaysia to students studying agricultural business and smallholder farmers in Johor. The English version of the toolkit was also shared with Thai colleagues. This dissemination strategy hopefully led to enhanced the scientific knowledge base around ecosystem services valuation of benefits derived from intact ecosystems, especially with regard to disease risk assessment and policy linkages. The IDEEAL team also worked to publicize the creation of the toolkit at various meetings and conferences to increase awareness about this resource. Over the course of the project the Health Impacts of Land Use Toolkit was shared with 702 individuals.

Activity 2.2.6:

Evaluate toolkit rollout and update toolkit content and dissemination strategies based on results

We continuously evaluated toolkit dissemination and collected feedback about its content from various stakeholder groups. Throughout the project updates to images, language, content, and organization were made based on feedback both formal and informal from the project rollout. For example, in an activity, the use of wild boar as an example animal was discontinued with some audiences due to cultural sensitivities. This feedback also allowed the developed facilitator guide to be updated with recommendations on adaptations to the toolkit for different audiences.

Activity 2.2.7:

Adapt toolkit for use in Peninsular Malaysia and continue outreach in expansion areas

The health impacts of land-use change toolkit was updated to be culturally relevant in Peninsular Malaysia by ensuring

language, terminology, and images are understood by various audiences. We also worked with partners in Thailand on the best way to present information on the project and shared the English version of the toolkit with them.

Activity 2.2.8:

Develop technical economic modeling tools/toolkit for stakeholders

The finalized economic model was generalized and developed into an online web application via an interactive application programming interface (API). This tool, which is available online via: ideal.eha.io, allows policy makers and industry partners to explore the impact of different parameters and test different scenarios by changing input values on the model output by changing them and visualizing the results. This tool, along with the toolkit, explains the model and result interpretations in detail and allows these results to be tested over different potential valuations of ecosystem services or disease impact. As a part of this development, we will conduct trainings on how to use this tool and how to incorporate it into planning decisions. This interactive tool is designed to be used alongside the toolkit to give participants core background knowledge on health and land use concepts and this apply this via interactive economic modeling.

Activity 2.2.9:

Introduce web-based toolkit version designed for broader audiences to stakeholders

The Interactive Web Modeling App is publicly available online and includes detailed instructions on how to use the web tool for different scenarios. Additionally, two targeted and in-depth trainings on this application were held, one in Sabah, Malaysia and one in Bangkok, Thailand, attended by 74 and 30 participants respectively. Participants included students, academic faculty, and government employees from various sectors. This training covered the modeling framework one which the application was built, detailed guidance on the data inputs for the model and how to use them or include other external data, information on the various ways the model can be applied practically to policy, land planning, and development decision-making, and hands-on tutorials and exercises to test these concepts.

SUB-IR 2.3:

Generated outreach activities and communication channels of resources to policy makers and civil society.

Outputs: 2.3.a: Scientific outreach and communication toolkits that translate research and modeling results for key stakeholders developed; **2.3.b:** Economic justification for promoting reduced impact of land utilization strengthened; **2.3.c:** Program-generated, evidence-based analyses accessed and employed by stakeholders to promote reduced impact land utilization

KEY ACTIVITY IR 2.3:

Develop outreach and communications translating quantitative resources to policy makers and civil society advocates

The IDEEAL team worked closely with the DHRU and internal EcoHealth Alliance communications team members to develop communications toolkits and strategies for disseminating scientific findings from this project to policy makers and key partners in industry, government and the public. The aim of these strategies is to translate IDEEAL's scientific analyses into actionable policies and practices for decision makers so that they can more formally integrate infectious disease and economic considerations into land use planning and decision-making. A key part of this strategy was the development of IDEEAL modeling concepts into a Position Paper for the Sabah government and briefing notes which have been accepted for joint presentation by SWD an SSHD and will be presented to the Chief Minister and Cabinet in Sabah. This Position Paper includes figures on the economic cost of land use change in Sabah and recommendations for cost savings if ecosystem services and disease regulation are incorporated into development decisions.

Activity 2.3.1:

Establish regular meetings, including quarterly stakeholder roundtables for public dissemination of materials and information to government, local communities and industry

Via the DHRU and other partners in Peninsular Malaysia and Thailand, the IDEEAL team held regular stakeholder meetings (**TABLE 2**) to engage key partners and share the latest modeling and policy updates. Additionally, the DCoP and other Malaysia-based staff met regularly individually or in small groups with other key partners to share specific information. Additionally, the IDEEAL team attended RSPO twice to better engage industry partners in a familiar forum and set up community meetings in Sabah via engagement with PACOS a community-based organization. The DHRU also has a specific website which highlights its goals and key outputs from the IDEEAL project. During the expansion we engaged new stakeholders in expanded regions and sought to engage them in the DHRU and existing IDEEAL networks via these stakeholder meetings.

Activity 2.3.2:

Design and deliver short-term training programs (in person and/or online) to address immediate needs of existing professionals to increase their knowledge and capacity in the area of land use change

Several workshops and seminars were hosted at the DHRU, included multi-day GIS trainings and Intro to R trainings, and several seminars on scientific writing and research (see activity 2.1.6). In addition, capacity building trainings and seminars were held in Thailand at FFKU. These seminars covered grant writing, knowledge translation, and peer-reviewed publication and the training included economic cost-benefit analysis and tutorials on implementing IDEEAL modeling tools. 30 participants from academia and government attended these Thailand trainings, in addition to the more than 152 participants reached via DHRU training activities.

Planned Activity 2.3.3:

Support website with new content and by expanding links to new stakeholders

The DHRU website is live as a page on the UMS website and the IDEEAL project page on the EcoHealth Alliance website (<https://www.ecohealthalliance.org/program/ideeal>) has been updated with new content throughout and features a video summarizing the project, project outputs, downloadable fact sheets, and a link to the interactive web application. This program page will remain active and live for a least one year following project completion (the interactive web application will be available for at least 3 years).

Activity 2.3.4:

Conduct workshops for relevant local government staff in use of toolkits and other outreach materials

Courses in use of toolkits and other outreach materials were conducted at DHRU, via joint trainings with PACOS, and with partners in Peninsular Malaysia (see Activity 2.2.3). This toolkit was also presented to industry stakeholders attending RSPO.

Activity 2.3.5:

Evaluate stakeholder awareness of issues of land use change, risk of disease emergence, and gender implications

The IDEEAL baseline survey was used as feedback to evaluate knowledge and perceptions around land use and disease risk. These findings were informally combined with feedback from toolkit information sessions and stakeholder input to evaluate these perceptions.

Activity 2.3.6: Develop communications with stakeholders based in the Americas, Europe, Asia, and Australia

The IDEEAL team based in NYC as well as the DCoP regularly communicated with international stakeholders through presentations at local and international scientific conferences (e.g. IOHC, CBD), industry meetings (e.g. RSPO) as well as high-level policy meetings such as the Subsidiary Body on Scientific, Technical and Technological

Advice (SBSTTA) of the Convention on Biological Diversity and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The impact of land use change on human health was included in the IPBES – Regional assessment report on biodiversity and ecosystem services for the Americas and highlighted in a separate document for policy makers (see publications FF and GG). These presentations and activities allowed IDEEAL to increase its visibility as a research project and tool for policy change.



PROJECT MILESTONES

PROJECT MILESTONES

OCTOBER 2013: Held an initial informational meeting to understand stakeholder landscape, identify interested parties and discuss project deliverables.

DECEMBER 2013: 1st Stakeholder Meeting - Project Chief of Party and Deputy Chief of Party met with USAID-RDMA and project stakeholders in Kota Kinabalu; established need and direction for communication strategy.

JANUARY 2014: Created a webpage for the project on the EHA website: <https://www.ecohealthalliance.org/program/ideeal>. Planned community awareness and project promotion campaign. Also created a brand identity for the project.

FEBRUARY 2014: Stakeholder introductory workshop held. Stakeholders identified; briefed on project goals; invited to participate and give input on project; and asked about attitudes and awareness around land use issues. Stakeholders will identify their areas of expertise and potential resources they could contribute to the project. Established regular meetings, including quarterly roundtables at UMS for stakeholders' use for dissemination of project materials and stakeholder input.

MAY 2014: Finalized pilot economic model with economic and ecological data from Brazil.

JUNE 2014: Initial meeting with Malaysia Palm Oil Council.

JULY 2014: 2nd IDEEAL Stakeholder Meeting - Met with policy makers and key industry partners to discuss the relevance of EID threats to certain policies and programs.

AUGUST 2014: DCoP presented PREDICT and IDEEAL projects at the MPOC International Palm Oil Sustainability Conference, which was followed by an article in the Star newspaper on the 29th of September detailing the progress and importance of both the PREDICT and IDEEAL projects.

SEPTEMBER 2014: 4th Roundtable - Evaluated results of communication strategy for Year 1 using community surveys, analysis of social media, etc.

OCTOBER 2014: DCoP had first meeting with Deputy Director General from SFD to discuss IDEEAL.

NOVEMBER 2014: DCoP formally introduced to the Director from SFD, and further discussed IDEEAL. DCoP working towards establishing relationship with industry stakeholders Wilmar and Sime Darby. DCoP met Chairman of UMS Board of Directors confirming his support for DHRU at UMS. DCoP presents on IDEEAL and PREDICT projects to the UN Special Rapporteur.

DECEMBER 2014: DVC confirms that the DHRU had been approved and would be housed within the EcoCampus, an existing Center at UMS. Dr. Sarma from the FBE would remain as the DHRU lead. Participants were presented the IDEEAL model in detail, using data from Sabah. DVS Sabah attended meeting for first time.

DECEMBER 2014: M&E Plan approved. Y2 Work Plan submitted and approved. Obtained landcover and deforestation dataset used by David Gaveau for his paper 'Four Decades of Forest Persistence, Clearance and Logging on Borneo.'

JANUARY 2015: UMS Legal Department provided copy of MOU for EHA review.

FEBRUARY 2015: Identified first potential graduate students with the DHRU.

MARCH 2015: Completed preliminary analysis of subset of DFHC data; UMS approved of MOU with EHA.

MAY 2015: MOU between UMS and EHA signed. Fourth IDEEAL Stakeholder Meeting. The Malaysian Palm Oil Council sent a representative to the meeting for the first time and the Director of PACOS Trust was also in attendance. First meeting held with Research Fellows

of DHRU to develop a 16-month plan for seminars, workshops, and toolkit development through the DHRU. CoP, DCoP, and SM met with Dr. William Gotulis, Deputy Director, Department of State Health Sabah to discuss the IDEEAL project and data still needed.

First DHRU conference “Links between Land Change, Development and Health” held at UMS. IOI attendees included staff and faculty from UMS, government, industry, and NGO stakeholders involved in the IDEEAL project.

JUNE 2015: IDEEAL invited to present to PACOS community leader meeting on the IDEEAL project. There were 62 Orang Asli participants from 37 communities.

JULY 2015: All spatial land cover datasets needed for modeling obtained. DCoP met with new acting Director General DVS and new Director of the Veterinary Research Institute and discussed the IDEEAL project.

AUGUST 2015: Toolkit Development meeting held with stakeholders in Malaysia.

SEPTEMBER 2015: Toolkit pilot tested with communities of Sukau and Bilit in Kinabatangan District.

OCTOBER 2015: 5th Stakeholder Meeting held in Malaysia. Final selection of three students for DHRU. First Industry Outreach meeting held in KL.

NOVEMBER 2015: Attended RSPO Annual Meeting in KL and displayed booth in the exhibition hall. Conducted first toolkit facilitator training for IDEEAL team members. Received preliminary agreement from Wilmar to allow sampling in plantation areas.

DECEMBER 2015: DCoP briefed Vicki Treadell, British High Commissioner, and Matthew Deith, Political and Economic Counsellor, from the British High Commission on details of the PREDICT and IDEEAL work in Sabah. Presented two talks related to IDEEAL work at the International Symposium on Biodiversity, Agriculture, Environment and Forestry in Ooty, India.

JANUARY 2016: Toolkit presentation to community of Bilit attended by 39 people. Toolkit presentation to community of Sukau attended by 27 people.

FEBRUARY 2016: Toolkit presentation to management from IOI Group, Morisem, Sepagaya Estate and Genting Plantation attended by 7 people. Toolkit presentation in Suan Lamba Genting Plantation attended by 83 workers.

Community Workshop and Toolkit Training Session with PACOS: Introduced toolkit to key representatives and leaders from several communities and began training and identifying key persons to receive additional training as toolkit facilitators.

R Workshop: Introductory R Workshop held at UMS with student and faculty as well as key stakeholder participants.

Met with Deputy Director of Sabah Forestry Department to discuss findings from IDEEAL modeling. Met with senior staff (including Director and both Deputy Directors), at Sabah Wildlife Department to present findings from Human Animal Contact Survey, PREDICT disease screening and the IDEEAL model.

MARCH 2016: Met with Director and other senior staff from Sabah State Health Department including Director of their Centre for Disease Control, to present findings the IDEEAL model. Met with Datuk Ginun Yangus Permanent Secretary Ministry of Tourism, Culture and Environment to present IDEEAL model. Interviewed by RTM for IDEEAL and PREDICT work.

DCoP met with YB Datuk Seri Panglima Masidi Manjun, Minister of Tourism, Culture and Environment, to present IDEEAL model. Datuk Masidi to support a Position Paper to be presented to the Sabah Cabinet and to arrange a time to meet with Chief Minister of Sabah Datuk Seri Panglima Musa Haji Aman to present the model.

APRIL 2016: Interviewed by RTM for IDEEAL and PREDICT work. Presented talk on IDEEAL and DEEP FOREST work at One Health Workforce “Emerging and Zoonotic Disease Colloquium” in Kuching. IDEEAL SCL and other IDEEAL staff from EHA met with Johnson & Johnson VP of Sustainability, and presented IDEEAL and discussed future support and expansion of the program (proposal was invited and submitted by EHA).

JUNE 2016: EHA submitted a proposal to the Environmental Protection Agency for three years of

support for IDEEAL to expand activities to Western Malaysia and include haze events in health analysis. EHA submitted a proposal to Johnson & Johnson (J&J) for over 3 years for work toward policy change in Malaysia as part of J&J's sustainability objectives. This would include expansion of IDEEAL to Peninsular Malaysia.

JULY 2016: CoP signed a contract to fund 3 Masters' students through the DHRU and conducted media interviews. CoP and SCL met with Managing Director of Rockefeller Foundation to discuss long-term support for IDEEAL activities.

AUGUST 2016: Introductory R Workshop held at UMS with student and faculty, as well as key stakeholder participants. Toolkit facilitators' training took place in partnership with PACOS and toolkit was presented at a community meeting in Sabah village. Three DHRU student abstracts were accepted for presentation at the One Health Eco Health Conference in Melbourne, Australia in December 2016.

OCTOBER 2016: Submitted an abstract to organize a side event for the Conference of the Parties - Convention on Biological Diversity to be held in Mexico in December 2016.

NOVEMBER 2016: Attended RSPO for second time and engaged with industry representatives and NGOs.

DECEMBER 2016: Participated in the symposium: Linking Public Health and Ecosystem Management: a One Health Approach at the Conference of the Parties - Convention on Biological Diversity (CBD - COP13). This symposium was highlighted by the Rio Conventions Pavilion Bulletin, Vol. 200, No. 35. <http://enb.iisd.org/download/pdf/sd/enbplus200num35e.pdf>

Two of the DHRU Masters' students presented their posters: "Zoonotic Viruses Surveillance for the Confiscated Pangolins in Malaysia" and "Soil - Transmitted Helminths Among Rural Indigenous Children in Kota Marudu, Sabah," and IDEEAL team member presented poster "Assessing viral diversity in non-human primates and bats of Peninsular and Bornean Malaysia" at the One Health Eco

Health Conference in Melbourne, Australia. DCoP gave a talk on IDEEAL: "Analyzing the health value of a tropical forest - New strategies to mitigate pandemic prevention."

JANUARY 2017: P&G agreed to use DHRU Research Fellows to present Toolkit at a workshop in May 2017, a key performance indicator in the DHRU's process to becoming an official Center.

FEBRUARY 2017: Presented IDEEAL work to MPOB, P&G, and Proforest, including Dr. Lee from P&G Environmental Stewardship and Sustainability program and Mr. Surin Sukswan, Southeast Asia Regional Director for Proforest.

DCoP attended International Workshop on Proboscis Monkey Conservation in Sabah. Discussed IDEEAL work with CEO of Yayasan Sime Darby, and held follow-up discussions with Yayasan Sabah and Sarawak Forestry Corporation.

MARCH 2017: First meetings held in Bangkok, Thailand to discuss expansion of IDEEAL work with DNPWPC and BoE DDC MPH.

APRIL 2017: DCoP met with new US Ambassador to Malaysia, Ms. Kamala Shirin Lakshdhir; Mr. Todd Hannah Environment, Science and Technology Officer; Ms. Sona Ramesh, Economic Officer; and Mr. Frank Whitaker, Public Affairs Officer, and had a lengthy discussion regarding IDEEAL work.

MAY 2017: EHA Field Manager, Community Engagement Coordinator and Spatial Modeler presented toolkit to 24 smallholder oil palm farmers in Kampung Sungai Jambi, Johor, Malaysia. As part of this presentation, two trained facilitators from the DHRU presented the toolkit to the smallholders with assistance from EcoHealth Alliance staff. This is one of the deliverables for the DHRU and will assist in its establishment as a Center.

Community Engagement Coordinator gave a talk, "Analyzing the health value of a tropical forest – New strategies to mitigate pandemic potential" at Yayasan Sime Darby's Environment Day. IDEEAL team presented toolkit activities to 3 teachers and 15 children.

DCoP gave a talk “Promoting One Health and Conservation through Zoonotic Disease Surveillance: The PREDICT and IDEEAL Projects in Malaysia” at the 3rd Borneo Tropical Medicine and Infectious Disease Congress 2017.

JUNE 2017: Wilmar asked IDEEAL to prepare land optimization proposal for Nigeria which will be a focus of Wilmar palm oil expansion for next 10-20 years. DCoP attended the first official Palm Oil & NGO (PONGO Alliance) meeting. DCoP met with Dr. Simon Lord, Group Chief Sustainability Officer for Sime Darby to discuss land evaluation we are planning with Wilmar. Sime Darby may be able to assist in obtaining IDEEAL data for Sabah and Peninsular Malaysia. Dr. Helen was confirmed as the new official Head of the DHRU. Potential study areas for Thailand were researched and selected.

JULY 2017: Estimated country-specific ecosystem services value for areas in the current IDEEAL study region.

AUGUST 2017: Meetings in Kuala Lumpur with Sime Darby to obtain detailed cost and oil palm production data for Sabah. Met with P&G to discuss potential sources of data acquisition.

SEPTEMBER 2017: Meetings in Thailand with Ministry of Health, Kasetsart University Faculty of Forestry, Department of National Parks, and MORU on potential data sources and possible areas for collaboration on research projects.

IDEEAL team met with Dr. Katherine Lee in New York to discuss future steps for modeling and publications on IDEEAL project. A road map was outlined on how to apply the IDEEAL model on a global scale.

7th IDEEAL Stakeholder Meeting held at FMHS. CoP gave a talk briefly on IDEEAL Project and DCoP gave a presentation on “Emerging Diseases and Zoonoses”.

NOVEMBER 2017: Drafted MOU with MORU. Data access meetings for Thailand expansion modeling were successful.

DECEMBER 2017: Spatial Modeler, Economist, and Community Engagement Coordinator led an Introduction to Geographic Information Systems (GIS) and Mapping workshop at UMS, organized by the DHRU. DHRU website finalized with input from all partners, and is now live at this link: <http://www.ums.edu.my/dhru/en>.

A roundtable meeting on Developing A Blueprint For Land Use Change In Sabah was held and it was attended by 20 people.

JANUARY 2018: Team members attended and presented at the Borneo Quality of Life Conference.

FEBRUARY 2018: DCoP presented poster “Analyzing the importance of land conversion as a driver of disease emergence in tropical forests” at PMAC.

MARCH 2018: Senior Modeler attended and participated in a plenary session at the 6th Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in Medellin, Colombia.

APRIL 2018: DCoP continued discussions with Sime Darby on the Position Paper, progress, and next steps.

MAY 2018: IDEEAL no-cost extension through November 30th granted. Ethical approval (IRB) received for Thailand malaria data.

JUNE 2018: DHRU student Amy Lim completes her viva. International One Health Congress in Saskatoon, Canada: Community Outreach Coordinator gave a talk on ‘IDEEAL modeling and outputs,’ DHRU student presented poster on his Master’s thesis work.

JULY 2018: Contract with Dr. Prateep at FFKU signed. Prof. Kamruddin agrees to move the DHRU under BMHRC, ensuring long-term sustainability of the DHRU.

AUGUST 2018: DCoP received oil palm and rubber price data from Dr. Prateep. 8th IDEEAL Stakeholder Meeting held at FMHS. CoP gave a talk at FMHS UMS, “Ebola, Nipah, Disease X, and the new global strategy to fight emerging diseases.”

SEPTEMBER 2018: Mei Ho Lee presented IDEEAL, PREDICT, and DTRA work in Malaysia at the 10th Danau Girang Field Centre Science Seminar, Kota Kinabalu, Sabah. Economic Modeling Workshop was held at Faculty of Forestry, Kasetsart University, Bangkok, Thailand.

OCTOBER 2018: Sonia Dattaray presented 'InVEST modeling for South East Asia' in a poster presentation at the American Museum of Natural History's Student Conference on Conservation Science in New York.

NOVEMBER 2018: Bureau of Vector-Borne Diseases, Department of Diseases Control, Ministry of Public Health, Thailand informed MORU that malaria case data can now be shared following in-country ethical approval.

