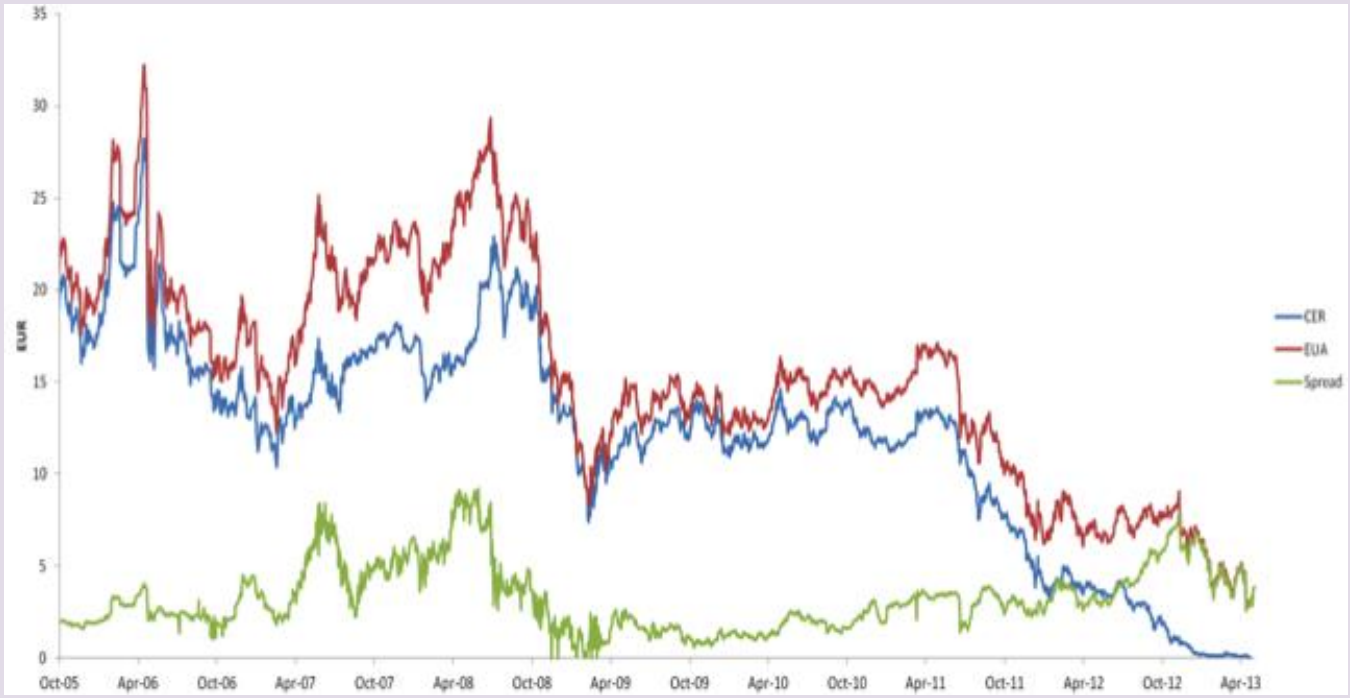
CREATING A SALABLE HEALTH PRODUCT FROM CLEAN COOKSTOVES: THE LAO PDR OPPORTUNITY FOR INNOVATION AND SECTORAL PARTNERSHIP

Why Try and Monetize Health Benefits of Clean Cookstoves

Compliance Carbon Market has collapsed



- **Prices up to 2011 were adequate to fund stoves projects on value of carbon credits alone**
- **By end 2011 prices had fallen below critical levels of Euros 4-6/CER**
- **Voluntary market has become over-supplied too**

Developers passionate about the transformational benefits of clean cookstoves have to look elsewhere to fund ICS projects

Benefits of Clean Efficient Cookstoves	Is there a market for them?
Climate Mitigation	
Reduction in CO2 emissions	Yes
Reduction in Short-Lived Climate Pollutants	No, but World Bank is planning to initiate that market
Climate Adaptation	
Reduction in tree, shrub and forest loss	Only indirectly
Longer Healthier Lives	
for Women;	No , but its possible with World Bank leadership
and children	
Reduced time and increased productivity from less fuel gathering	
for Women;	No
and girl children	No
Lowered expenditure on firewood and charcoal	
Increased disposable income	No
Decreased risk of physical abuse gathering biomass fuels	
Both women and children	No

Why Try and Monetize Health Benefits of Clean Cookstoves

Four Good Reasons to Try in Lao PDR

1. **Convincing evidence that cooking over open fires and with woody biomass is a major cause of disease, including in Lao PDR:**
   - Laos may have highest burden of disease in world from household air pollution from biomass smoke
   - 223,000 years of life lost (YLL) worth 3.5% of GDP, assuming YLL as lost productivity using GDP per capita
2. **Health Performance metric exists: Averted DALYs**
   - WHO recognized measure of burden of disease
3. **Improved measurement and analytical tools now exist to understand pollution exposure-response relationship**
   - Pioneering work by Professor Kirk Smith and colleagues at University of California, Berkeley, has created tools to quantify and price reductions in DALYs
4. **Firewood and woody biomass stove technology has matured rapidly over the past three years**
   - clean modern wood-burning cookstoves are now commercially available at scale, including Phillips Gasifier stove (from Africa Clean Energy) and Biolite (even charge cell phone), USA.