DCoP met with Director of SSHD to discuss Position Paper. Director of SSHD suggested including all agencies that Paper is relevant to in the summary, and confirmed that fines for violating disease control regulations are covered under Section 13(1) of the Destruction of Disease -- Bearing Insects Act 1975. Director of SSHD suggested that a good way to improve industry practices and regulations to reduce health-associated costs to communities would be by extending and enforcing Act 446 Workers Minimum Standards of Housing and Amenities Act 1990 throughout Malaysia, not just for Peninsular. This requires companies whose economic activity may increase the risk of infectious diseases to provide health facilities in areas where they plan to operate to help deal with this increased risk to their workers and the local population; will ensure that these companies take preventive measures such as providing treated bed nets and screens on windows of staff housing. DCoP meets with Deputy Director of SWD to discuss SSHD edits to Position Paper. SWD is happy with the suggested changes and DCoP will make edits to Position Paper. DCoP sent revised Position Paper to Deputy Director SWD and Director SSHD.

DCoP and FAO Regional BioSafety Coordinator met with Head of BMHRC to finalize work plan for BMHRC and DHRU for next 5 years. DCoP met with Head of DHRU to discuss February 2019 training and meeting plans. Head of DHRU is happy with all plans and for Head of BMHRC to become Head of DHRU. Dr. Lasimbang will remain as a

Research Fellow and will be involved with DHRU activities. DCoP met with Head of BMHRC to discuss collaboration between BMHRC, DHRU, SSHD and KKPHL. Also discussed plans for February 2019 IDEEAL training and stakeholder meeting.

DECEMBER 2018: MORU provided malaria case data including number of malaria cases by species and province, per year, for entire country, and number of malaria cases by species and subdistrict, per year, for Surat Thani and Krabi from 2012-2017. Bureau of Vector-Borne Diseases, Department of Diseases Control, Ministry of Public Health, Thailand provided malaria cost data.

DCoP met with Dr. Prayuth and Suravadee from MoPHT to evaluate malaria cost data and discuss plans February training and meeting. DCoP met with Dr. Prateep and team to address final issues with land use data and plans for February training and meeting. DCoP met with RDMA to discuss plans for last 3 months of project, Thailand data, Thailand meeting and training, and project closeout.

Director of SSHD returned Position Paper to DCoP with list of edits and questions. DCoP edited and addressed questions, and returned Position Paper to Director of SSHD.

JANUARY 2019: Director of SSHD approved final version of Position Paper. DCoP met with Deputy Director of SWD to discuss next steps for Position Paper now that it has been approved by SSHD. DCoP and Deputy Director SWD to meet with Permanent Secretary Ministry of Tourism, Culture and Environment Sabah on February 15th to discuss Position Paper.

DCoP met with Quek Yew Aun, Officer from Biodiversity and Forestry Management, Division of the Ministry of Water, Land and Natural Resources, to discuss the IDEEAL work and how the project results could be useful to the Ministry as they try to strengthen forest protection and improve connectivity in the Central Forest Spine on Peninsular Malaysia. Yew Aun requested the DCoP meet with YBhg. Dato' Wan Mazlan bin Wan Mahmood, Under Secretary, Biodiversity and Forestry Management Division of the Ministry of Water, Land and Natural Resources, to discuss the IDEEAL work further.

DCoP met with the Head of DHRU to update on plans for February meetings and training, the DHRU/ BMHRC merger and to discuss the progress of the two remaining Masters' students. DCoP met with Masters' students Alice Mathew and Jimmy Lee to discuss their progress and timelines for completing their studies. Both will be completed by September 2019. DCoP met with Head of BMHRC to discuss plans for the 9th IDEEAL Stakeholder Meeting scheduled for February 18th, the IDEEAL seminars on February 19th, and the GIS training on February 20th and 21st. Prof. Kamruddin informed DCoP that the approval for moving the DHRU under the BMHRC is progressing; awaiting final approval from Deputy VC of UMS.

DCoP met with Prof. Marc Mendelson and Britta Lassmann to discuss the ICID meeting to be held in KL in Feb 2020. They were very interested in the IDEEAL work and were agreeable to the idea of an IDEEAL symposium at the conference. They also thought it would be a great opportunity to run an IDEEAL workshop showcasing the model as it would be a good draw for international participants.

DCoP spoke with Dr. Prateep to finalize plans for Thailand meetings and training at Kasetsart University. IDEEAL seminars will be held February 26th, in addition to two days of training on 27th and 28th covering the IDEEAL model, in addition to approaches on how to communicate and fund research.

FEBRUARY 2019: Completed modeling to determine the drivers of malaria incidence for Thailand, Peninsular Malaysia and Sarawak, Malaysia.

Generated yearly malaria risk models using machine-learning methods of ecological factors including land use land change, demographic, disease and climatic metrics for Sarawak, Malaysia, Peninsular Malaysia and Thailand.

Developed a global economic model to estimate the losses from potential emerging infectious diseases due to excessive forest land conversion.

Drafted Global Economic Model manuscript for publication in 2019.

IDEEAL interactive web application (ShinyApp) was updated and hosted on the web. This interactive tool now includes scenarios for different regions in Southeast Asia and updated descriptions and outputs and a more user-friendly design. The application can be accessed at: <http://ideeal.eha.io/>.

DCoP met with YBhg. Dato' Wan Mazlan bin Wan Mahmood, Undersecretary of the Ministry of Water, Land and Natural Resources of the Biodiversity and Forestry Management Division to discuss the IDEEAL work. YBhg. Dato' Wan Mazlan bin Wan Mahmood asked DCoP to keep them informed on progress with Position Paper in Sabah. He also offered to organize a meeting at the Ministry for all government departments involved in land use change after the Position Paper has been presented to ensure IDEEAL findings are shared with relevant departments.

DCoP and Deputy Director SWD met with Permanent Secretary Ministry of Tourism, Culture and Environment Sabah, William Baya to discuss the IDEEAL project and the Position Paper. Secretary Baya agreed that the IDEEAL work is important and the Position Paper should be presented to the Cabinet. DCoP discussed use of IDEEAL modeling with Associate Prof. Richard Maude, Head of Epidemiology at MORU, to assist with the malaria policy project funded by the Bill & Melinda Gates Foundation which aims to eliminate malaria in the Asia Pacific region by 2030.

Held Ninth IDEEAL stakeholder meeting to update all partners on the progress that has been made with the model, the Position Paper, and the Development and Health Research Unit. IDEEAL seminars included **Surveillance of Zoonotic Viruses and Population Genetics of Confiscated Sunda Pangolins from Malaysia; Preview of IDEEAL Issue Eco Health Journal Issue; Ecosystem Service Valuations South East Asia; The Global Cost of Land Use Change and Emerging Pandemics; The IDEEAL Model; and The IDEEAL Interactive Web Modeling App** presented by Jimmy Lee (DHRU Student); Dr. Hume Field (DHRU Student Supervisor); Allison White (Community and Stakeholder

Outreach and Engagement Coordinator); Dr. Peter Daszak (CoP), Samantha Maher (Spatial Modeler) in collaboration with Carlos Zambrana-Torrel (Senior Modeler), Yasha Feferholtz (Economist) and Sonia Dattaray (Research Assistant). These seminar sessions were attended by 74 staff and students from UMS, government, and NGOs.

The Second Geospatial Information System (GIS) Training was held at UMS. This training was conducted by Allison White and Samantha Maher, and it was attended by 25 participants from UMS.

The IDEEAL seminars at the Faculty of Forestry, Kasetsart University, Thailand, covered the following topics: **The IDEEAL Project in Southeast Asia** (Tom Hughes, DCoP); **The Global Cost of Land Use Change and Emerging Pandemics** (Tom Hughes); **Ecosystem services valuation Southeast Asia** (Samantha Maher); **The IDEEAL Model** (Allison White) -- discussion included how the model was developed, what data was needed, the challenges, findings from Malaysia and Thailand, and how the model can be used in the future; **The IDEEAL Interactive Web Modeling App** (Allison White and Samantha Maher).

The seminars were attended by 30 participants from Mahidol University, MORU, USAID RDMA, MoPH BOE and BOVBD, TRC-EID Chulalongkorn University, Faculty of Forestry KU, Mahasarakham University, and Sukhothai Thammathirat Open University.

During the second day of training, the following topics were discussed: **IDEEAL Training on the IDEEAL Model and the IDEEAL Modeling Interactive Modeling App** (Allison White and Samantha Maher). The trainings were attended by 30 participants from Mahidol University, MORU, MoPH BOE, TRC-EID Chulalongkorn University, Faculty of Forestry KU, Mahasarakham University, and Sukhothai Thammathirat Open University.

The final trainings were led by Allison White and covered the following topics: **IDEEAL Training on Knowledge Translation**; **The IDEEAL Toolkit**; **Communicating Science: Publishing your research and maximizing impact**; **Funding Science: Tips on grant-writing and fundraising for scientific research projects**. The trainings were attended by 20 participants from Mahidol University,

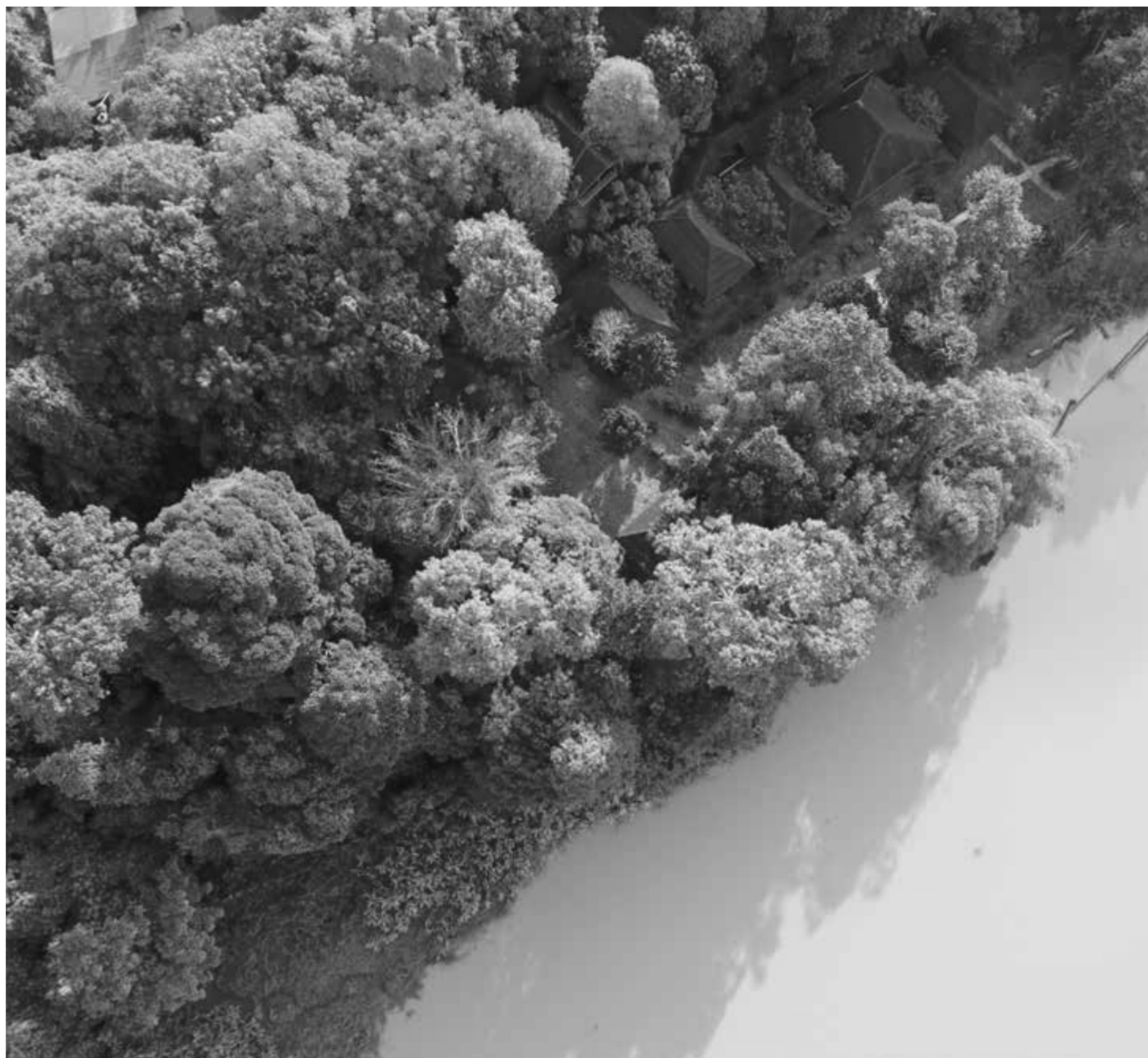
MORU, TRC-EID Chulalongkorn University, Faculty of Forestry KU, Mahasarakham University, and Sukhothai Thammathirat Open University.

Project continuation

MARCH 2019: DCoP and Director of SWD met with Datuk Christina Liew, Minister of Tourism, Culture and Environment who is also Deputy Chief Minister of Sabah Y.B. DCoP briefed Minister Liew on IDEEAL work, project findings, and the aim of the Position Paper. SWD will work with the Permanent Secretary to finalize details and prepare Malay summary to be presented with Position Paper to the Cabinet. Date for presenting Position Paper to Sabah Cabinet to be confirmed.

APRIL 2019: CoP, DCoP and Richard Maude, Head of Epidemiology at MORU, held call to further discuss using the IDEEAL modeling to assist with the malaria policy project working across Thailand, Laos, Cambodia, Myanmar and Vietnam. It was agreed that Thailand results will be shared, and model may be refined with new data sets or with data from other countries in the region to help with this effort. IDEEAL team members travelled to Monrovia, Liberia for initial scoping visit for EcoHealth Alliance's Forest Health Futures, Liberia project. The project will formally launch in June, and seeks to apply an economic framework incorporating health and ecosystem services into land planning in Liberia.

MAY 2019: DCoP met with new Deputy VC of Research and Innovation at UMS, Associate Prof. TS Dr. Ramzah Dambul. Dr. Ramzah informed DCoP, Head of BMHRC, and Head of DHRU that the DHRU move to become part of the BMHRC has been approved, ensuring continuity of the DHRU. The Head of BMHRC will now also be Head of DHRU, and Dr. Helen Lasimbang will continue to be actively involved in the DHRU and BMHRC activities.



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Appendices

I. DATA SOURCES

COUNTRY LEVEL

DATA COLLECTED (SOURCE)

Average national risk of an EID from (Allen et al. 2017).

Gross domestic product (GDP) (The World Bank 2015)

Gross domestic product average growth rate 1961-2016
(The World Bank 2015)

Total population, 2015 (The World Bank 2015)

Corporate tax rate, 2011 (The World Bank 2015)

Total forest land, 2015 (The World Bank 2015)

Total agricultural land, 2015 (The World Bank 2015)

Agriculture, value added (current US\$)
(The World Bank 2015)

Employment in agriculture (% of total employment)
(modeled ILO estimate) (The World Bank 2015)

GLOBAL DATA

Forest cover loss (University of Maryland:
Global Forest Change 2013)

Land cover (ESA Land Cover)

Precipitation data (Climate Prediction Center – NOAA)

Social Cost of Carbon (Tol 2009)

Social Discount Rate (Mathematical Bioeconomics:
The mathematics of Conservation – Clark)

DISEASE DATA

Health data – Malaysia (Department of Health
Malaysia 2015)

Health data – Thailand (MORU 2017)

IDEAL SHINY APP

Crude Palm Oil (USD) (Index Mundi)

Crude Palm Oil per hectare (metric tons) (FAO)

Total Expenditures on Disease Prevention and
Control Thailand (DDC Thailand 2017)

Total Number of Infections Thailand (MORU 2017)

Total Expenditures on Disease Prevention and Control
Sabah, Malaysia (Sabah Department of Health 2015)

Total Number of Infections Sabah, Malaysia (2015)
(Sabah CDC 2015)

Total Expenditures on disease prevention and
control, Malaysia (Malaysia, Department of Health)

Total Number of Infections (Department of
Health, Malaysia)

Sum total of ecosystem services (USD/ha) (TEEB)

Total Land (FAO)

% Forested Land (FAO; ESA CCI Land Cover)

Total land, PM Malaysia (Forestry Department
of Peninsular Malaysia)

% Forested Land (Forestry Department of
Peninsular Malaysia)

Appendices

2. IDEEAL PARTNERS AND STAKEHOLDERS FOR MALAYSIA

The following have attended IDEEAL meetings at the Development and Health Research Unit set up at Universiti Malaysia Sabah, and / or have helped provide or compile data, and / or helped review the data sets and model and / or helped put together the IDEEAL toolkit for stakeholder engagement or attended trainings or toolkit presentations.

- BC Initiative
- Bornean Rhino Alliance
- Biotechnology Research Institute, Universiti Malaysia Sabah
- Danau Girang Field Centre
- Department of Veterinary Services
- Department of Wildlife and National Parks Peninsular Malaysia
- EcoHealth Alliance
- Faculty of Business and Economics and Accounting, Universiti Malaysia Sabah
- Faculty of Humanities, Art and Heritage, Universiti Malaysia Sabah
- Faculty of Medical and Health Sciences, Universiti Malaysia Sabah
- Biotechnology Research Institute, Universiti Malaysia Sabah
- Faculty of Engineering, Universiti Malaysia Sabah
- Faculty of Food Science and Nutrition, University Malaysia Sabah
- Faculty of Business, Economics and Accountancy
- Faculty of Humanities Arts and Heritage, Universiti Malaysia Sabah
- University College Sabah Foundation, Universiti Malaysia Sabah
- Forest Research Institute Malaysia
- Faculty of Science and Natural Resources, Universiti Malaysia Sabah
- Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah
- Borneo Medical and Health Research Centre, University Malaysia Sabah
- Johnson and Johnson Company
- LEAP - Land Empowerment Animals People
- Living Landscape Alliance (Nicola Abram Kent University)
- Ministry of Health
- Malaysian Palm Oil Council
- Proctor and Gamble
- PACOS Trust - Partners of Community Organisations Sabah Trust
- Roundtable on Sustainable Palm Oil
- Sabah Economic and Development and Investment Authority
- Sabah Forestry Department
- Sabah Land and Survey Department
- Sabah State Health Department
- Sabah Wildlife Department
- Sime Darby
- Universiti Malaysia Sabah
- United States Agency for International Development

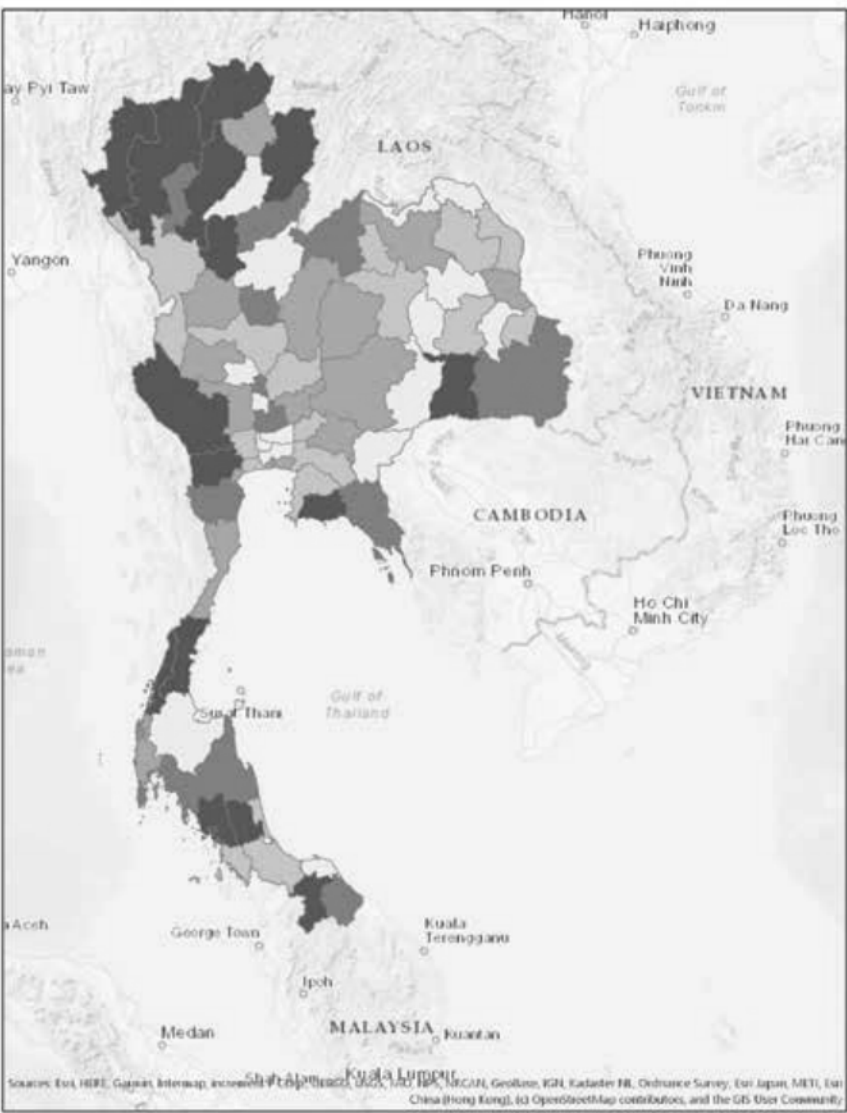
- Wilmar
- WWF
- IOI Morisem Plantation
- Genting Plantations
- Coca Cola
- Centre for Promotion of Knowledge and Language Learning, Universiti Malaysia Sabah
- Trescope Sdn Bhd
- Ministry of Water, Land and Natural Resources
- Ministry of Tourism, Culture and Environment Sabah
- Wild Asia
- PROFOREST
- Faculty Plantation and Agrotechnology, University Teknologi Malaysia - MARA
- Jesselton College
- Chevron
- Cargill
- Colgate-Palmolive
- FAO
- Village heads
- US Embassy Malaysia

THAILAND

- Ministry of Public Health Department of Disease Control (MoPH-DDC: Bureau of Vector Borne Diseases (BVD) and Bureau of Epidemiology (BoE),
- Faculty of Forestry Kasetsart University (FFKU),
- Vet Faculty Kasetsart University (VFKU),
- Chulalongkorn University,
- Mahasarakham University,
- Maejo University,
- Department of Livestock Development Thailand,
- Sukhothai Thammathirat Open University
- Department of National Parks, Wildlife and Plant Conservation, Thailand
- Mahidol-Oxford Research Unit (MORU) Faculty of Tropical Medicine, Mahidol University.
- FAO

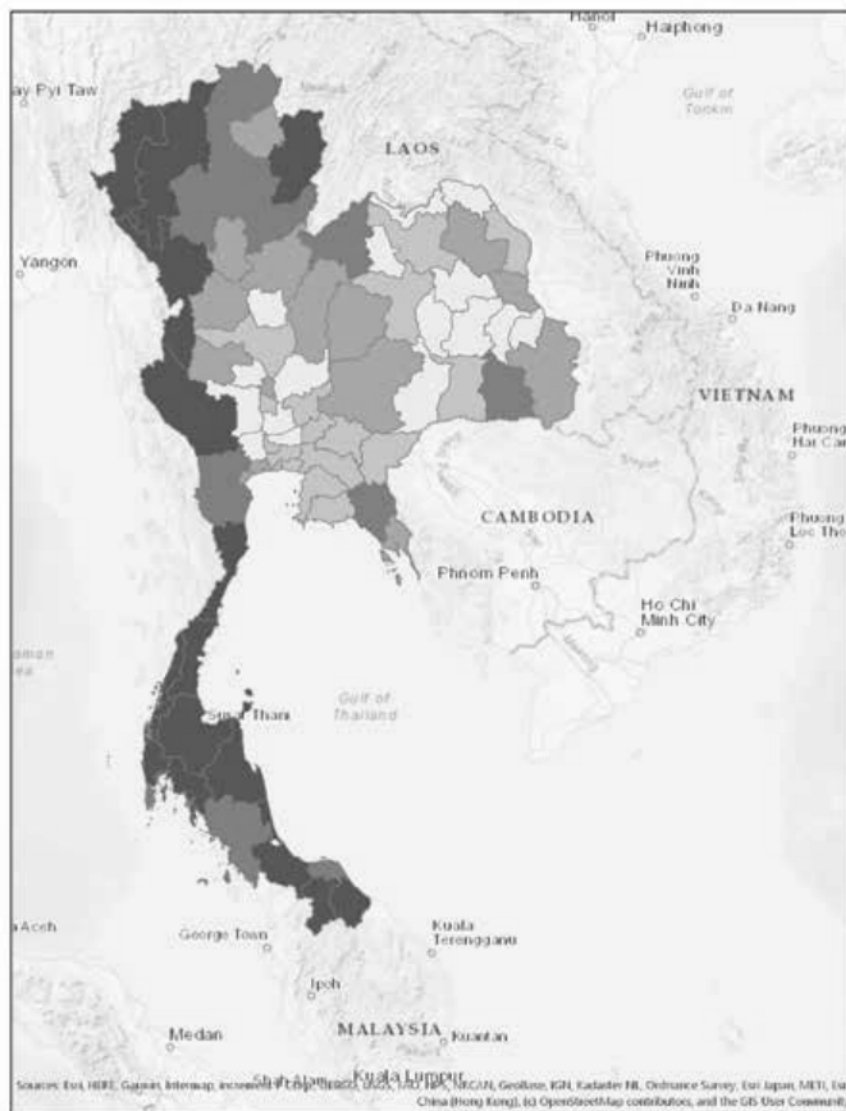
Appendices

3. EXPECTED RISK OF MALARIA

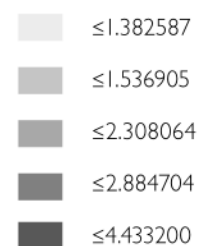


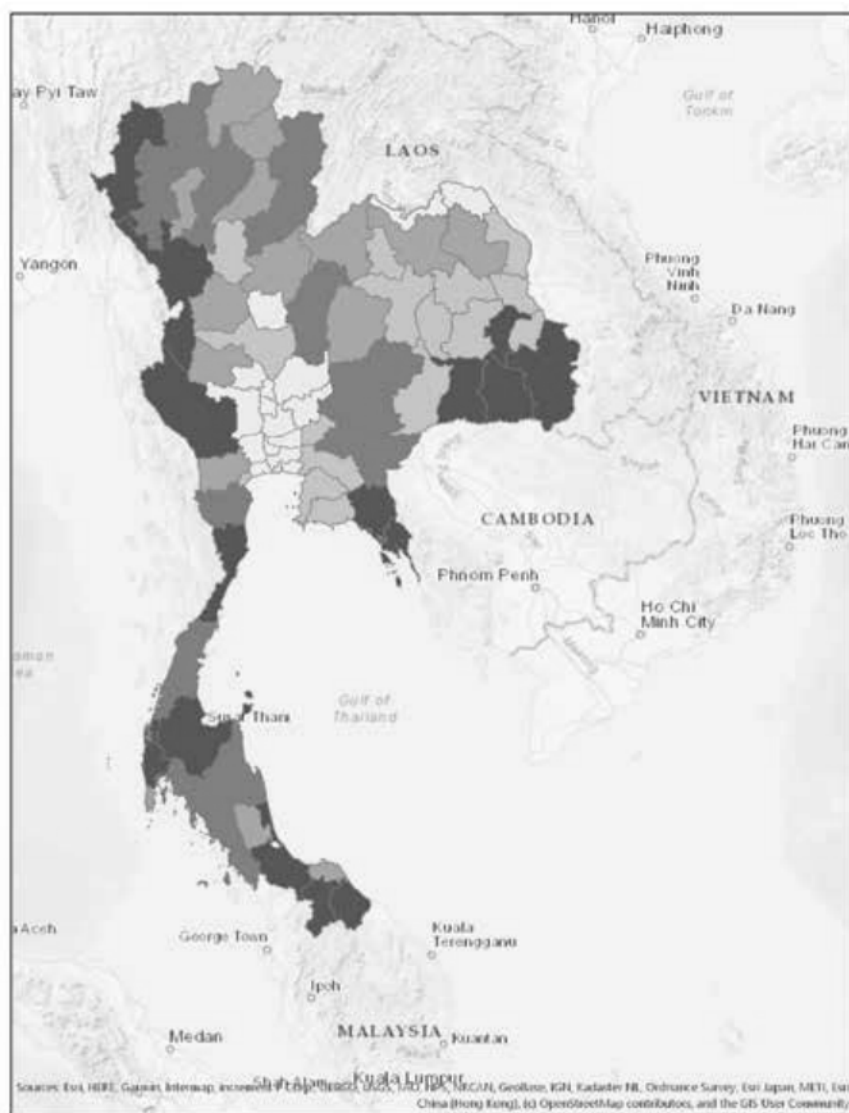
**THAILAND
STANDARDIZED
MALARIA RISK 2012**

- ≤1.337883
- ≤1.532178
- ≤2.298040
- ≤2.794256
- ≤4.349370

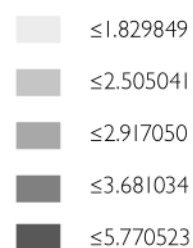


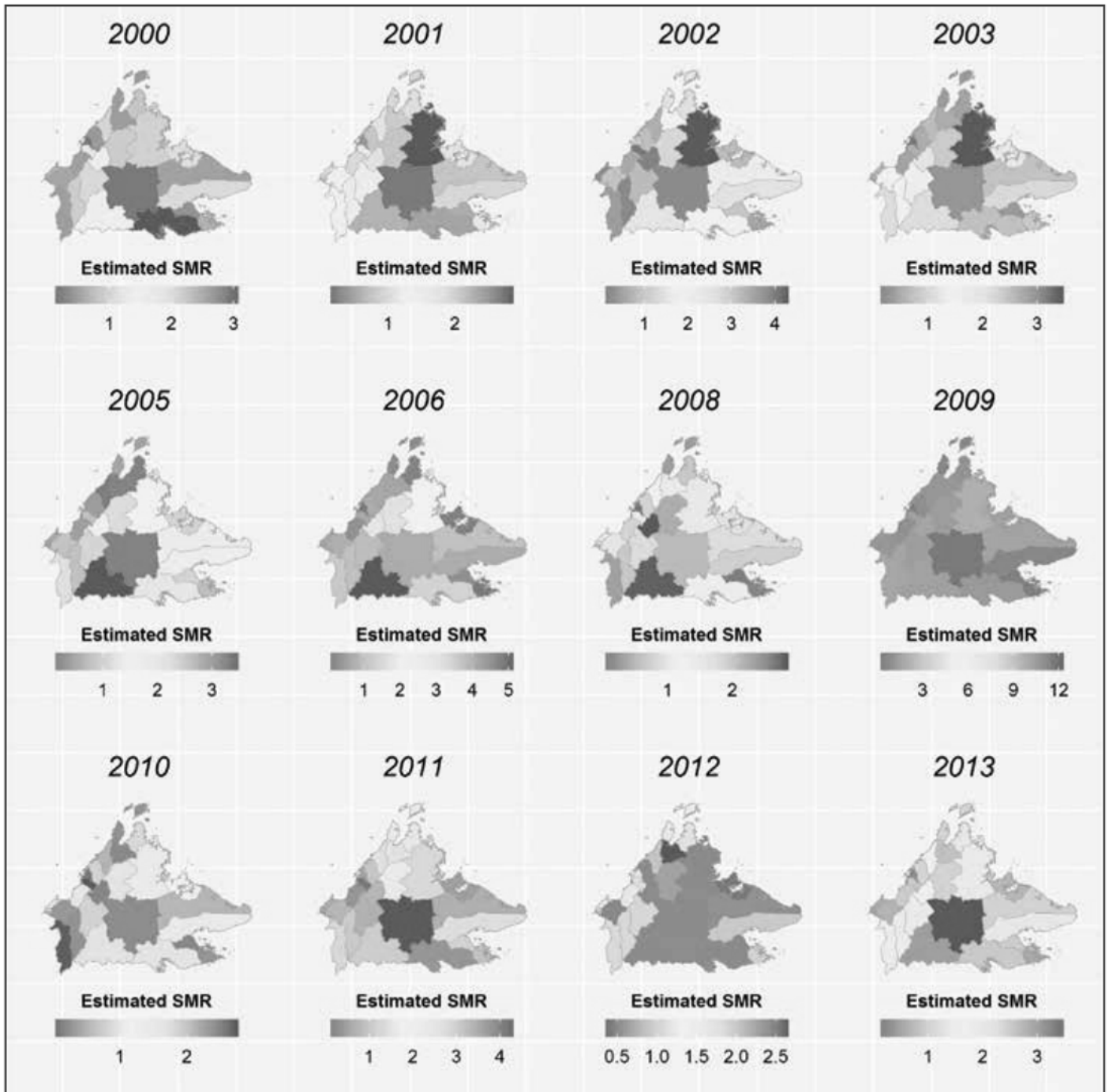
THAILAND STANDARDIZED MALARIA RISK 2013



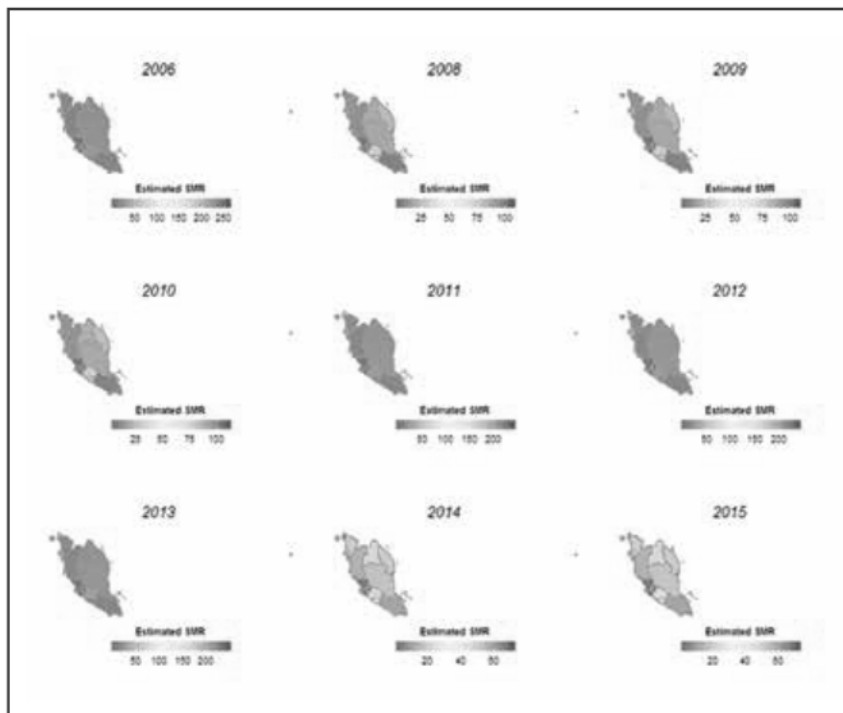


THAILAND STANDARDIZED MALARIA RISK 2015

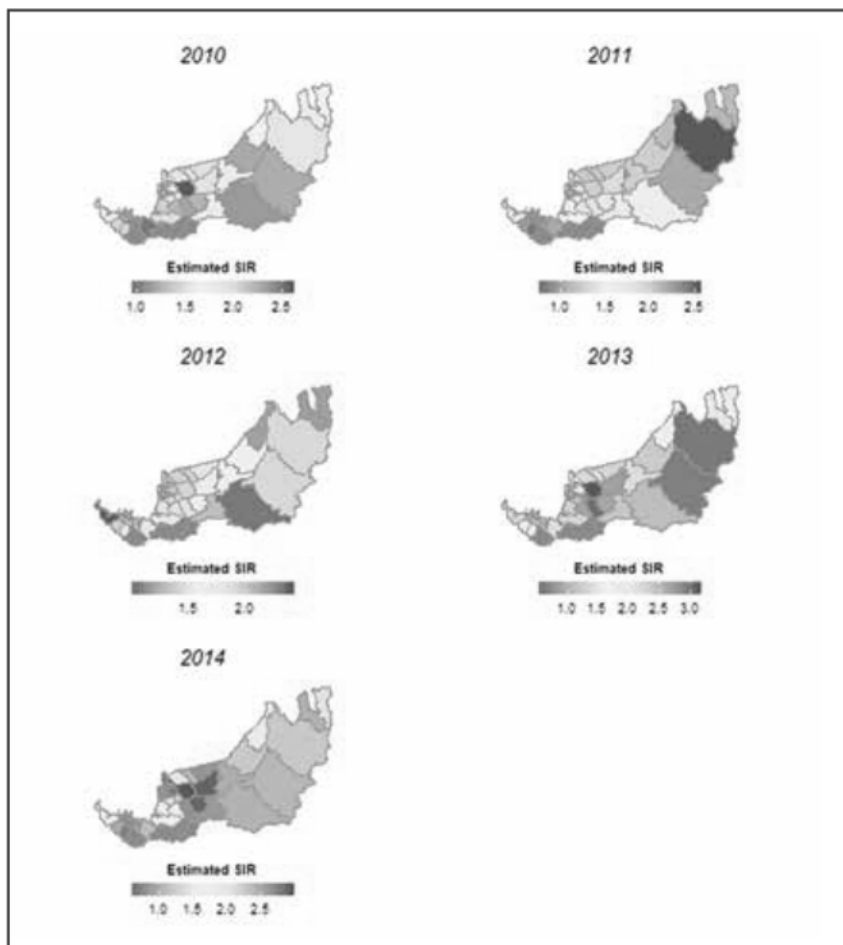




SABAH, MALAYSIA STANDARDIZED MALARIA RISK



**PENINSULAR
MALAYSIA
STANDARDIZED
MALARIA RISK**



**SARAWAK, MALAYSIA
STANDARDIZED MALARIA RISK**

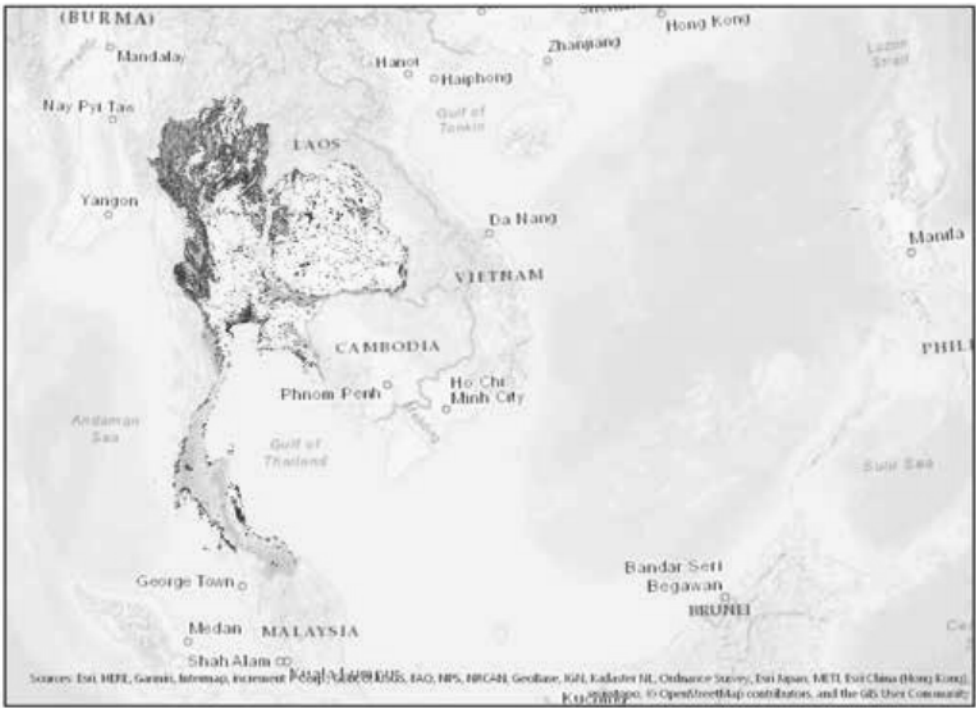
Appendices

4. InVEST



THAILAND:
CHANGE IN CARBON
(2015 – 2030)
(MG C/pixel)

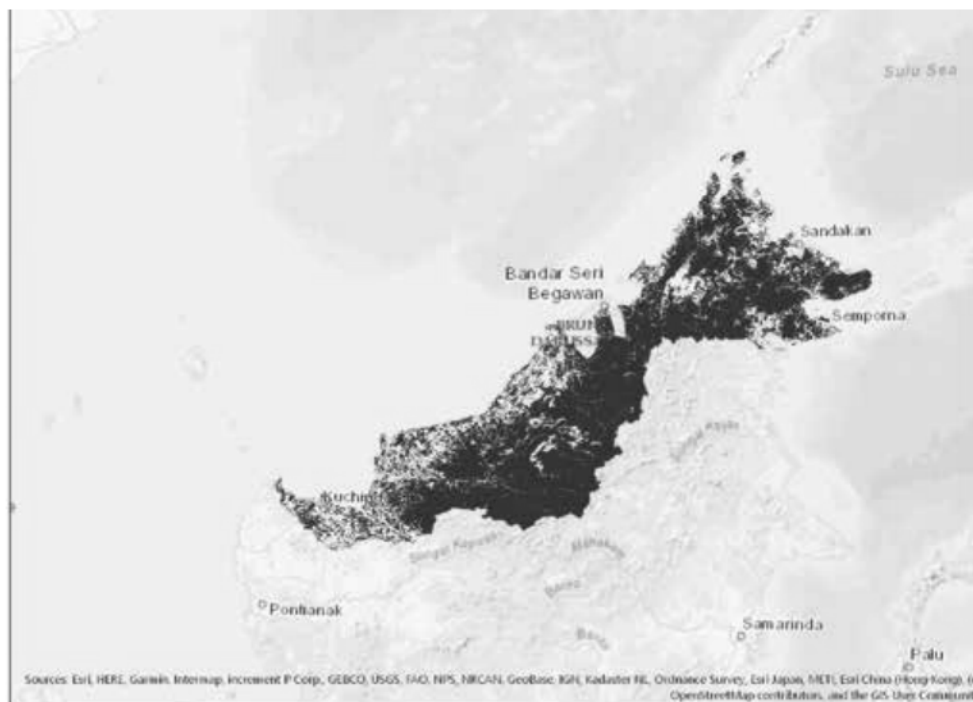
- ≤-149 MG C
- ≤-69 MG C
- ≤-9 MG C



THAILAND:
NET PRESENT VALUE
(2015 – 2030)
(USD/pixel)

- 9 USD
- 209 USD





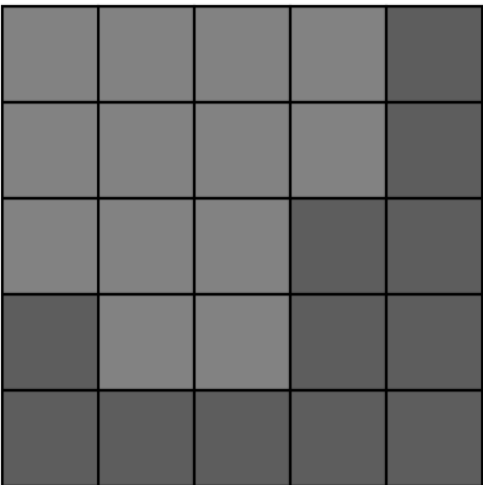


Appendices

5. SPATIALLY EXPLICIT MODELING: A CONCEPTUAL MODEL

Considering a hypothetical landscape with two habitat types, forest and river. The total area is divided into a grid system. The number of grid squares depends on the resolution of the spatial data (for example 30 meters). The geospatial data created for use in the model contained geographical characteristics (accessibility, slope), ecological information (type of forest) and conservation strategies (protected areas). The landscape characteristics are

processed using a valuation equation to estimate the value of each parcel of land for development and conservation. To determine whether value for development or conservation is larger, the value of conservation is subtracted from development value. If the resulting number is negative, the conservation value outweighs development



Value=development value – conservation value.

5	10	10	10	-4
10	6	3	1	-10
5	5	1	-6	-3
-5	3	5	-3	-5
-5	-2	-1	-4	-7

The model then performs an algorithm to determine the number of “alike” neighboring land parcels. Proximity of a representative cell to other cells with values of the same sign (positive or negative) modifies the value for the representative cell. The modeler can choose the desired search distance the algorithm should use to “look” in each direction for value connectivity. The algorithm identifies cells that have the largest number of similarly valued neighbors. This process identifies focal areas for development and minimizes landscape fragmentation.

$$Value_{i,j} = Value_{i,j} + c \frac{neighbor\ value}{r^2}$$

Where c is a constant and r is the chosen search radius.

5	10	10	10	-4
10	6	3	1	-10
5	5	1	-6	-3
-5	3	5	-3	-5
-5	-2	-1	-4	-7

The modeler enters a desired area of land to develop, and another algorithm identifies a combination of cells to maximize the value of land conversion, prioritizing connected cells.

5	10	10	10	-4
10	6	3	1	-10
5	5	1	-6	-3
-5	3	5	-3	-5
-5	-2	-1	-4	-7

The spatially implicit model outputs an area of land to convert for every time period within the model horizon. This output is then entered into the spatially explicit model as the area of land desired to develop.



INFECTIOUS DISEASE EMERGENCE AND ECONOMICS OF ALTERED LANDSCAPES (IDEEAL)



USAID
FROM THE AMERICAN PEOPLE



**EcoHealth
Alliance**



MEMORANDUM

September 26, 2016

To: (b)(6) Regional Office of Procurement, USAID/RDMA

From: (b)(6) Office of Public Health, USAID/RDMA

Subject: Justification for Extension to the Infectious Disease Emergence and Economics of Altered Landscapes Cooperative Agreement No. AID-486-A-13-00005

A. ACTION REQUESTED:

Your approval of an amendment to the subject cooperative agreement with EcoHealth Alliance to extend, at no cost, the agreement completion date by six weeks from October 15, 2016 to November 30th 2016 enabling completion of planned activities.

B. BACKGROUND

USAID/Regional Development Mission for Asia (RDMA) has awarded a three-year cooperative agreement (No. AID-486-A-13-00005) from October 15, 2013 to October 14, 2016 to EcoHealth Alliance, with a total budget \$1,999,203. The Infectious Disease Emergence and Economics of Altered Landscapes (IDEAL) award was designed to quantify the disease regulatory value of ecosystems, and apply an informed economic analysis to land use decision making. The approach involved the development of a suite of modeling products, an informational tool kit, and the creation of a center of excellence for applied research and learning around land use change and disease emergence.

Through this cooperative agreement, RDMA has supported enhanced characterization of the pathways and economic impacts of disease emergence linked to landscape change, recognizing that deforestation and forest degradation are drivers of both global climate change and emerging diseases of pandemic potential.

Project accomplishments—including the development and validation of models, and their application to inform land use plans in Sabah, Malaysia—have generated interest amongst other stakeholders working in this arena. Collaborative opportunities with both private sector entities and USAID missions in the region are under consultation. Utilizing FY 16 funding, an RDMA supported expansion and scale of the project approach within Asia is planned. A six week no-cost extension is requested. A no-cost extension will enable effective implementation of other remaining activities and sustain critical support functions until such time as an amendment with cost can be made.

C. JUSTIFICATION

Several key activities supporting project objectives outlined in the original award remain to be finalized. These include the completion of a management plan for the center of excellence at the University of Malaysia, Sabah; presentation to the Sabah state cabinet and Ministry of Tourism and Environment of modeling analyses pertaining to land use development scenarios in Sabah; and preparation for expansion

of approach to peninsular Malaysia and Kalimantan, Indonesia. Additionally, project expenditures have moderately under paced expected average monthly rates, resulting in pipeline remaining at the anticipated award completion date.

Referencing ADS section 303.3.6.5 2 (h) pertaining to "Justifications for Restriction of Eligibility (JRE),"

A JRE is not required if the amendment is strictly for administrative purposes, including:

iii. A no-cost time extension...

The breakdown of remaining funding anticipated under the no-cost extension is presented in the following table.

LINE ITEM	Original Award Budget	Actual Expenditures as of 07/31/2016	Projected Expenditures	Remaining Unexpended Amount
Salaries	\$			
Fringe Benefits	\$			
Travel and Transportation	\$			
Contractual/Sub-grants	\$			
Other Direct Costs	\$			
Overhead	\$			
TOTAL PROGRAM COST	\$			

The no-cost extension will allow achievement of program objectives, completion of activities as per original proposal, and preparation for expansion under future cost extension action.

The referenced deficit of \$(b)(4) at the conclusion of the period of no cost extension will be assumed by the partner using non-USG funding under the cost sharing category of the original project budget.

Recommendation:

It is recommended that you approve an amendment to the cooperative agreement AID-486-A-13-00005 to extend, at no cost, the agreement completion date by six weeks from October 15, 2016 to November 30th 2016, enabling completion of planned activities.

Approved:

(b)(6)

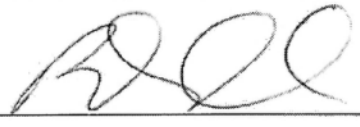
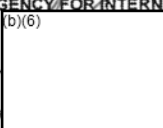
Date:

9/26/2016

Not Approved:

(b)(6)

Date: _____

MODIFICATION OF ASSISTANCE			Page 1 of 1										
1. MODIFICATION NUMBER 1	2. EFFECTIVE DATE OF MODIFICATION See Block 15	3. AWARD NUMBER: AID-486-A-13-00005	4. EFFECTIVE DATE OF AWARD: 09/17/2013										
5. GRANTEE: EcoHealth Alliance 460 W 34th St, 17th fl New York, NY 10001 DUNS NO. : 077090066 TIN NO. : (b)(4) LOC NO. :		6. ADMINISTERED BY: Regional Office of Procurement Regional Development Mission, Asia 25 th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
7. FISCAL DATA: Amount Obligated: \$00.00 Budget Fiscal Year: Operating Unit: Strategic Objective: Team/Division: Benefiting Geo Area: Object Class: 4100201 REQM-486-16-000400		8. TECHNICAL OFFICE: OPH, USAID, RDM/A, Bangkok 9. PAYMENT OFFICE: Office of Financial Management Regional Development Mission, Asia 25th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
10. FUNDING SUMMARY: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center; border-bottom: 1px solid black;">Obligated Amount</th> <th style="width: 25%; text-align: center; border-bottom: 1px solid black;">Total Est. Aml.</th> </tr> </thead> <tbody> <tr> <td>Amount Prior to this Modification:</td> <td style="text-align: center;">\$1,999,203.00</td> <td rowspan="3" style="text-align: center; vertical-align: middle;"> <div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div> </td> </tr> <tr> <td>Change Made by this Modification:</td> <td style="text-align: center;">\$0.00</td> </tr> <tr> <td>New/Current Total:</td> <td style="text-align: center;">\$1,999,203.00</td> </tr> </tbody> </table>					Obligated Amount	Total Est. Aml.	Amount Prior to this Modification:	\$1,999,203.00	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div>	Change Made by this Modification:	\$0.00	New/Current Total:	\$1,999,203.00
	Obligated Amount	Total Est. Aml.											
Amount Prior to this Modification:	\$1,999,203.00	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div>											
Change Made by this Modification:	\$0.00												
New/Current Total:	\$1,999,203.00												
11. DESCRIPTION OF MODIFICATION: The purpose of this modification is to: 1. Revise the completion date of the Agreement from October 14, 2016 to November 30, 2016; Except as provided herein, all terms and conditions of the document remain unchanged and in full force and effect.													
12. THIS MODIFICATION IS ENTERED INTO PURSUANT TO THE AUTHORITY OF THE FOREIGN ASSISTANCE ACT OF 1961 AS AMENDED. EXCEPT AS SPECIFICALLY HEREIN AMENDED, ALL TERMS AND CONDITIONS OF THE GRANT REFERENCED IN BLOCK #3 ABOVE, AS IT MAY HAVE HERETOFORE BEEN AMENDED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.													
13. GRANTEE: <input checked="" type="checkbox"/> IS <input type="checkbox"/> IS NOT REQUIRED TO SIGN THIS DOCUMENT TO RECONFIRM ITS AGREEMENT WITH THE CHANGES EFFECTED HEREIN													
14. GRANTEE: BY: <u></u> <u>Peter Daszak</u> (Name Typed or Printed) TITLE: <u>President</u> DATE: <u>9/28/16</u>		15. THE UNITED STATES OF AMERICA U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT (b)(6) BY: <u></u> (Name Typed or Printed) TITLE: <u>(b)(6)</u> DATE: <u>Sep. 29, 2016</u>											

MODIFICATION OF ASSISTANCE

Page 1 of 2

1. MODIFICATION
NUMBER

2

2. EFFECTIVE DATE OF
MODIFICATION

See Block 15

3. AWARD NUMBER:

AID-486-A-13-00005

4. EFFECTIVE DATE OF
AWARD:

09/17/2013

6. GRANTEE:

EcoHealth Alliance
460 W 34th St, 17th fl.
New York, NY 10001

6. ADMINISTERED BY:

Regional Office of Procurement
Regional Development Mission, Asia
25th Floor Athenee Tower
63 Wireless Road
Bangkok 10330, Thailand

DUNS NO.: 077090066

TIN NO.:

(b)(4)

LOC NO.:

7. FISCAL DATA:

Amount Obligated: \$499,944.00

8. TECHNICAL OFFICE:

OPH, USAID, RDM/A, Bangkok

9. PAYMENT OFFICE:

Office of Financial Management
Regional Development Mission, Asia
25th Floor Athenee Tower
63 Wireless Road
Bangkok 10330, Thailand

(b)(4)

10. FUNDING SUMMARY:

Amount Prior to this Modification:

Obligated Amount

\$1,999,203.00

Total Est. Amt.

Change Made by this Modification:

\$499,944.00

New/Current Total:

\$2,499,147.00

11. DESCRIPTION OF MODIFICATION:

The purpose of this modification is to:

1. Revise the completion date of the Agreement from November 30, 2016 to May 30, 2018;
2. Revise the Total Estimated Amount and the Total Obligated Amount by \$(b)(4) from \$1,999,203 to \$(b)(4);
3. Update A.9 COST Sharing in the Schedule as detailed on page 2 of this modification.
4. Revise the budget in the Agreement under Schedule A.4 to add the increase in this modification as detailed on page 2 of this modification;
5. Add Clause 13.6 Special Funding Conditions under Schedule "Special Provisions" as detailed on page 2 of this modification.
6. Add NICRA dated June 30, 2016 to the Award and its modifications.
7. Include Attachment A as part of the program description of the Agreement.

Except as provided herein, all terms and conditions of the document remain unchanged and in full force and effect.

12. THIS MODIFICATION IS ENTERED INTO PURSUANT TO THE AUTHORITY OF THE FOREIGN ASSISTANCE ACT OF 1961

AS AMENDED. EXCEPT AS SPECIFICALLY HEREIN AMENDED, ALL TERMS AND CONDITIONS OF THE GRANT REFERENCED IN BLOCK #3 ABOVE, AS IT MAY HAVE HERETOFORE BEEN AMENDED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.

(b)(6)

13. GRANTEE: ☒ IS ☐ IS NOT REQUIRED TO SIGN THIS DOCUMENT TO RECONFIRM ITS AGREEMENT WITH THE CHANGES EFFECTED HEREIN

14. GRANTEE

BY:

Dr. Peter Daszak
(Name Typed or Printed)

TITLE:

President

DATE:

28 Nov 2016

15. THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

BY:

(b)(6)

(Name Typed or Printed)

TITLE:

(b)(6)

DATE:

Nov. 30, 2016

The Cooperative Agreement identified in Block 3 of the cover page is amended as follows:

- A. Revise the completion date of the Agreement and its modifications from "November 30, 2016" to "May 30, 2018" in lieu thereof.
- B. Revise the Total Estimated Amount and the Total Obligated Amount in the Agreement from "\$1,999,203" to read "\$[b)(4)]" in lieu thereof.
- C. Update A.9 COST SHARING in the Schedule of the Agreement to add the following"
 "The Recipient agrees to expend an additional \$[b)(4)] under modification 2 as cost share as detailed in the modification budget and in accordance with Applicable Mandatory Standard Provision RAA.9 titled Cost Sharing.
- D. Revise the budget in the Agreement under Schedule under A.4 "Cooperative Agreement Budget" to :

COST ELEMENT	ORIGINAL AWARD	MODIFICATION 2	REVISED NEW TOTAL ESTIMATED AMOUNT
Program Activities			
Indirect Cost			
Total USAID Amount			
Cost Share			
Total Program Amount			

(b)(4)

(b)(4)

- E. Add the NICRA dated June 30, 2016 in the Agreement as follows:

Description	Rate	Base	Type	Period
Fringe				
G&A				

[b)(4)] Salaries and Wages

Type of Rate: Provisional

Period: 07-01-17 until amended

[b)(4)] Total direct costs excluding capital expenditure (buildings, individual equipment, alterations and renovations), and that portion of each amount of each sub-award in excess of \$25,000 incurred and flow through funds.

Type of Rate: Provisional

Period: 07-01-17 until amended

- F. Add Clause 13.6 "Special Funding Conditions" under Schedule "Special Provisions" as follows:

"Funds obligated under this Agreement shall not be expended for activities in Cambodia and Burma unless authority is provide by USAID."

- G. Incorporate Attachment A as part of the Program Description of the Agreement.

End of Modification 2

Infectious Disease Emergence and Altered Landscapes: Cost Extension Scope of Work

I. Introduction

Exponential growth of human population in the past century has led to unprecedented land use change which is now a key environmental issue as well as one of the most significant drivers of disease emergence. Around one-fifth of emerging infectious disease events during the last 6 decades are associated with land use changes including agricultural conversion and intensification, deforestation, and extractive industries (e.g., mining, logging). For example, increased rates of vector-borne diseases have been linked to land conversion in Brazil, Indonesia and Malaysia. The continued threat of vector-borne diseases, like Zika virus, Dengue, and yellow fever, make these especially important issues currently. In addition, a range of high impact zoonoses have emerged due to factors related to land use change, e.g. HIV/AIDS and Ebola related to bushmeat hunting at the forest edge.

Previous efforts to deal with the economic drivers of land use change, and promote a long-term sustainable view of the forest have used an ecosystem service approach. These programs estimate the economic value of pollination, carbon sequestration, water filtration and other ecosystem services that forests provide. These values are used to help governments and other stakeholders make better decisions around the costs and benefits of conversion. The IDEAL project's goals are to estimate the health value of intact forests by virtue of the cost of emerging diseases if such lands are converted to agricultural use (i.e. the "Avoided Costs" gained by not converting forest), and use this to assist stakeholders in decision making.

Our cost-benefit analysis comparing costs and benefits of avoiding deforestation due to palm oil expansion in Sabah (Malaysia) found that, once human health (specifically cost of malaria treatment) and ecosystem services costs were included, the study region has already converted too much land, too quickly, and potentially in the wrong places, resulting in overall economic loss.

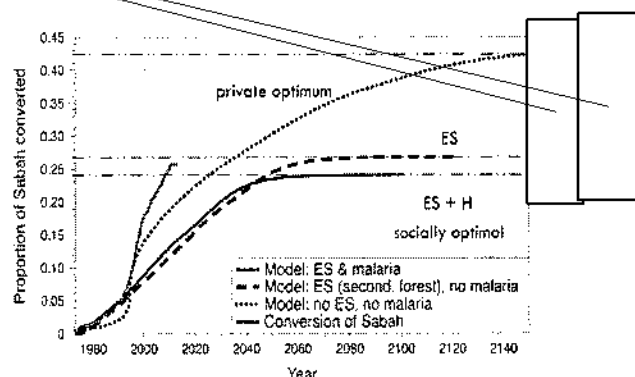


Figure 1. Results of our health and ecosystem services analysis ("Avoided Costs Model") of land use change for palm oil production in Borneo, Malaysia. The green line represents the actual deforestation rate. Here we present three alternative models of forest development: 1) Private optimum considering benefits and costs of oil palm operations only; 2) Ecosystem services (ES), takes account benefits and costs of oil palm industries as well as ecosystem services and 3) Socially optimal,

includes ecosystem services, benefit to industries and the cost of malaria treatment. Any deviation from the black lines represents economic losses absorbed by the Malaysian government. Our results show that tropical forests in Malaysia have been converted sub-optimally, inefficiently allocating land development in space and time.

Our Avoided Costs Model developed in the first phase of IDEEAL has required: 1) a detailed mechanistic understanding, supported by field data, of how land use change drives disease risk; 2) a detailed estimate of the costs of these diseases; and 3) evidence-based strategies supported by local different stakeholders (industry, government and local communities). In this extension, we aim to extend our approach regionally by:

1. Developing quantitative models capturing disease and ecosystem service related savings as a function of land use in Peninsular Malaysia, the Mekong Basin and Indonesia;
2. Supporting specific research activities in the Development and Health Research Unit in Malaysia;
3. Providing actionable model outputs and ecosystem services training to communities and stakeholders, promoting evidence-based development planning.

II. Importance of a Regional Expansion

Like Borneo, large areas of Peninsula Malaysia, Indonesia (Sumatra and Kalimantan) and the Mekong river basin were naturally covered by biodiverse forests, much of which have now been lost to intensive land use change for rubber and oil palm plantations (e.g. Figure 2). The Mekong river basin spans six countries and is one of the largest river systems in the globe. A WWF report found that, excluding China, between 1973 and 2009, countries in the Mekong basin lost nearly one third of their forest cover. Similarly, forest was converted in Indonesia at a rate of 20,000 km²/year between the years 2011 and 2012. In Indonesia burning to remove forests has led to large peatland fires that also have profound health, economic, and environmental impacts and lead to economically significant atmospheric haze events that result in school and factory closures, increased morbidity and mortality, and public concern from Singapore to southern China. The Mekong's fisheries provide the primary economic value much of the region, and degradation of surrounding forests has led to erosion, loss flood control, and loss water quality regulation. This has led to a series of calls for ecosystem services valuation to be used to improve land use planning and reduction of deforestation in the region. However, to our knowledge, the combined economic costs of disease, particularly, infectious diseases, and ecosystem services loss have not been included in these projections and discussions. Thus, modeling the economic costs and benefits of land conversion, with specific data on health and ecosystem services will provide a crucial land-use planning tool for this region.

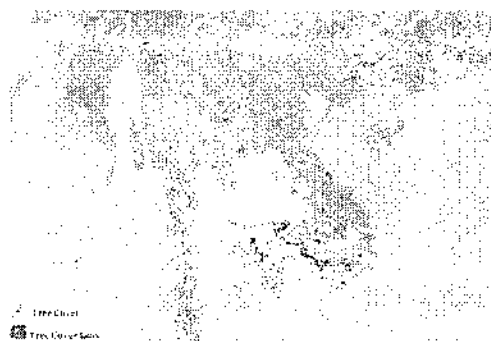


Figure 2. Forest cover and forest cover loss in the Mekong Basin (Vietnam, Thailand, Cambodia, Laos and Myanmar). Red areas represent forest cover loss since 2000 and green areas represent forest cover in 2014. Note that the Global Forest Change website consider forest any vegetation taller than 5 m height and likely includes oil palm and other plantations.

III. Adapting our “Avoided Costs Model” beyond palm oil production

The economic model we developed under IDEEAL is portable and can be adapted to other landscapes by parameterizing it with data from that region. To do this requires data on disease-land use correlations, the economic costs of diseases, and the profits from land conversion for specific agricultural development (e.g. rice and rubber production) in these countries. These new data, considered collectively for the first time in the region, will provide significant insight in the cost-benefit of land conversion. For example, unlike mixed agroforestry systems in other regions, rubber plantations in continental Southeast Asia are typically monocultures, resulting in a great reduction in biodiversity and habitat loss for many animal species. This reduction in habitat could increase contact between humans and wildlife and alter vector distribution and pathways of pathogen transmission, posing potential risk for disease spillover. These plantations are also capable of altering geochemical and hydrological cycles which alter ecosystem services provided to local communities. Furthermore, select populations such as plantation workers, particularly tappers, might be at higher risk for contracting malaria since most of this work is done during vector feeding hours. Multiple vector and waterborne diseases such as melioidosis, leptospirosis and malaria have been associated with stagnant waters necessary for cultivating rice. Avian influenza is also a concern in areas developed for rice agriculture since free grazing ducks may represent a transmission risk. Livelihoods of local communities may be further affected by degradation in water quality and soil nutrient leaching.

IV. Project Activities and Timeline:

We envisage an 18-month project that begins on December 1st 2016, ending on May 30th 2018.

1. **Refinement of Borneo Avoided Costs Model:** In consultation with palm oil industry stakeholders, we will improve our avoided cost model by including parameters related to productivity and efficiency of oil palm and other crops (e.g. yield, palm oil volume production, proportion of kernel oil vs. palm oil). We will also determine the cost/benefit relationships related to recover land degradation through forest restoration and how this can be considered when establishing high conservation value areas, as required by palm oil certifiers such as the Roundtable on Sustainable Palm Oil for example. **Dec. 2016 – Dec. 2017**
2. **Scoping of model expansion:** We will conduct stakeholder consultation and engagement meetings; systematic review and synthesis of academic and grey literature; selection of relevant existing case studies; and collection of background socio-economic and environmental data relevant to these across the region. We will establish the geographic and ecological boundaries of the study area identified above, and the scope, location, spatial scale, and strategic focus of the study to be defined in an annual work plan. We will assess which diseases are likely to be significantly linked to land use change in each country of focus. **Dec. 2016 – Mar. 2017.**

3. **Ecosystem service data collection and analysis:** We will assess the quantity, spatial distribution, and ecological characteristics of land cover types that are categorized into agro-ecological and ecosystems zones and analyzed through a Geographical Information System (GIS). We will gather and collate data from relevant intergovernmental agencies, regional agencies and other databases. For each land cover category we will identify and analyze stocks and flows of ecosystem services for classification along the four categories of the ecosystem service framework (provisioning, regulating, cultural, and supporting services). We will identify land use change patterns and drivers, pressures on sustainable management of land resources and drivers of adoption of sustainable land management, and their spatial distribution to inform the establishment of global scenarios. **Feb. 2017 – August 2017, and ongoing refinement throughout project.**
4. **Infectious disease data collection and analysis:** We will communicate with in-country contacts in each country/region of expansion to identify datasets on infectious disease cases and locations. These will include EcoHealth Alliance members, contacts through PREDICT country partners, and members of Ministries of Health in each country. We will analyze the spatial and temporal distribution of cases to identify significant correlations with land use change. We will also create a reliable database of disease outbreaks from public databases such as GIDEON, the WHO Disease Outbreak News reports and from reviewing the literature. **Jan. 2017 – August 2017, and ongoing refinement throughout project.**
5. **Economic valuation of disease costs:** For each country and region, we will work with local contacts to identify, arrange collaboration for, and analyze data on the economic damages associated with diseases identified to correlate with land use change. Some of this will likely include work in-country with agencies to collate and analyze data. **May 2017 – Jan. 2018.**
6. **Economic valuation of atmospheric haze events:** We will gather data on the occurrence, extent, and intensity of land-use change driven atmospheric haze events, including due to peat forest burning in Indonesia. Starting in Riau Sumatra, we will gather data on morbidity and mortality related to these events, where available, from each country. We will analyze correlations with haze and assess proxies for regions where data are lacking. We will estimate economic costs of these haze-related morbidity and mortality events, and lost work- and school-days. **June 2017 – Jan. 2018.**
7. **Detailed cost-benefit analysis:** We will use a combination of the following approaches to analyze the costs and benefits of an 'action' scenario to that of 'business-as-usual' for land use change: Toolkit for Ecosystem Service at Site-based Assessment (TESSA); Assessment and Research Infrastructure for Ecosystem Services (ARIES); Corporate Ecosystem Services Review (ESR); Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST); Multi-scale Integrated Models of Ecosystem Services (MIMES); Natura 2000. This will enable identification of on-the-ground actions that are economically desirable, and facilitate project advocacy with key stakeholders to precipitate evidence based land use planning. **Jan 2018 – May 2018.**

8. **Development and Health Research Unit (DHRU) as a coordinating center:** The Development and Health Research Unit (DHRU) at University of Malaysia Sabah will serve as the primary hub for scientific outreach, technical capacity building, and collaboration of this project. The DHRU will support existing student projects, and provide mentorship to additional students and researchers on the topic (including students from other countries in the region). Mid-way through the hub a regional meeting will be held at the DHRU, with stakeholders from across the program invited to attend to present research project. This unit will help to facilitate workshops, mentor graduate students working under this project, work with local stakeholders, and play a key role in developing, producing and distributing the toolkit products and serve as the sustainable operational center of excellence for continued adoption of the project approach. **Throughout project timeline.**
9. **Community Outreach:** During the initial phase of the IDEEAL project we created a gender-sensitive health and land-use change toolkit to communicate scientific modeling results in a manner that directly addresses community needs. We will update this toolkit based on the results from the work above, adapting and translating it for two countries within the expanded region. Information included in the toolkit will be evidence-based and regionally appropriate. Workshops and community outreach will be planned as appropriate. We will conduct further outreach in Sabah, Peninsular Malaysia, Kalimantan, Sumatra and other countries to be identified in an initial annual work plan. **Throughout project timeline.**
10. **Outreach to policy and industry stakeholders:** We will continue to meet with stakeholders from government, industry, community groups and NGOs in each country, regionally, within the USA and within Intergovernmental Agencies. **Throughout project timeline.**

VII. Key Deliverables

Regional model

- Analysis of which diseases are most critically linked to land use change for countries within mainland southeast Asia and Indonesia
- Estimated cost of diseases that have emerged due to land use change within mainland southeast Asia and Indonesia
- Estimated value of lost ecosystem services due to land use change in mainland SEA and Indonesia
- Estimation of the value (due to avoided health impacts and loss of ecosystem services) of avoiding deforestation regionally and by country. This will be parameterized with country-specific data on diseases, land-use change scenarios, and agricultural crop production, and location-specific data to inform land use plans as data is available.

Analysis of Haze events

- Estimation of the health and ecosystem service related costs of atmospheric haze resulting from land use change.

- Health and land-use change toolkit adapted for use in two additional regions
- Facilitators trained, toolkit disseminated to community groups, and used to improve decision-making in two additional regions
- Meetings with stakeholders from government, industry, community groups and NGOs in each country, regionally, within the USA and in Intergovernmental Agencies.

Chief of Party: Dr. Peter Daszak (12.5% time + 8.3% time in-kind)

(50%time)

The day-to-day management of the project in Southeast Asia will be the overall responsibility of the [redacted] (who reports directly to the CoP). The [redacted] will divide his/her time across the project region as needed to interact with partners and supervise activities, including of in-country [redacted]

~~(8.3% + 8.3% time in-kind)~~

Project Responsibilities (Job Description): The [redacted] will work with National and State government authorities and private sector parties to identify, engage and maintain working relationships with relevant stakeholders throughout the life of the project and provide the oversight for sustainable transition of relevant activities to partners by the end of the project.

(25% time)

will coordinate the modeling activities and will oversee the Modeling Team and be responsible for ensuring modeling activities and products are integrated with other project components. He will also develop the statistical framework to assess the likelihood of disease outbreak given differing levels of deforestation.

(16% time)

_____ based at the University of Idaho will lead the development of the avoided costs model and participate in the associated data collection.

(8.3% time) (EcoHealth Alliance)

_____ will collaborate with _____ to develop the avoided costs model and participate in the associated data collection.

12.5% time)

(b)(6)

(b)(6)

(b)(6)

The [redacted] will work to spatially map optimal areas of development, driven by the results of the economic model. (b)(6)

(b)(6)

[redacted] (16.7% time)

[redacted] will work to engage with community and local partners throughout the research process, and to communicate the scientific findings to community members.

(b)(6)

[redacted] (8.3% time)

The [redacted] will provide administrative oversight and support for the project's financial management.

(b)(6)

[redacted] (8.3% time)

The [redacted] will conduct all daily administrative coordination; ensure regular communication amongst team members; work with [redacted] to ensure timely reporting and payments; and arrange all travel and meetings. (b)(6)

Additional and potential partners

Google Earth Engine: We are exploring the possibility to establish a partnership with Google Earth Engine seeking to develop data and tools that will enable the quantification of changes in land cover and land use change.

Wilmar International: We are currently collaborating with Wilmar on our DEEP FOREST project and will expand this collaboration. We will use this partnership to connect to other plantations throughout the study region allowing us greater access to on the ground data collection as well as outreach to impacted groups.

Johnson and Johnson: We are in discussion with the sustainability leaders at JnJ to assess if they can support some additional outreach to local communities that builds on and develops from this work.

EcoHealth Alliance donors: We will continue to reach out to donors to EcoHealth Alliance to support community and conservation outreach to coincide with the rollout of this extension.

(b)(4)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(4)

(b)(4)

(b)(4)

(b)(4)

FRINGE RATE		Dec16-Nov17	Dec17-May18	
SALARY & FRINGE	TITLE	Y4	Y5	Total
Daszak, Peter	Chief of Party			(b)(4)
Fringe (Daszak)				
TOTAL FRINGE				
TOTAL SALARY				
TOTAL SALARY & FRINGE				
TRAVEL				
Meeting travel	Regional collaborators			
International				
TOTAL TRAVEL				
OTHER DIRECT COSTS				
Conference and Membership				
TOTAL OTHER DIRECT COSTS				
CONSULTANTS				
Conservation Medicine Ltd.	DCoP and field staff salary; local travel and expenses			
TOTAL CONSULTANTS				
SUBCONTRACTS				
M&E				
Toolkit Trainings				
TOTAL SUBCONTRACTS				
TOTAL EHA DIRECT				
MODIFIED DIRECT				
INDIRECT COST				
TOTAL				

MODIFICATION OF ASSISTANCE			Page 1 of 1										
1. MODIFICATION NUMBER 03	2. EFFECTIVE DATE OF MODIFICATION See Block 15	3. AWARD NUMBER: AID-486-A-13-00005	4. EFFECTIVE DATE OF AWARD: 09/17/2013										
5. GRANTEE: EcoHealth Alliance 460 W 34th St, 17th fl. New York, NY 10001 DUNS NO. : 077090066 TIN NO. : (b)(4) LOC NO. :		6. ADMINISTERED BY: Regional Office of Procurement Regional Development Mission, Asia 25 th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
7. FISCAL DATA: Amount Obligated: 0.00 Budget Fiscal Year: Operating Unit: Strategic Objective: Team/Division: Benefiting Geo Area: Object Class: REQM-482-17-000011		8. TECHNICAL OFFICE: OPH, USAID, RDM/A, Bangkok 9. PAYMENT OFFICE: Office of Financial Management Regional Development Mission, Asia 25th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
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Change Made by this Modification:	\$ 0.00												
New/Current Total:	\$2,499,147.00												
11. DESCRIPTION OF MODIFICATION: The purpose of this modification is to include the name of Agreement Officer's Representative (AOR) in GLAAS. All other terms and conditions of the original award remain unchanged and in full force and effect.													
12. THIS MODIFICATION IS ENTERED INTO PURSUANT TO THE AUTHORITY OF THE FOREIGN ASSISTANCE ACT OF 1961 AS AMENDED. EXCEPT AS SPECIFICALLY HEREIN AMENDED, ALL TERMS AND CONDITIONS OF THE GRANT REFERENCED IN BLOCK #3 ABOVE, AS IT MAY HAVE HERETOFORE BEEN AMENDED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.													
13. GRANTEE: <input type="checkbox"/> IS <input checked="" type="checkbox"/> IS NOT REQUIRED TO SIGN THIS DOCUMENT TO RECONFIRM ITS AGREEMENT WITH THE CHANGES EFFECTED HEREIN													
14. GRANTEE: BY: _____ <div style="border-bottom: 1px solid black; width: 100%;"></div> (Name Typed or Printed) TITLE: _____ DATE: _____		15. THE UNITED STATES OF AMERICA U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT (b)(6) BY: _____ <div style="border-bottom: 1px solid black; width: 100%;"></div> (Name Typed or Printed) TITLE: (b)(6) <div style="border-bottom: 1px solid black; width: 100%;"></div> DATE: 11 MAY 2017											

MODIFICATION OF ASSISTANCE			Page 1 of 1										
1. MODIFICATION NUMBER 04	2. EFFECTIVE DATE OF MODIFICATION See Block 15	3. AWARD NUMBER: AID-486-A-13-00005	4. EFFECTIVE DATE OF AWARD: 09/17/2013										
5. GRANTEE: EcoHealth Alliance 460 W 34th St, 17th fl New York, NY 10001 DUNS NO.: 077090066 TIN NO.: (b)(4) LOC NO.:		6. ADMINISTERED BY: Regional Office of Procurement Regional Development Mission, Asia 25th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
7. FISCAL DATA: Amount Obligated: \$0.00 Budget Fiscal Year: Operating Unit: Strategic Objective: Team/Division: Benefiting Geo Area: Object Class: 4100201 REQM NO.: REQM-486-18-000217		8. TECHNICAL OFFICE: OPH, USAID, RDM/A, Bangkok 9. PAYMENT OFFICE: Office of Financial Management Regional Development Mission, Asia 25th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand											
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	Obligated Amount	Total Est. Amt.											
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Change Made by this Modification:	\$0.00												
New/Current Total:	\$2,499,147.00												
11. DESCRIPTION OF MODIFICATION: The purpose of this modification is to revise the completion date of the Agreement from May 30, 2018 to November 30, 2018. All other terms and conditions of the agreement remain unchanged and in full force and effect.													
12. THIS MODIFICATION IS ENTERED INTO PURSUANT TO THE AUTHORITY OF THE FOREIGN ASSISTANCE ACT OF 1961 AS AMENDED EXCEPT AS SPECIFICALLY HEREIN AMENDED, ALL TERMS AND CONDITIONS OF THE GRANT REFERENCED IN BLOCK #3 ABOVE, AS IT MAY HAVE HERETOFORE BEEN AMENDED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.													
13. GRANTEE: <input checked="" type="checkbox"/> IS <input type="checkbox"/> IS NOT REQUIRED TO SIGN THIS DOCUMENT TO RECONFIRM ITS AGREEMENT WITH THE CHANGES EFFECTED HEREIN													
14. GRANTEE: <div style="border: 1px solid black; width: 150px; height: 50px; margin: 10px auto;"></div> BY: _____ Peter Daszak, PhD (Name Typed or Printed) TITLE: President DATE: April 20, 2018		15. THE UNITED STATES OF AMERICA U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT <div style="border: 1px solid black; width: 100px; height: 40px; margin: 10px auto;"></div> BY: _____ (Name Typed or Printed) <div style="border: 1px solid black; width: 150px; height: 15px; margin: 5px auto;"></div> TITLE: _____ DATE: April 23, 2018											

MODIFICATION OF ASSISTANCE

Page 1 of 1

1. MODIFICATION NUMBER 05	2. EFFECTIVE DATE OF MODIFICATION See Block 15	3. AWARD NUMBER: AID-486-A-13-00005	4. EFFECTIVE DATE OF AWARD: 09/17/2013
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5. GRANTEE: EcoHealth Alliance 460 W 34th St, 17th fl New York, NY 10001 DUNS NO. : 077090066 TIN NO. : (b)(4) LOC NO. :	6. ADMINISTERED BY: Regional Office of Procurement Regional Development Mission, Asia 25 th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand
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7. FISCAL DATA: Amount Obligated: \$0.00 Budget Fiscal Year: Operating Unit: Strategic Objective: Team/Division: Benefiting Geo Area: Object Class: 4100201 REQM NO.: REQM-486-19-000xxx	8. TECHNICAL OFFICE: OPH, USAID, RDM/A, Bangkok 9. PAYMENT OFFICE: Office of Financial Management Regional Development Mission, Asia 25th Floor Athenee Tower 63 Wireless Road Bangkok 10330, Thailand
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10. FUNDING SUMMARY:	Obligated Amount	Total Est. Amt.
Amount Prior to this Modification:	\$2,499,147.00	
Change Made by this Modification:	\$0.00	
New/Current Total:	\$2,499,147.00	

11. DESCRIPTION OF MODIFICATION:

The purpose of this modification is to revise the completion date of the Agreement from November 30, 2018 to February 28, 2019.

All other terms and conditions of the agreement remain unchanged and in full force and effect.

12. THIS MODIFICATION IS ENTERED INTO PURSUANT TO THE AUTHORITY OF THE FOREIGN ASSISTANCE ACT OF 1961 AS AMENDED EXCEPT AS SPECIFICALLY HEREIN AMENDED, ALL TERMS AND CONDITIONS OF THE GRANT REFERENCED IN BLOCK #3 ABOVE, AS IT MAY HAVE HERETOFORE BEEN AMENDED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.

13. GRANTEE: ☒ IS ☐ IS NOT REQUIRED TO SIGN THIS DOCUMENT TO RECONFIRM ITS AGREEMENT WITH THE CHANGES EFFECTED HEREIN

14. GRANTEE: BY: <u>Peter Daszak, PhD</u> (Name Typed or Printed) TITLE: <u>President</u> DATE: <u>November 26, 2018</u>	15. THE UNITED STATES OF AMERICA U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT BY: <u>(b)(6)</u> (Name Typed or Printed) TITLE: <u>(b)(6)</u> DATE: <u>11-28-18</u>
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EcoHealth Alliance

(b)(6)

March 2016

(b)(6)

Emerging Infectious Diseases

USAID RDMA

Bangkok, Thailand

Dear (b)(6):

EcoHealth Alliance would like to request subcontract approval for (b)(6) under the Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL) program, funded by USAID.

Under the SPaCES program (Spatial Planning for Conservation, Sustainable Economic Development and Society in Sabah), (b)(6) is facilitating surveys with Forever Sabah and LEAP. These surveys will provide IDEEAL with useful information to improve model and toolkit research with the goal of engaging policy makers at the cabinet level in Sabah to develop State land use policy. (b)(6) is also liaising with companies and managers of the States Forest Managed Units (FMU's) to discuss alternative plans for land use within the FMU's.

For the IDEEAL project, (b)(6) will generate species distribution maps for threatened and non-threatened mammal species. She will employ two modeling approaches (boosted regression trees and Maxent – to ensure models are as robust as possible). These will provide initial Biodiversity metrics at species level. Using available data, she will map peoples' use and value of forests (for their health, environmental health, provisioning services such as timber, meat, medicinal herbs; as well as people's perceptions on land cover change (and oil palm, specifically). (b)(6) will use decision support tools to allow integrated spatial planning to help achieve the application of policies into effective and sustainable land use plans. This will be conducted through collaborative stakeholder workshops and the use of planning-support tools.

(b)(6) contract period would begin on April 1, 2015 through October 14, 2016. Total contract amount is USD (b)(4)

(b)(6)

Thank you for your consideration.

Sincerely,

Dr. Peter Daszak
President, EcoHealth Alliance

Local conservation.
Global health.

EcoHealth Alliance
460 West 34th Street, 17th Floor
New York, NY 10001-2320
212.380.4460

EcoHealthAlliance.org

USAID-00579

Page 2 of 9

Withheld pursuant to exemption

(b)(6)

of the Freedom of Information and Privacy Act

Page 3 of 9

Withheld pursuant to exemption

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of the Freedom of Information and Privacy Act

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Page 6 of 9

Withheld pursuant to exemption

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of the Freedom of Information and Privacy Act

Page 7 of 9

Withheld pursuant to exemption

(b)(6)

of the Freedom of Information and Privacy Act



(b)(6)@usaid.gov>

Fwd: IDEEAL Subcontract request

1 message

(b)(6)@usaid.gov>

Thu, Feb 3, 2022 at 3:23 PM

To: (b)(6)@usaid.gov>

Cc: (b)(6)@usaid.gov>

----- Forwarded message -----

From: (b)(6)@ecohealthalliance.org>

Date: Tue, Mar 15, 2016 at 3:39 AM

Subject: IDEEAL Subcontract request

To: (b)(6)@usaid.gov>

Cc: (b)(6)@usaid.gov>, Peter Daszak <daszak@ecohealthalliance.org>, (b)(6)

<(b)(6)@ecohealthalliance.org>

Dear (b)(6),

Please find the IDEEAL subcontract agreement request for (b)(6), along with her curriculum vitae.

Please let me know if you have any questions.

Best,

(b)(6)


EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001


(b)(6) (direct)
(b)(6) (mobile)
(b)(6) (fax)

www.ecohealthalliance.org

EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics.

2 attachments

 IDEEAL Contract Justification (b)(6).pdf
113K

 (b)(6).CV.pdf
672K



(b)(6)@usaid.gov>

Re: Subaward for (b)(6)

1 message

(b)(6)@usaid.gov>

Thu, Feb 3, 2022 at 3:23 PM

To: (b)(6)@usaid.gov>

Cc: (b)(6)@usaid.gov>

Hi (b)(6)

As the subaward was under \$ (b)(4) we received guidance that no AO approval was needed. I will forward you the communication with the partner under separate heading.

Best,

(b)(6)

On Thu, Feb 3, 2022 at 3:10 PM (b)(6)@usaid.gov> wrote:

Dear (b)(6)

(b)(6) am gathering FIOA documents again. I'm looking at the Subaward folder and I need to ask if you have the subaward for (b)(6). I see there's only the subaward for BCI. Do you know if there was a subaward approval for (b)(6)?

(b)(6)

Shared with me > Core (b)(6) File > Sub-Award ▾

Name ↑

Owner

BCI

IDEEAL Contract Justification_BCI_3May2016.pdf

IDEEAL Contract Justification (b)(6).pdf

(b)(6)_CV.pdf

(b)(6)

(b)(6)

Regional Office of Acquisition and Assistance
USAID / Regional Development Mission Asia
25th Floor Athenee Tower
63 Wireless Road, Bangkok 10330

EHA LAND USE CHANGE & DISEASE EMERGENCE BUDGET

(b)(4)

FRINGE RATE

(b)(4)

(b)(6)

(b)(6)

Y1	Y2	Y3	SALARY & FRINGE	TITLE	Y1	Y2	Y3	TOTAL
2.0	2.0	2.0	Daszak, Peter	Chief of Party				
			Fringe (Daszak)					
12.0	12.0	12.0						
1.0	1.0	1.0						
1.0	1.0	1.0						
9.0	9.0	9.0						
2.0	2.0	2.0						
3.0	3.0	3.0						
2.0	2.0	2.0						
4.0	4.0	4.0						
2.0	2.0	2.0						
1.0	1.0	1.0						
			TOTAL FRINGE					
			TOTAL SALARY					
			TOTAL SALARY & FRINGE					

(b)(4)

EHA Travel Detail

International Travel - Hughes to BKK

TOTAL

BKK PER DIEM (\$142 Hotel; \$103 Meals and Incidentals) \$

(b)(4)

Airfare: KUL <-> BKK \$

(b)(4)

BKK (5 NIGHTS & 6 DAYS) \$

KUL <-> BKK \$

(KUL <->BKI) at \$300 for flight; 5 nights at \$100 per night; food and incidentals at \$70 per day for 6 days \$

INTERNATIONAL TOTAL \$

International Travel - EHA to KUL

Y1

Y2

Y3

TOTAL

KUL PER DIEM (\$169 Hotel; \$94 Meals and Incidentals) \$

(b)(4)

EWR <-> KUL \$

PD, WBK, JHE, & SE 1 X YEAR EWR <-> KUL \$

PD, WBK, JHE, & SE 1 X YEAR KUL (5 NIGHTS & 6 DAYS) \$

KM & LL 1 X YEAR \$

KM & LL 1 X YEAR (14 NIGHTS & 15 DAYS) \$

INTERNATIONAL TOTAL \$

Domestic USA Travel - Present to USAID

Y1

Y2

Y3

TOTAL

WAS PER DIEM (\$205 Hotel; \$71 Meals and Incidentals) \$

(b)(4)

NYC <-> WAS (TRAIN) \$

PD, WBK, JHE, & SE 1 X YEAR TRAIN NYC <-> WAS \$

PD, WBK, JHE, & SE 1 X YEAR (2 NIGHTS & 3 DAYS) \$

DOMESTIC TOTAL \$

EcoHealth Alliance Budget Narrative

Chief of Party (COP) Daszak, [REDACTED]

Stakeholder [REDACTED]

for Health and Policy [REDACTED]

A. Personnel

COP Daszak will commit 3 months p.a. to this project, though he will only charge a portion of his salary to this grant and will use EHA core funds to cover the rest of his salary. COP Daszak will provide overall management and coordination of program vision, direction and functional successes; and is responsible for the administration and integration of the entire program.

[REDACTED] will commit [REDACTED] to this project to manage the day-to-day of the project in Malaysia, with regular communications and assistance of the other key personnel, the administrative staff from the home office, the Center of Excellence in Sabah and other key partners.

[REDACTED] will commit [REDACTED] to this project, though he will only charge a portion of his salary to this grant and will use EHA core funds to cover the rest of his salary. He will ensure high level integration of project activities and products with stakeholder and partner needs and priorities, help develop and implement workshops with the [REDACTED] and the Center for Development and Health, provide consistency in approaches across the project, and provide the oversight for sustainable transition of relevant activities to partners by the end of the project.

[REDACTED] will commit [REDACTED] to this project, though he will only charge a portion of his salary to this grant and will use EHA core funds to cover the rest of his salary. He will identify opportunities and strategies for program outcomes to serve as guidance for policy and best practices among government and non-governmental stakeholders in Sabah, Malaysia, and regionally as appropriate.

[REDACTED] will commit [REDACTED] to develop the avoided costs model and participate in the associated data collection.

[REDACTED] will commit [REDACTED] to oversee the execution of the modeling strategy, collaborating with the other scientists and actively communicating and discussing the model developments with the CoP.

[REDACTED] will commit [REDACTED] to manage the disease and land cover geodatabases with particular attention to the assurance of data quality.

(b)(6) [redacted] will commit [redacted] assist in the supervision of the data collection, and connection of DEEP FOREST project data to the quantitative tools.

(b)(6) [redacted] will commit [redacted] to provide programmatic support for the project's health communication and policy outreach activities, and the formation of collaborations with non-traditional partners.

[redacted] will commit [redacted] to provide administrative oversight and support for the project's financial management, working closely with the CFO at EHA, and administrative staff funded through EHA core funds.

We are requesting 4 months p.a. for an assistant economist to serve as Economic Modeler.

B. Fringe benefits.

(b)(4) [redacted] Fringe benefits are calculated for EcoHealth Alliance as [redacted] of base salary, and increase by [redacted] per year to compensate for increasing insurance costs etc. All salaries increase by [redacted] per year for cost of living increases.

C. Travel.

International:

(b)(6) [redacted] All flights to/from Kuala Lumpur from/to Bangkok were calculated at \$204 round-trip airfare. The per diem for each day in Bangkok totals \$245 per day for hotel (\$142), meals and incidentals (\$103). Each year (Y1-Y3) [redacted] will go to Bangkok [redacted] and stay for 5 nights/ 6 days; $((\$204 + (\$142/\text{day} * 5 \text{ days} + \$103/\text{day} * 6 \text{ days})) * [redacted])$

(b)(6) [redacted] All flights to/from Kuala Lumpur from/to Sabah were calculated at \$300 round-trip airfare. The per diem for each day in Sabah totals \$170 per day for hotel (\$100), meals and incidentals (\$70). Each year (Y1-Y3) [redacted] to work with stakeholders and establish the center of excellence and stay for 5 nights/ 6 days; $((\$300 + (\$100/\text{day} * 5 \text{ days} + \$70/\text{day} * 6 \text{ days})) * [redacted])$

(b)(4) [redacted] All flights to/from Newark from/to Kuala Lumpur were calculated at \$2,200 round-trip airfare. The per diem for each day in Kuala Lumpur totals \$263 per day for hotel (\$169), meals and incidentals (\$94). Each year (Y1-Y3) COP Daszak [redacted] will go to Kuala Lumpur once per year to coordinate with Malaysia program staff and stakeholders and [redacted]

All flights to/from Newark from/to Kuala Lumpur were calculated at \$2,200 round-trip airfare. The per diem for each day in Kuala Lumpur totals \$263 per day for hotel (\$169), meals and

Domestic:

D. Supplies

E. Other

Procurement plan: EcoHealth Alliance complies with all aspects of the procurement guidelines set forth by 22 CFR Ch. II (4-1-06 Edition), Part 226 – “Administration of Assistance Awards to U.S. Non-Governmental Organizations”, including section 226.49 (USAID-Specific procurement requirements). In addition, as a low risk, federally audited institution, we have observed strict policies on procurement throughout our history as an organization receiving federal funding from HHS, Dept. State, and DoD. This includes using a competitive bidding procedure for large items, and actively seeking alternatives to all suppliers, seeking rental rather than purchase where appropriate and a range of other strategies that we engage in to reduce potential waste of resources.

CostShare: Cost Share (at greater than 5%) funds will come from core unrestricted funding to EcoHealth Alliance from non-federal sources. All cash and in-kind contributions will meet the criteria set forth in 22 CFR 226.23 and other OMB cost principles. Cost-share will be composed of in-kind salary support for 1 month p.a. for

Drs. Daszak [redacted] approximately [redacted] and in-kind salary support for [redacted] who is a [redacted] [redacted] with extensive USAID grants administration experience (see CV, Technical application, Annex B).

Financial and in-kind contributions of all implementing organizations: In-kind contributions totaling [redacted] will be made available by the Sabah Wildlife Department, including salary [redacted] travel support and drivers for visitors to DEEP FOREST field sites.

Potential contributions of non-USAID or private commercial donors: During this project we will seek in-kind and other contributions from the private sector, including stakeholders that we have already engaged. We expect that these will be small in the first year of the project (approximately [redacted]), but develop significantly as the project progresses, so that the overall in-kind or direct contributions from the private sector would exceed [redacted]. We will use the Center of Excellence in Sabah to host regular roundtable events for corporate representatives in the region from each sector, including agricultural (IOI Corp, TH Group, Kwantas Corp and Selangor Agriculture Development Board, the Rubber Industry Board, Rubber Settlement Scheme, Malaysian Cocoa Board, Tech Guan Cocoa company). We will invite our current corporate partners including Mars, Cargill, PepsiCo and others that are active in Southeast Asia to these meetings, and will propose development of projects that analyze health risks to their workers and corporate sustainability projects around the EID threats from land use change. We envisage seeking funding from our corporate partners to then trial out our toolkits, and develop small-scale on-the-ground tests of our approaches.

F. Indirect Costs

We will take our federally agreed indirect cost of [redacted] on all direct costs. In addition, University of Malaysia Sabah and Sabah Wildlife Department has each taken an [redacted] overhead on their subcontract.

Total EcoHealth Alliance budgeted indirect cost is [redacted]

(b)(4)

UNIVERSITY OF MALAYSIA SABAH

			SALARY				TOTAL
			(b)(6)	Center of Excellence, Director	\$	(b)(4)	
			TOTAL SALARY		\$		
			TRAVEL				
			TOTAL TRAVEL		\$		
			OTHER DIRECT COSTS				
			Annual Meetings		\$		
			Promotional Materials		\$		
			TOTAL OTHER DIRECT COSTS		\$		
			TOTAL DIRECT		\$		
			INDIRECT (b)(4) %		\$		
			TOTAL		\$		

University of Malaysia Sabah Budget Narrative

Contractual

Personnel: Center of Excellence Director (b)(6) will contribute (b)(4) to work with Senior Personnel and local partners to establish the Center for Development and Health at UMS. She will also facilitate workshops and mentor graduate students working under this project. **Travel:** We have budgeted (b)(4) for travel, which includes reimbursement for travel to Bangkok (\$504 flight, \$245 (\$142 hotel, \$103 meals) accommodation expenses (b)(4)).

Other Direct Costs: We have budgeted (b)(4) for quarterly meetings (b)(4); which includes travel for stakeholders, meals and accommodation). We have budgeted (b)(4) for promotional materials, including purchase supplies and production costs for brochures, handouts and other educational/promotional documents. **Indirect:** University of Malaysia Sabah will take (b)(4) overhead on their subcontract.

(b)(4)

SABAH WILDLIFE DEPARTMENT

			SALARY					TOTAL
					\$ -	\$ -	\$ -	\$ -
			TOTAL SALARY		\$ -	\$ -	\$ -	\$ -
			TRAVEL					
			TOTAL TRAVEL		(b)(4)			
			OTHER DIRECT COSTS					
			Annual Meetings					
			Training & Education					
			TOTAL OTHER DIRECT COSTS					
			TOTAL DIRECT					
			INDIRECT (b)(4) %					
			TOTAL					

(b)(4)

Sabah Wildlife Department Budget Narrative

Contractual

Travel: We have budgeted (b)(4) for travel, which includes reimbursement for travel to Bangkok ((b)(4) flight, \$245 (\$142 hotel, \$103 meals) accommodation costs (b)(4)). **Other Direct Costs:** We have budgeted (b)(4) for a Conference on Conservation and Land Development ((b)(4) per person (b)(4) (b)(4)). We have budgeted (b)(4) for training and education of SWD staff.

This will include travel and cost of attendance at CDH workshops and courses (b)(4) (b)(4) = (b)(4)), attendance at meetings nationally (b)(4) Peninsular Malaysia, (b)(4) airfare, \$142 hotel and \$103 meals f (b)(4), cost of attendance of an international conference annually in the USA or Europe (estimated at (b)(4) airfare and (b)(4) accommodation at (b)(4) day and food/incidentals at (b)(4) p. day = (b)(4)) travel to the US to learn GIS and analytical skills from the EHA modeling team so that we can ensure project sustainability in Sabah after the end of the IDEEAL program (b)(4)

(b)(4) including (b)(4) round trip air travel, (b)(4) at \$250 per night (b)(4) meals at \$103 = (b)(4). **Indirect:** Sabah Wildlife Department will take (b)(4) overhead on their subcontract.

Peter Daszak

EcoHealth Alliance, 460 W. 34th St. New York, NY 10001

daszak@ecohealthalliance.org

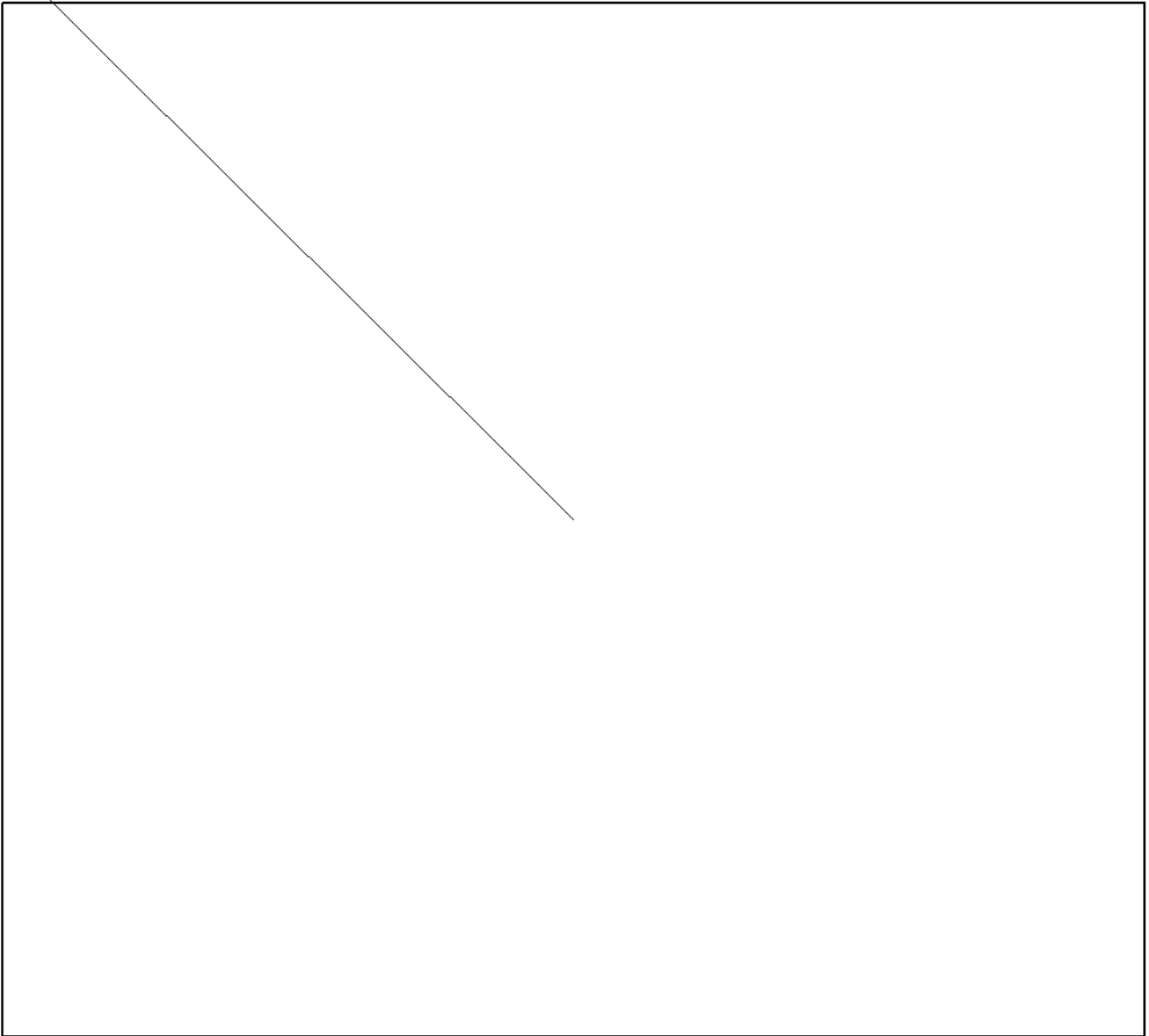
Dr. Peter Daszak is President of EcoHealth Alliance, a US-based organization which conducts research and outreach programs on global health, conservation and international development. Dr. Daszak's research has been instrumental in identifying and predicting the impact of emerging diseases across the globe. His achievements include producing the first ever global emerging disease 'hotspots' map, the design and implementation of the DEEP FOREST Project, identification of the wildlife reservoir of SARS, identifying the causes of Nipah and Hendra virus emergence, and coining the term 'pathogen pollution'. He has 20 years' experience managing international research and outreach projects, including directing the Consortium for Conservation Medicine for 8 years, establishing EHA's formal partnership with the Malaysian Govt. 15 years ago (HERG), and launching the One Health Alliance of South Asia in 2008. Currently, Dr. Daszak leads the modeling team for the USAID EPT PREDICT program. Dr Daszak is a member of the Institute of Medicine's Forum on Microbial Threats, and served on the IOM Committee on global surveillance for emerging zoonoses, the NRC committee on the future of veterinary research, the International Standing Advisory Board of the Australian Biosecurity CRC. He has briefed White House National Security Staff twice on global health issues. Dr Daszak won the 2000 CSIRO medal for collaborative research on the discovery of amphibian chytridiomycosis and is Editor-in-Chief of the journal *Ecohealth*. He has authored over 190 scientific papers, and his work has been the focus of extensive media coverage, ranging from popular press articles to television appearances.

Education

(b)(6)

(b)(6)

(b)(6)



E-mail info@ecohealthalliance.org

Education

- Coordinating sample collection from people with high exposure to wildlife, bats, rodents and primates with PERHILITAN, DVS and MOH in Peninsular Malaysia
- Coordinate meetings and communicate with government partners (MOH, PERHILITAN and DVS) to facilitate the approval of the MOU among the Malaysian government, EHA, and GVF, and to share results and findings from this study

Field Officer, Ecology of Nipah virus in Malaysia, EcoHealth Alliance 2005 - 2007

- Monitoring the population size and movement of *Pteropus* bats and collecting biological samples.

Arborist. The Tree Company (London) Ltd. 2003 - 2005

Expedition Leader. Tropical Forest Project. Perhentian Islands Malaysia. Coral Cay Conservation. (Collaborative research project with PERHILITAN) 2004 - 2004

Synergistic Activities

Reviewer

EcoHealth Journal.

Public Education

Worked at the village school and with businesses on The Perhentian Islands to educate school children, residents and tourists on the terrestrial flora and fauna of the islands, the importance of conserving this environment and its value to the livelihood of residents; Worked at the school on Tioman Island to educate students, teachers and parents on the ecological and economical importance of the Flying Fox in an attempt to raise awareness of the importance of this species.

Professional Affiliations & Activities

Member, Henipavirus Ecology Research Group.

Publications

Five most closely related to proposed project

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

EcoHealth Alliance, 460 W. 34th St. New York, NY 10001

E-mail: [redacted]@ecohealthalliance.org

(b)(6)
(b)(6)

[redacted]

of Conservation

Medicine at EcoHealth Alliance. He is the

USAID EPT PREDICT.

[redacted]

(b)(6)

[redacted]

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

(b)(6)

[Redacted]

EcoHealth Alliance, 460 W. 34th St. New York, NY 10001

[Redacted]@ecohealthalliance.org

[Redacted]

Health and Policy for EcoHealth Alliance.

He serves as president of the World Animal Health Organization (OIE) Working Group on Wildlife Diseases and chairs the IUCN SSC Wildlife Health Specialist Group, a network of wildlife and health experts around the world. Currently [Redacted] for the USAID Emerging Pandemic Threats PREDICT program. [Redacted] has pioneered initiatives focusing attention and resources to solving One Health problems raised by the

(b)(6)

(b)(6)

(b)(6)

[Redacted]

(b)(6)

[Redacted]

(b)(6)

(b)(6)

(b)(6)

(b)(6)



EcoHealth Alliance

Friday 24th May, 2013, COB

Cover Letter

**Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)
In response to USAID-RDMA-RFA-486-13-000001**

Dear (b)(6),

Please find our proposal for the Land Use Change and Emerging Diseases RFA: USAID-RDMA-486-13-000001 entitled "Infectious Disease Emergence and Economics of Altered Landscapes (IDEEAL)".

The Chief of Party for this proposal is Dr. Peter Daszak, and

I am the EcoHealth Alliance Authorized Organizational Representative. Please contact me, if there are any questions or concerns.

Many thanks for your consideration,

Sincerely,

(b)(6)

EcoHealth Alliance

(e) (b)(6) @ecohealthalliance.org

(t) (b)(6)

**Local conservation.
Global health.**

EcoHealth Alliance
460 West 34th Street, 17th Floor
New York, NY 10001-2320
212.380.4460

EcoHealthAlliance.org

USAID-00611

Opportunity Title:	Land Use Change and Disease Emergence Program
Offering Agency:	Thailand USAID-Bangkok
CFDA Number:	98.001
CFDA Description:	USAID Foreign Assistance for Programs Overseas
Opportunity Number:	USAID-RDMA-RFA-486-13-000001
Competition ID:	USAID-RDMA-RFA-486-13-000001
Opportunity Open Date:	04/05/2013
Opportunity Close Date:	05/29/2013
Agency Contact:	<div>(b)(6)</div> <div>(b)(6)</div> <div>E-mail: (b)(6)@usaid.gov</div> <div>Phone: (b)(6)</div>

This electronic grants application is intended to be used to apply for the specific Federal funding opportunity referenced here.

If the Federal funding opportunity listed is not the opportunity for which you want to apply, close this application package by clicking on the "Cancel" button at the top of this screen. You will then need to locate the correct Federal funding opportunity, download its application and then apply.

☐ I will be submitting applications on my behalf, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

* Application Filing Name: IDEEAL

Mandatory Documents

Assurances for Construction Programs (SF-424D)
Budget Information for Construction Programs (S

Move Form to
Complete

Move Form to
Delete

Mandatory Documents for Submission

Budget Information for Non-Construction Program
Application for Federal Assistance (SF-424)
Attachments
Assurances for Non-Construction Programs (SF-42

Optional Documents

Faith Based EEO Survey

Move Form to
Submission List

Move Form to
Delete

Optional Documents for Submission

Instructions

- 1 Enter a name for the application in the Application Filing Name field.**

 - This application can be completed in its entirety offline; however, you will need to login to the Grants.gov website during the submission process.
 - You can save your application at any time by clicking the "Save" button at the top of your screen.
 - The "Save & Submit" button will not be functional until all required data fields in the application are completed and you clicked on the "Check Package for Errors" button and confirmed all data required data fields are completed.
- 2 Open and complete all of the documents listed in the "Mandatory Documents" box. Complete the SF-424 form first.**

 - It is recommended that the SF-424 form be the first form completed for the application package. Data entered on the SF-424 will populate data fields in other mandatory and optional forms and the user cannot enter data in these fields.
 - The forms listed in the "Mandatory Documents" box and "Optional Documents" may be predefined forms, such as SF-424, forms where a document needs to be attached, such as the Project Narrative or a combination of both. "Mandatory Documents" are required for this application. "Optional Documents" can be used to provide additional support for this application or may be required for specific types of grant activity. Reference the application package instructions for more information regarding "Optional Documents".
 - To open and complete a form, simply click on the form's name to select the item and then click on the => button. This will move the document to the appropriate "Documents for Submission" box and the form will be automatically added to your application package. To view the form, scroll down the screen or select the form name and click on the "Open Form" button to begin completing the required data fields. To remove a form/document from the "Documents for Submission" box, click the document name to select it, and then click the <= button. This will return the form/document to the "Mandatory Documents" or "Optional Documents" box.
 - All documents listed in the "Mandatory Documents" box must be moved to the "Mandatory Documents for Submission" box. When you open a required form, the fields which must be completed are highlighted in yellow with a red border. Optional fields and completed fields are displayed in white. If you enter invalid or incomplete information in a field, you will receive an error message.
- 3 Click the "Save & Submit" button to submit your application to Grants.gov.**

 - Once you have properly completed all required documents and attached any required or optional documentation, save the completed application by clicking on the "Save" button.
 - Click on the "Check Package for Errors" button to ensure that you have completed all required data fields. Correct any errors or if none are found, save the application package.
 - The "Save & Submit" button will become active; click on the "Save & Submit" button to begin the application submission process.
 - You will be taken to the applicant login page to enter your Grants.gov username and password. Follow all onscreen instructions for submission.

Application for Federal Assistance SF-424

* 1. Type of Submission:

- ☐ Preapplication
☒ Application
☐ Changed/Corrected Application

* 2. Type of Application:

- ☒ New
☐ Continuation
☐ Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received:

Completed by Grants.gov upon submission.

4. Applicant Identifier:

IDEEAL2013

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name:

EcoHealth Alliance Inc.

* b. Employer/Taxpayer Identification Number (EIN/TIN):

(b)(4)

* c. Organizational DUNS:

0770900660000

d. Address:

* Street1:

460 West 34th Street

Street2:

17th Floor

* City:

New York

County/Parish:

* State:

NY: New York

Province:

* Country:

USA: UNITED STATES

* Zip / Postal Code:

10001-2317

e. Organizational Unit:

Department Name:

Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:

Ms.

* First Name:

(b)(6)

Middle Name:

Last Name:

(b)(6)

Suffix:

Title:

Federal Grants and Programs

Organizational Affiliation:

EcoHealth Alliance

* Telephone Number:

(b)(6)

Fax Number:

* Email:

(b)(6)

@ecohealthalliance.org

Application for Federal Assistance SF-424

* 9. Type of Applicant 1: Select Applicant Type:

M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

* 10. Name of Federal Agency:

Thailand USAID-Bangkok

11. Catalog of Federal Domestic Assistance Number:

98.001

CFDA Title:

USAID Foreign Assistance for Programs Overseas

* 12. Funding Opportunity Number:

USAID-RDMA-RFA-486-13-000001

* Title:

Land Use Change and Disease Emergence Program

13. Competition Identification Number:

USAID-RDMA-RFA-486-13-000001

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment

Delete Attachment

View Attachment

* 15. Descriptive Title of Applicant's Project:

Infectious Disease Emergence and Economics of Altered Landscapes (IDEAL)

Attach supporting documents as specified in agency instructions.

Add Attachments

Delete Attachments

View Attachments

Application for Federal Assistance SF-424**16. Congressional Districts Of:**

* a. Applicant NY010

b. Program/Project 00-000

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment

Delete Attachment

View Attachment

17. Proposed Project:

* a. Start Date: 09/01/2013

* b. End Date: 08/31/2016

Estimated Funding (\$):

* a. Federal	(b)(4)
* b. Applicant	
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	(b)(4)

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

- ☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .
- ☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.
- ☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment

Delete Attachment

View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Ms. * First Name: (b)(6)

Middle Name:

Name: (b)(6)

Suffix:

* Title: Finance Operations

* Telephone Number: (b)(6) Fax Number:

* Email: (b)(6)@ecohealthalliance.org

* Signature of Authorized Representative: Completed by Grants.gov upon submission. * Date Signed: Completed by Grants.gov upon submission.

ATTACHMENTS FORM

Instructions: On this form, you will attach the various files that make up your grant application. Please consult with the appropriate Agency Guidelines for more information about each needed file. Please remember that any files you attach must be in the document format and named as specified in the Guidelines.

Important: Please attach your files in the proper sequence. See the appropriate Agency Guidelines for details.

1) Please attach Attachment 1	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
2) Please attach Attachment 2	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
3) Please attach Attachment 3	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
4) Please attach Attachment 4	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
5) Please attach Attachment 5	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
6) Please attach Attachment 6	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
7) Please attach Attachment 7	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
8) Please attach Attachment 8	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
9) Please attach Attachment 9	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
10) Please attach Attachment 10	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
11) Please attach Attachment 11	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
12) Please attach Attachment 12	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
13) Please attach Attachment 13	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
14) Please attach Attachment 14	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment
15) Please attach Attachment 15	<input type="text"/>	Add Attachment	Delete Attachment	View Attachment

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.
19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

<p>* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</p> <p>Completed on submission to Grants.gov</p>	<p>* TITLE</p> <p>Director of Finance Operations</p>
<p>* APPLICANT ORGANIZATION</p> <p>EcoHealth Alliance Inc.</p>	<p>* DATE SUBMITTED</p> <p>Completed on submission to Grants.gov</p>

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BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 06/30/2014

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Land Use Change and Disease Emergence Program (LUCDEP)	98.001	\$	\$	645,216.00	\$	645,216.00
2. Land Use Change and Disease Emergence Program (LUCDEP)	98.001			663,248.00		663,248.00
3. Land Use Change and Disease Emergence Program (LUCDEP)	98.001			691,535.00		691,535.00
4.						
5. Totals		\$	\$	1,999,999.00	\$	1,999,999.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1)	(2)	(3)	(4)	
	Land Use Change and Disease Emergence Program (LUCDEP)	Land Use Change and Disease Emergence Program (LUCDEP)	Land Use Change and Disease Emergence Program (LUCDEP)		
a. Personnel	\$ (b)(4)			\$	\$ (b)(4)
b. Fringe Benefits					
c. Travel					
d. Equipment	0.00	0.00	0.00		
e. Supplies	(b)(4)				(b)(4)
f. Contractual					
g. Construction	0.00	0.00	0.00		
h. Other	(b)(4)				(b)(4)
i. Total Direct Charges (sum of 6a-6h)					\$
j. Indirect Charges					\$
k. TOTALS (sum of 6i and 6j)	\$			\$	\$
7. Program Income	\$ 0.00	\$	\$	\$	\$

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(b)(4)

(b)(4)

SECTION C DERAL RESOURCES

(a) Grant Program		(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.	EcoHealth Alliance Unrestricted Funding	\$ (b)(4)	\$	\$	\$ (b)(4)
9.	EcoHealth Alliance Unrestricted Funding				
10.	EcoHealth Alliance Unrestricted Funding				
11.					
12.	TOTAL (sum of lines 8-11)	\$	\$	\$	\$

SECTION D - FORECASTED CASH NEEDS

13.	Federal	\$ 645,216.00	\$ 213,723.00	\$ 182,757.00	\$ 124,368.00
14.	Non-Federal	\$			
15.	TOTAL (sum of lines 13 and 14)	\$			

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program

FUTURE FUNDING PERIODS (YEARS)

16.	Land Use Change Disease Emergence Program (LUCDEP)	\$ (b)(4)	\$	\$
17.				
18.				
19.				
20.	TOTAL (sum of lines 16 - 19)	\$ (b)(4)	\$	\$

SECTION F - OTHER BUDGET INFORMATION

21.	Direct Charges: (b)(4)	Rate: (b)(4), Base: (b)(4)	Indirect Charges: (b)(4)	IDC: (b)(4)
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23. Remarks:

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Activity Based Budget

Activity Description		Total
Structure project and project management	(b)(4)	
Required data gathered and maintained to run the quantitative model		
Quantitative algorithm assessing EID spillover likelihood and cost as function of land use		
Establishment and function of a center of excellence, for additional research, analysis, and cross-disciplinary partnerships		
Development and use of a gender sensitive tool kit for communicating the health impacts of differing land use options		
Improved outreach and communication of translated, quantitative resources to policy makers and civil society advocates		
Total Estimated Costs		

ORIGINAL

NONPROFIT RATE AGREEMENT

EIN: (b)(4)

DATE: 04/03/2013

ORGANIZATION:

FILING REF.: The preceding
agreement was dated
03/23/2012

EcoHealth Alliance
460 West 34th St., 17th Fl.
New York, NY 10001-2320

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: INDIRECT COST RATES

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

EFFECTIVE PERIOD

<u>TYPE</u>	<u>FROM</u>	<u>TO</u>	<u>RATE (%)</u>	<u>LOCATION</u>	<u>APPLICABLE TO</u>
FINAL	07/01/2011	06/30/2012	(b)(4)	On-Site	All Programs
PROV.	07/01/2012	Until Amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2012.

*BASE

Total direct costs excluding capital expenditures (buildings, individual items of equipment; alterations and renovations), that portion of each subaward in excess of \$25,000 and flow-through funds.

ORGANIZATION: EcoHealth Alliance

AGREEMENT DATE: 4/3/2013

SECTION I: FRINGE BENEFIT RATES**

<u>TYPE</u>	<u>FROM</u>	<u>TO</u>	<u>RATE (%)</u>	<u>LOCATION</u>	<u>APPLICABLE TO</u>
FINAL	7/1/2011	6/30/2012	(b)(4)	All	Full-Time Employees
PROV.	7/1/2012	Until amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2012.

** DESCRIPTION OF FRINGE BENEFITS RATE BASE:

Salaries and wages.

ORGANIZATION: EcoHealth Alliance

AGREEMENT DATE: 4/3/2013

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences.

Fringe benefits include FICA/Medicare, health insurance, life insurance, dental insurance, short/long term disability insurance, retirement, workers' compensation and unemployment and other.

Equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit.

ORGANIZATION: EcoHealth Alliance

AGREEMENT DATE: 4/3/2013

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its indirect cost pool as finally accepted; such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as indirect costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from indirect to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-122, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing indirect costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of indirect costs allocable to these programs.

BY THE INSTITUTION:

EcoHealth Alliance

(b)(6)

(b)(4)

(TITLE)

(DATE)

4/8/2013

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

(b)(6)

(NAME)

Division of Cost Allocation

4/3/2013

(DATE) 1227

HHS REPRESENTATIVE:

(b)(6)

Telephone:

SECTION D - CERTIFICATIONS, ASSURANCES, AND OTHER STATEMENTS OF RECIPIENT

PART I - CERTIFICATIONS AND ASSURANCES

1. ASSURANCE OF COMPLIANCE WITH LAWS AND REGULATIONS GOVERNING NON-DISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

(a) The recipient hereby assures that no person in the United States shall, on the bases set forth below, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under, any program or activity receiving financial assistance from USAID, and that with respect to the grant for which application is being made, it will comply with the requirements of:

(1) Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352, 42 U.S.C. 2000-d), which prohibits discrimination on the basis of race, color or national origin, in programs and activities receiving Federal financial assistance;

(2) Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794), which prohibits discrimination on the basis of handicap in programs and activities receiving Federal financial assistance;

(3) The Age Discrimination Act of 1975, as amended (Pub. L. 95-478), which prohibits discrimination based on age in the delivery of services and benefits supported with Federal funds;

(4) Title IX of the Education Amendments of 1972 (20 U.S.C. 1681, et seq.), which prohibits discrimination on the basis of sex in education programs and activities receiving Federal financial assistance (whether or not the programs or activities are offered or sponsored by an educational institution); and

(5) USAID regulations implementing the above nondiscrimination laws, set forth in Chapter II of Title 22 of the Code of Federal Regulations.

(b) If the recipient is an institution of higher education, the Assurances given herein extend to admission practices and to all other practices relating to the treatment of students or clients of the institution, or relating to the opportunity to participate in the provision of services or other benefits to such individuals, and shall be applicable to the entire institution unless the recipient establishes to the satisfaction of the USAID Administrator that the institution's practices in designated parts or programs of the institution will in no way affect its practices in the program of the institution for which financial assistance is sought, or the beneficiaries of, or participants in, such programs.

(c) This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the recipient by the Agency, including installment payments after such date on account of applications for Federal financial assistance which were approved before such date. The recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this Assurance, and that the United States shall have the right to seek judicial enforcement of this Assurance. This Assurance is binding on the recipient, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this Assurance on behalf of the recipient.

2. CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

(a) Instructions for Certification

(1) By signing and/or submitting this application or grant, the recipient is providing the certification set out below.

(2) The certification set out below is a material representation of fact upon which reliance was placed when the agency determined to award the grant. If it is later determined that the recipient knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

(3) For recipients other than individuals, Alternate I applies.

(4) For recipients who are individuals, Alternate II applies.

(b) Certification Regarding Drug-Free Workplace Requirements

Alternate I

(1) The recipient certifies that it will provide a drug-free workplace by:

(A) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the applicant's/grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(B) Establishing a drug-free awareness program to inform employees about:

1. The dangers of drug abuse in the workplace;
2. The recipient's policy of maintaining a drug-free workplace;
3. Any available drug counseling, rehabilitation, and employee assistance programs; and
4. The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(C) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (b)(1)(A);

(D) Notifying the employee in the statement required by paragraph (b)(1)(A) that, as a condition of employment under the grant, the employee will-

1. Abide by the terms of the statement; and
2. Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction;

(E) Notifying the agency within ten days after receiving notice under subparagraph (b)(1)(D)1, from an employee or otherwise receiving actual notice of such conviction;

(F) Taking one of the following actions, within 30 days of receiving notice under subparagraph (b)(1)(D)2., with respect to any employee who is so convicted--

1. Taking appropriate personnel action against such an employee, up to and including termination; or

2. Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(G) Making a good faith effort to continue to maintain a drug- free workplace through implementation of paragraphs (b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(1)(D), (b)(1)(E) and (b)(1)(F).

(2) The recipient shall insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

EcoHealth Alliance, 460 W 34th St, 17th Fl, New York, NY 10001

University of Malaysia Sabah, School of Business and Economics, Jalan Ums, 88400, Kota, Kinabalu, Sabah

Sabah Wildlife Department, Block B, 5th Fl, MUIS Building, 88100 Sembulan, Kota, Kinabalu, Sabah

Alternate II

The recipient certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance in conducting any activity with the grant.

3. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS -- PRIMARY COVERED TRANSACTIONS [3]

(a) Instructions for Certification

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meaning set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. [4] You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transaction," [5] provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the methods and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealing.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

(b) Certification Regarding Debarment, Suspension, and Other Responsibility Matters--Primary Covered Transactions

- (1) The prospective primary participant certifies to the best of its knowledge and belief, the it and its principals:
- (A) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - (B) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (C) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(B) of this certification;
 - (D) Have not within a three-year period proceeding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

4. CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, United States Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that: If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

5. PROHIBITION ON ASSISTANCE TO DRUG TRAFFICKERS FOR COVERED COUNTRIES AND INDIVIDUALS (ADS 206)

USAID reserves the right to terminate this [Agreement/Contract], to demand a refund or take other appropriate measures if the [Grantee/ Contractor] is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR Part 140. The undersigned shall review USAID ADS 206 to determine if any certification are required for Key Individuals or Covered Participants.

If there are COVERED PARTICIPANTS: USAID reserves the right to terminate assistance to, or take or take other appropriate measures with respect to, any participant approved by USAID who is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR Part 140.

The recipient has reviewed and is familiar with the proposed grant format and the applicable regulations, and takes exception to the following (use a continuation page as necessary):

Solicitation No. USAID-RDMA-RFA-486-13-000001

Application/Proposal No. USAID-RDMA-RFA-486-13-000001

Date of Application/Proposal 5/29/2013

Name of Recipient EcoHealth Alliance

Typed Name and Title Dr. Peter Daszak, President

[1] FORMATS\GRNTCERT: Rev. 06/16/97 (ADS 303.6, E303.5.6a) [2] When these Certifications, Assurances, and Other Statements of Recipient are used for cooperative agreements, the term "Grant" means "Cooperative Agreement". [3] The recipient must obtain from each identified subgrantee and (sub)contractor, and submit with its application/proposal, the Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lower Tier Transactions, set forth in Attachment A hereto. The recipient should reproduce additional copies as necessary. [4] See ADS Chapter E303.5.6a, 22 CFR 208, Annex1, App A. [5] For USAID, this clause is entitled "Debarment, Suspension, Ineligibility, and Voluntary Exclusion (March 1989)" and is set forth in the grant standard provision entitled "Debarment, Suspension, and Related Matters" if the recipient is a U.S. nongovernmental organization, or in the grant standard provision entitled "Debarment, Suspension, and Other Responsibility Matters" if the recipient is a non-U.S. nongovernmental organization.

PART II - OTHER STATEMENTS OF RECIPIENT

1. AUTHORIZED INDIVIDUALS

The recipient represents that the following persons are authorized to negotiate on its behalf with the Government and to bind the recipient in connection with this application or grant:

Name	Title	Telephone No.	Facsimile No.
Dr. Peter Daszak	President	1-212-380-4474	1-212-380-4465
<hr/>			
<hr/>			

2. TAXPAYER IDENTIFICATION NUMBER (TIN)

If the recipient is a U.S. organization, or a foreign organization which has income effectively connected with the conduct of activities in the U.S. or has an office or a place of business or a fiscal paying agent in the U.S., please indicate the recipient's TIN:

TIN: (b)(4)

3. CONTRACTOR IDENTIFICATION NUMBER - DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER

(a) In the space provided at the end of this provision, the recipient should supply the Data Universal Numbering System (DUNS) number applicable to that name and address. Recipients should take care to report the number that identifies the recipient's name and address exactly as stated in the proposal.

(b) The DUNS is a 9-digit number assigned by Dun and Bradstreet Information Services. If the recipient does not have a DUNS number, the recipient should call Dun and Bradstreet directly at 1-800-333-0505. A DUNS number will be provided immediately by telephone at no charge to the recipient. The recipient should be prepared to provide the following information:

- (1) Recipient's name.
- (2) Recipient's address.
- (3) Recipient's telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the organization was started.
- (7) Number of people employed by the recipient.
- (8) Company affiliation.

(c) Recipients located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.dbisna.com/dbis/customer/custlist.htm>. If an applicant is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@dbisma.com.

The DUNS system is distinct from the Federal Taxpayer Identification Number (TIN) system.

DUNS: 077090066

4. LETTER OF CREDIT (LOC) NUMBER

If the applicant has an existing Letter of Credit (LOC) with USAID or another US federal agency, please indicate the LOC number:

LOC: N/A

5. PROCUREMENT INFORMATION

(a) Applicability. This applies to the procurement of goods and services planned by the recipient (i.e., contracts, purchase orders, etc.) from a supplier of goods or services for the direct use or benefit of the recipient in conducting the program supported by the grant, and not to assistance provided by the recipient (i.e., a subgrant or subagreement) to a subgrantee or subrecipient in support of the subgrantee's or subrecipient's program. Provision by the recipient of the requested information does not, in and of itself, constitute USAID approval.

(b) Amount of Procurement. Please indicate the total estimated dollar amount of goods and services which the recipient plans to purchase under the grant:

\$ b)(4)

approval of the Agreement Officer, please indicate below (using a continuation page, as necessary) the types, quantities of each, and estimated unit costs. Nonexpendable equipment for which the Agreement Officer's approval to purchase is required is any article of nonexpendable tangible personal property charged directly to the grant, having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit.

TYPE/DESCRIPTION QUANTITY ESTIMATED UNIT COST (Generic)

N/A

(d) Source, Origin, and Componentry of Goods. If the recipient plans to purchase any goods/commodities which are not of U.S. source and/or U.S. origin, please indicate below (using a continuation page, as necessary) the types and quantities of each, estimated unit costs of each, and probable source and/or origin. "Source" means the country from which a commodity is shipped to the cooperating country or the cooperating country itself if the commodity is located therein at the time of purchase. However, where a commodity is shipped from a free port or bonded warehouse in the form in which received therein, "source" means the country from which the commodity was shipped to the free port or bonded warehouse. Any commodity whose source is a non-Free World country is ineligible for USAID financing. The "origin" of a commodity is the country or area in which a commodity is mined, grown, or produced. A commodity is produced when, through manufacturing, processing, or substantial and major assembling of components, a commercially recognized new commodity results, which is substantially different in basic characteristics or in purpose or utility from its components. Merely packaging various items together for a particular procurement or relabeling items does not constitute production of a commodity. Any commodity whose origin is a non-Free World country is ineligible for USAID financing. "Components" are the goods which go directly into the production of a produced commodity. Any component from a non-Free World country makes the commodity.

N/A

(e) Restricted Goods. If the recipient plans to purchase any restricted goods, please indicate below (using a continuation page, as necessary) the types and quantities of each, estimated unit costs of each, intended use, and

ineligible for USAID financing.

TYPE/ DESCRIPTION (Generic)	QUANTITY	EST. UNIT COST	GOODS COMPONENTS	PROBABLE SOURCE	GOODS COMPONENTS	PROBABLE ORIGIN
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probable source and/or origin. Restricted goods are Agricultural Commodities, Motor Vehicles, Pharmaceuticals, Pesticides, Rubber Compounding Chemicals and Plasticizers, Used Equipment, U.S. Government-Owned Excess Property, and Fertilizer.

TYPE/ QUANTITY ESTIMATED PROBABLE PROBABLE INTENDED DESCRIPTION UNIT COST
SOURCE ORIGIN USE (Generic)

N/A

(f) Supplier Nationality. If the recipient plans to purchase any goods or services from suppliers of goods and services whose nationality is not in the U.S., please indicate below (using a continuation page, as necessary) the types and quantities of each good or service, estimated costs of each, probable nationality of each non-U.S. supplier of each good or service, and the rationale for purchasing from a non-U.S. supplier. Any supplier whose nationality is a non-Free World country is ineligible for USAID financing.

N/A

(g) Proposed Disposition. If the recipient plans to purchase any nonexpendable equipment with a unit acquisition

current fair market value of the property), or sell the property and reimburse USAID an amount computed by applying to the sales proceeds the percentage of federal participation in the cost of the original program (except that the recipient may deduct from the federal share \$500 or 10% of the proceeds, whichever is greater, for selling and handling expenses), or donate the property to a host country institution, or otherwise dispose of the property as instructed by USAID.

TYPE/DESCRIPTION QUANTITY ESTIMATED PROPOSED DISPOSITION (Generic) UNIT COST

N/A

ineligible for USAID financing.

TYPE/ DESCRIPTION	QUANTITY	EST. UNIT	GOODS COMPONENTS	PROBABLE SOURCE	GOODS COMPONENTS	PROBABLE ORIGIN
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(h) The source and origin of procurements under this agreement will be subject to the Standard Provisions titled "USAID ELIGIBILITY RULES FOR GOODS AND SERVICES (APRIL 1998)" and "Local Procurement".

N/A

6. PAST PERFORMANCE REFERENCES On a continuation page or as part of your cost proposal, please provide a list of the U.S. Government and/or privately-funded contracts, grants, cooperative agreements, etc., received during the last three years, and the name, address, and telephone number of the Contract/Agreement Officer or other contact person.

Included as part of cost proposal.

7. TYPE OF ORGANIZATION

The recipient, by checking the applicable box, represents that -

(a) If the recipient is a U.S. entity, it operates as ☐ a corporation incorporated under the laws of the State of, ☐ an individual, ☐ a partnership, ☒ a nongovernmental nonprofit organization, ☐ a state or local governmental organization, ☐ a private college or university, ☐ a public college or university, ☐ an international organization, or ☐ a joint venture; or

(b) If the recipient is a non-U.S. entity, it operates as ☐ a corporation organized under the laws of _____ (country), ☐ an individual, ☐ a partnership, ☐ a nongovernmental nonprofit

organization, [] a nongovernmental educational institution, [] a governmental organization, [] an international organization, or [] a joint venture.

8. ESTIMATED COSTS OF COMMUNICATIONS PRODUCTS

The following are the estimate(s) of the cost of each separate communications product (i.e., any printed material [other than non- color photocopy material], photographic services, or video production services) which is anticipated under the grant. Each estimate must include all the costs associated with preparation and execution of the product. Use a continuation page as necessary.

PART III - STANDARD PROVISIONS

1. Mandatory Standard Provisions for U.S. Nongovernmental recipients can be accessed through USAID's website <http://www.usaid.gov/policy/ads/300/refindx3.htm>

Mandatory Standard Provisions for Non-U.S., Nongovernmental recipients can be accessed through USAID's website

<http://www.usaid.gov/policy/ads/300/refindx3.htm>

2. SF 424 Application For Federal Assistance Website: This form can be downloaded on USAID website at: http://www.usaid.gov/procurement_bus_opp/procurement/forms.

ATTACHMENTS

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION LOWER TIER COVERED TRANSACTIONS

(a) Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, has the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. 1/ You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier covered Transaction," 2/ without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Non procurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred,

ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

(b) Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Solicitation No. USAID-RDMA-RFA-486-13-000001

Application/Proposal No. USAID-RDMA-RFA-486-13-000001

Date of Application/Proposal 5/29/13

Name of Applicant/Subgrantee EcoHealth Alliance

Typed Name and Title Dr. Peter Daszak, President

Signature _____

1/ See ADS Chapter 303, 22 CFR 208.

2/ For USAID, this clause is entitled "Debarment, Suspension, Ineligibility, and Voluntary Exclusion (March 1989)" and is set forth in the USAID grant standard provision for U.S. nongovernmental organizations entitled "Debarment, Suspension, and Related Matters" (see ADS Chapter 303), or in the USAID grant standard provision for non-U.S. nongovernmental organizations entitled "Debarment, Suspension, and Other Responsibility Matters" (see ADS Chapter 303).

KEY INDIVIDUAL CERTIFICATION NARCOTICS OFFENSES AND DRUG TRAFFICKING

I hereby certify that within the last ten years:

1. I have not been convicted of a violation of, or a conspiracy to violate, any law or regulation of the United States or any other country concerning narcotic or psychotropic drugs or other controlled substances.
2. I am not and have not been an illicit trafficker in any such drug or controlled substance.
3. I am not and have not been a knowing assistor, abettor, conspirator, or colluder with others in the illicit trafficking in any such drug or substance.

Signature: _____

Date: 5/24/2013

Name: Dr. Peter Daszak

Title/Position: President

Organization: EcoHealth Alliance

Address: 460 W 34th St, 17th Fl
New York, NY 10001

Date of Birth: 11/18/1965

NOTICE:

1. You are required to sign this Certification under the provisions of 22 CFR Part 140, Prohibition on Assistance to Drug Traffickers. These regulations were issued by the Department of State and require that certain key individuals of organizations must sign this Certification.
2. If you make a false Certification you are subject to U.S. criminal prosecution under 18 U.S.C. 1001.

CERTIFICATION REGARDING MATERIAL SUPPORT AND RESOURCES

As a condition of entering into the referenced agreement, EcoHealth Alliance hereby certifies that it has not provided and will not provide material support or resources to any individual or entity that it knows, or has reason to know, is an individual or entity that advocates, plans, sponsors, engages in, or has engaged in terrorist activity, including but not limited to the individuals and entities listed in the Annex to Executive Order 13224 and other such individuals and entities that may be later designated by the United States under any of the following authorities: § 219 of the Immigration and Nationality Act, as amended (8 U.S.C. § 1189), the International Emergency Economic Powers Act (50 U.S.C. § 1701 et seq.), the National Emergencies Act (50

U.S.C. § 1601 et seq.), or § 212(a)(3)(B) of the Immigration and Nationality Act, as amended by the USA Patriot Act of 2001, Pub. L. 107-56 (October 26, 2001)(8 U.S.C. § 1182). EcoHealth Alliance further certifies that it will not provide material support or resources to any individual or entity that it knows, or has reason to know, is acting as an agent for any individual or entity that advocates, plans, sponsors, engages in, or has engaged in, terrorist activity, or that has been so designated, or will immediately cease such support if an entity is so designated after the date of the referenced agreement.

For purposes of this certification, "material support and resources" includes currency or other financial securities, financial services, lodging, training, safe houses, false documentation or identification, communications equipment, facilities, weapons, lethal substances, explosives, personnel, transportation, and other physical assets, except medicine or religious materials.

For purposes of this certification, "engage in terrorist activity" shall have the same meaning as in section 212(a)(3)(B)(iv) of the Immigration and Nationality Act, as amended (8 U.S.C. § 1182(a)(3)(B) (iv)).

For purposes of this certification, "entity" means a partnership, association, corporation, or other organization, group, or subgroup.

This certification is an express term and condition of the agreement and any violation of it shall be grounds for unilateral termination of the agreement by USAID prior to the end of its term.

Signature: _____

Name: Dr. Peter Daszak

Date: 5/24/2013

Address: 460 W 34th St, 17th Fl, New York, NY 10001

NOTICE:

If you make a false Certification you are subject to U.S. criminal prosecution under 18 U.S.C. 1001.

End of RFA.

Survey on Ensuring Equal Opportunity for Applicants

OMB No. 1890-0014 Exp. 1/31/2006

Purpose: The Federal government is committed to ensuring that all qualified applicants, small or large, non-religious or faith-based, have an equal opportunity to compete for Federal funding. In order for us to better understand the population of applicants for Federal funds, we are asking nonprofit private organizations (not including private universities) to fill out this survey.

Upon receipt, the survey will be separated from the application. Information on the survey will not be considered in any way in making funding decisions and will not be included in the Federal grants database. While your help in this data collection process is greatly appreciated, completion of this survey is voluntary.

Instructions for Submitting the Survey: If you are applying using a hard copy application, please place the completed survey in an envelope labeled "Applicant Survey." Seal the envelope and include it along with your application package. If you are applying electronically, please submit this survey along with your application.

Applicant's (Organization) Name: EcoHealth Alliance
Applicant's DUNS Number: 077090066
Grant Name: Land Use Change and Disease Emergence Program **CFDA Number:** 98.001

1. Does the applicant have 501(c)(3) status?

☒ Yes No

4. Is the applicant a faith-based/religious organization?

Yes ☒ No

2. How many full times equivalent employees does the applicant have? (Check only one box.)

3 or Fewer ☒ 15-50
4-5 51-100
6-12 over 100

5. Is the applicant a non-religious community based organization?

Yes ☒ No

3. What is the size of the applicant's annual budget? (Check only one box.)

Less than \$150,000
\$150,000 - \$299,999
\$300,000 - \$499,999
\$500,000 - \$999,999
\$1,000,000 - \$4,999,999
☒ \$5,000,000 or more

6. Is the applicant an intermediary that will manage the grant on behalf of other organizations?

Yes ☒ No

7. Has the applicant ever received a government grant or contract (Federal, State, local)?

☒ Yes No

8. Is the applicant a local affiliate of a national organization?

Yes ☒ No

Survey Instructions on Ensuring

Provide the applicant's (organization) name and DUNS number and the grant name and CFDA number.

1. 501(c)(3) status is a legal designation provided on application to the Internal Revenue Service by eligible organizations. Some grant programs may require nonprofit applicants to have 501(c)(3) status. Other grant programs do not.
2. For example, two part-time employees who each work half-time equal one full-time equivalent employee. If the applicant is a local affiliate of a national organization, the responses to survey questions 2 and 3 should reflect the staff and budget size of the local affiliate.
3. Annual budget means the amount of money our organization spends each year on all of its activities.
4. Self-identify.
5. An organization is considered a community-based organization if its headquarters/service location shares the same zip code as the clients you serve.
6. An "intermediary" is an organization that enables a group of small organizations to receive and manage government funds by administering the grant on their behalf.
7. Self-explanatory.
8. Self-explanatory.

Equal Opportunity for Applicants

Paperwork Burden Statement

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless such collection displays a valid OMB control number. The valid OMB control number for this information collection is 1890-0014. The time required to complete this information collection is estimated to average five (5) minutes per response, including the time to review instructions, search existing data resources, gather the data needed, and complete and review the information collection. **If you have any comments concerning the accuracy of the time estimate(s) or suggestions for improving this form, please write to:** U.S. Department of Education, Washington, D.C. 20202-4651.

If you have comments or concerns regarding the status of your individual submission of this form, write directly to:

Joyce I. Mays, Application Control Center,
U.S. Department of Education, 7th and D
Streets, SW, ROB-3, Room 3671,
Washington, D.C. 20202-

Cost Share

(b)(6) Cost Share (at greater than 5%) funds will come from core unrestricted funding to EcoHealth
(b)(6) Alliance from non-federal sources. All cash and in-kind contributions will meet the criteria set
(b)(6) forth in 22 CFR 226.23 and other OMB cost principles. Cost-share will be composed of in-kind
salary support for (b)(6) for Drs. Daszak, (b)(6) (approximately (b)(4)
in total) and in-kind salary support for (b)(4) (approximately (b)(4)
(b)(4)), who is a (b)(6) with extensive USAID grants administration experience (see CV,
Technical application, Annex B).

**ECOHEALTH ALLIANCE, INC.
(FORMERLY KNOWN AS WILDLIFE TRUST, INC.)
AND WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.**

**CONSOLIDATED FINANCIAL STATEMENTS,
AUDITOR'S REPORTS AND SCHEDULE
RELATED TO OFFICE OF MANAGEMENT
AND BUDGET CIRCULAR A-133**

JUNE 30, 2010

**ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.**

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**ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.**

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**Independent Auditor's Report on Financial Statements
and Schedule of Expenditures of Federal Awards**

**Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.**

We have audited the accompanying consolidated balance sheet of EcoHealth Alliance, Inc. (formerly known as Wildlife Trust, Inc.) and Wildlife Preservation Trust International, Inc. as of June 30, 2010, and the related consolidated statements of activities, functional expenses and cash flows for the year then ended. These financial statements are the responsibility of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s 2009 financial statements and, in our report dated March 2, 2010, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. as of June 30, 2010, and the changes in their net assets and their cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards*, we have also issued our report dated March 2, 2011 on our consideration of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting and on our tests of their compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit conducted in accordance with *Government Auditing Standards* and should be considered in assessing the results of our audit.

Our audit was conducted for the purpose of forming an opinion on the basic consolidated financial statements taken as a whole. The accompanying schedule of expenditures of federal awards is presented for purposes of additional analysis as required by U.S. Office of Management and Budget Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations* and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic consolidated financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the basic consolidated financial statements taken as a whole.

Loeb & Troper LLP

March 2, 2011

**ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.**

CONSOLIDATED BALANCE SHEET

JUNE 30, 2010 AND 2009

	<u>2010</u>	<u>2009</u> (Restated)
ASSETS		
Cash and cash equivalents	\$	(b)(4)
Investments (Note 3)		
Contributions receivable - current		
Government contracts receivable - current		
Other receivable		
Prepaid expenses		
Security deposits		
Fixed assets - net (Note 4)		
Total assets	\$	
LIABILITIES AND NET ASSETS		
Accounts payable and accrued expenses	\$	(b)(4)
Loan payable (Note 5)		
Refundable advances		
Total liabilities		
Net assets (Exhibit B)		
Unrestricted		
Temporarily restricted (Note 7)		
Permanently restricted (Note 11)		
Total net assets		
Total liabilities and net assets	\$	

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

EXHIBIT B

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2010
(With Summarized Financial Information
for the Year Ended June 30, 2009)

LOEB & TROPER LLP

	2010			2009
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Operating revenues and other support	<div style="border: 1px solid black; padding: 10px;"> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">\$</div> <div> <div>(b)(4)</div> </div> </div> </div>			
Government contracts and grants				
Foundations - contributions				
Corporations - contributions				
Bequests				
Individuals - contributions				
Special events				
Other revenues				
Net assets released from restrictions (Note 7)				
Total operating revenues and other support				

-continued-

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

EXHIBIT B

-2-

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2010

(With Summarized Financial Information
for the Year Ended June 30, 2009)

	2010			
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
				2009
Expenses (Exhibit C)				
Program service				
Research and education				
Supporting services				
Management and general				
Fund raising				
Direct costs of special events				
Total supporting services expenses				
Total expenses				
Operating gain (loss)				
Nonoperating activities				
Investment income (loss) (Note 3)				
Change in net assets (Exhibit D)				
Net assets - beginning of the year, before restatement				
Restatement (Note 12)				
Net assets - beginning of the year, restated				
Net assets - end of year (Exhibit A)				

\$ (b)(4)

\$

See independent auditor's report.

The accompanying notes are an integral part of these statements.

CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES

YEAR ENDED JUNE 30, 2010
(With Summarized Financial Information
for the Year Ended June 30, 2009)

	Research and Education	Management and General	Supporting Services		Total	Total	
			Fund Raising	Direct Costs of Special Events		2010	2009
Salaries	(b)(4)						
Payroll taxes and employee benefits							
Total salaries and related expenses							
Professional fees							
Subcontracts							
Grants to other organizations							
Field costs							
Meetings and conferences							
Travel							
Occupancy (Note 8)							
Printing							
Postage							
Supplies							
Telephone							
Equipment							
Dues and subscriptions							
Miscellaneous							
Repairs and maintenance							
Depreciation and amortization							
Catering and facility rental							
Bad debts							
Investment expenses							
Total other than salaries and related expenses							
Total expenses							
Less expenses reported net of revenues							
Total expenses reported by function on the consolidated statement of activities (Exhibit B)							

See independent auditor's report.

The accompanying notes are an integral part of these statements.

**ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.**

CONSOLIDATED STATEMENT OF CASH FLOWS

YEARS ENDED JUNE 30, 2010 AND 2009

	<u>2010</u>	<u>2009</u>
Cash flows from operating activities		
Change in net assets (Exhibit B)	\$	(b)(4)
Adjustments to reconcile change in net assets to net cash provided (used) by operating activities		
Depreciation and amortization		
Realized and unrealized (gains) losses on investments		
Decrease (increase) in assets		
Contributions receivable		
Government contracts receivable		
Other receivable		
Prepaid expenses		
Security deposits		
Increase (decrease) in liabilities		
Accounts payable and accrued expenses		
Grants payable		
Refundable advances		
Net cash provided (used) by operating activities		
Cash flows from investing activities		
Purchase of fixed assets		
Proceeds from sale of investments		
Purchase of investments		
Net cash used by investing activities		
Cash flows from financing activities		
Proceeds from loan		
Net change in cash and cash equivalents		
Cash and cash equivalents - beginning of year		
Cash and cash equivalents - end of year	\$	
Supplemental disclosure of cash flow information		
Cash paid during the year for interest	\$	

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2010

NOTE 1 - ORGANIZATION AND TAX STATUS

On June 22, 2010, Wildlife Trust, Inc. changed their name to EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. was incorporated on July 20, 2000 in the Commonwealth of Massachusetts. EcoHealth Alliance, Inc.'s mission is to protect wildlife and safeguard ecosystems through integrated programs of research, hands-on wildlife management professional training and public education.

EcoHealth Alliance, Inc. is funded primarily by contributions and government contracts and grants.

Wildlife Preservation Trust International, Inc. (WPTI) was incorporated on January 7, 1976 in the state of Pennsylvania. WPTI is a dormant corporation. In 2000, WPTI transferred the predominance of its assets to EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. and WPTI are related through common control.

EcoHealth Alliance, Inc. and WPTI are exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code.

EcoHealth Alliance, Inc. and WPTI are collectively referred to as "the Alliance."

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of accounting - The financial statements are prepared on the accrual basis of accounting.

Principles of consolidation - All material intercompany transactions and balances have been eliminated.

FASB Accounting Standards Codification - In July 2009, the FASB released FASB Accounting Standards Codification (ASC) as the single source of authoritative nongovernmental U.S. Generally Accepted Accounting Principles (GAAP). The Codification is effective for interim and annual periods ending after September 15, 2009. All existing accounting standards documents are superseded as described in FASB Statement No. 168, *The FASB Accounting Standards Codification and the Hierarchy of Generally Accepted Accounting Principles*. All other accounting literature not included in the Codification is considered nonauthoritative.

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ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2010

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Use of estimates - The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Cash and cash equivalents - The Alliance considers highly liquid debt instruments purchased with original maturities of three months or less to be cash equivalents. The Alliance has periodically throughout the year maintained balances in various operating and money market accounts in excess of federally insured limits.

Investments - Investments are recorded at fair value based on quoted market prices. The Alliance invests in various investment securities. Investment securities are exposed to various risks such as interest rate, market and credit risks. Due to the level of risk associated with investment securities, it is at least reasonably possible that changes in the values of investment securities will occur in the near term, based upon the markets' fluctuations, and that such changes could materially affect the Alliance's balance sheet.

Contributions receivable - Unconditional promises to give that are expected to be collected within one year are recorded at net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using risk-free interest rates applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Revenues on conditional promises to give are not included as support until the conditions are subsequently met.

Government contracts receivable - Government contracts receivable are recorded when services are rendered and the Alliance has a signed contract for services.

Allowance for doubtful accounts - The Alliance determines whether an allowance for uncollectibles should be provided for contributions and government contracts receivable. Such estimates are based on management's assessment of the aged basis of its contributions and other sources, current economic conditions and historical information. Contributions and government contracts receivable are written off against the allowance for doubtful accounts when all reasonable collection efforts have been exhausted.

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ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2010

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Fixed assets - Fixed assets are recorded at cost and depreciated over their estimated useful lives using the straight-line method. Leasehold improvements are recorded at cost and are being amortized over the shorter of the term of the lease or its estimated useful life using the straight-line method. Items with a cost of \$1,000 and an estimated useful life of more than one year are capitalized.

Refundable advances - Refundable advances consist of advances received on government contracts that are anticipated to be earned in the future.

Net assets - Unrestricted net assets include funds having no restriction as to use or purpose imposed by donors. Temporarily restricted net assets are those whose use has been limited by donors to a specific time period or purpose. Permanently restricted net assets have been restricted by donors to be maintained in perpetuity.

Revenues from government agencies - Revenues from government agencies are recognized when earned. Expense-based grants are recognized as allowable expenses are incurred. Performance-based grants are recognized as milestones are achieved.

Contributed services - Contributed services are recognized as revenue if the services create or enhance nonfinancial assets or require specialized skills, are provided by individuals possessing those skills, and typically need to be purchased if not provided by donation.

Contributions - Unconditional contributions, including promises to give cash and other assets, are reported at fair value at the date the contribution is received. Contributions are reported as either temporarily or permanently restricted support if they are received with donor stipulations that limit the use of the donated assets. When a donor restriction expires, that is, when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified as unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

Functional allocation of expenses - The costs of providing the Alliance's programs and other activities have been summarized on a functional basis. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Rent expense - The Alliance leases space at various locations. All leases are operating leases. Rent expense is recognized on the first day of each month for the current month's rent. All leases are reflected on the straight-line basis.

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