Mortality and Burden of Disease

Mortality = Numbers of Deaths

Burden = Disability Adjusted Life Year (DALY)

DALY = YLL + YLD

years of life lost due to premature death (YLLs)

years of life lived with disability (YLDs)

one DALY = one lost year of healthy life

Leading Edge Clean Cookstove Technology

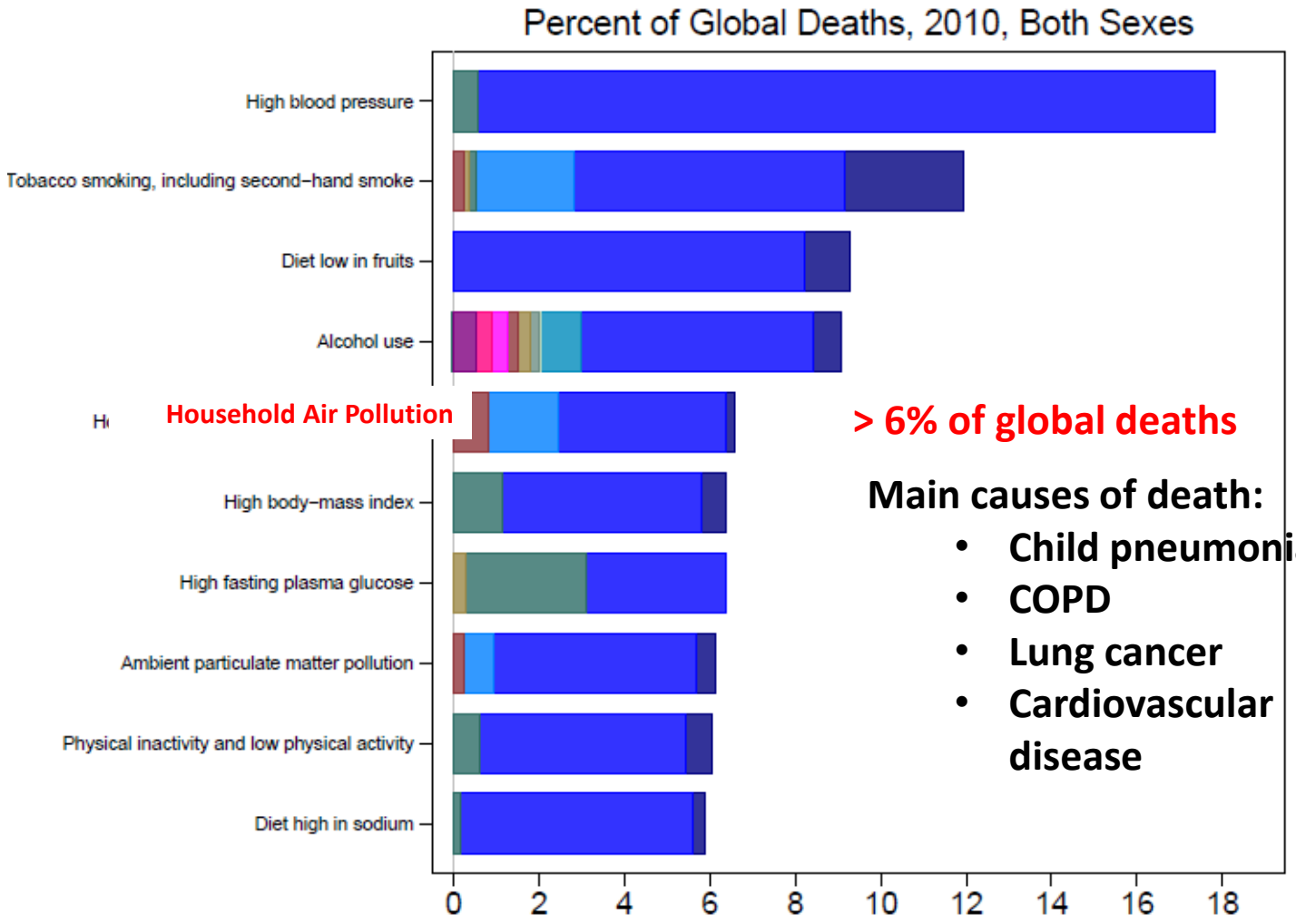
Africa Clean Energy Stove by
Phillips Electronics

Biolite Home Stove

NEW TRANSFORMATIONAL TECHNOLOGY

CQuestCapital

~ 4 Million Deaths Due to Household Air Pollution in 2010

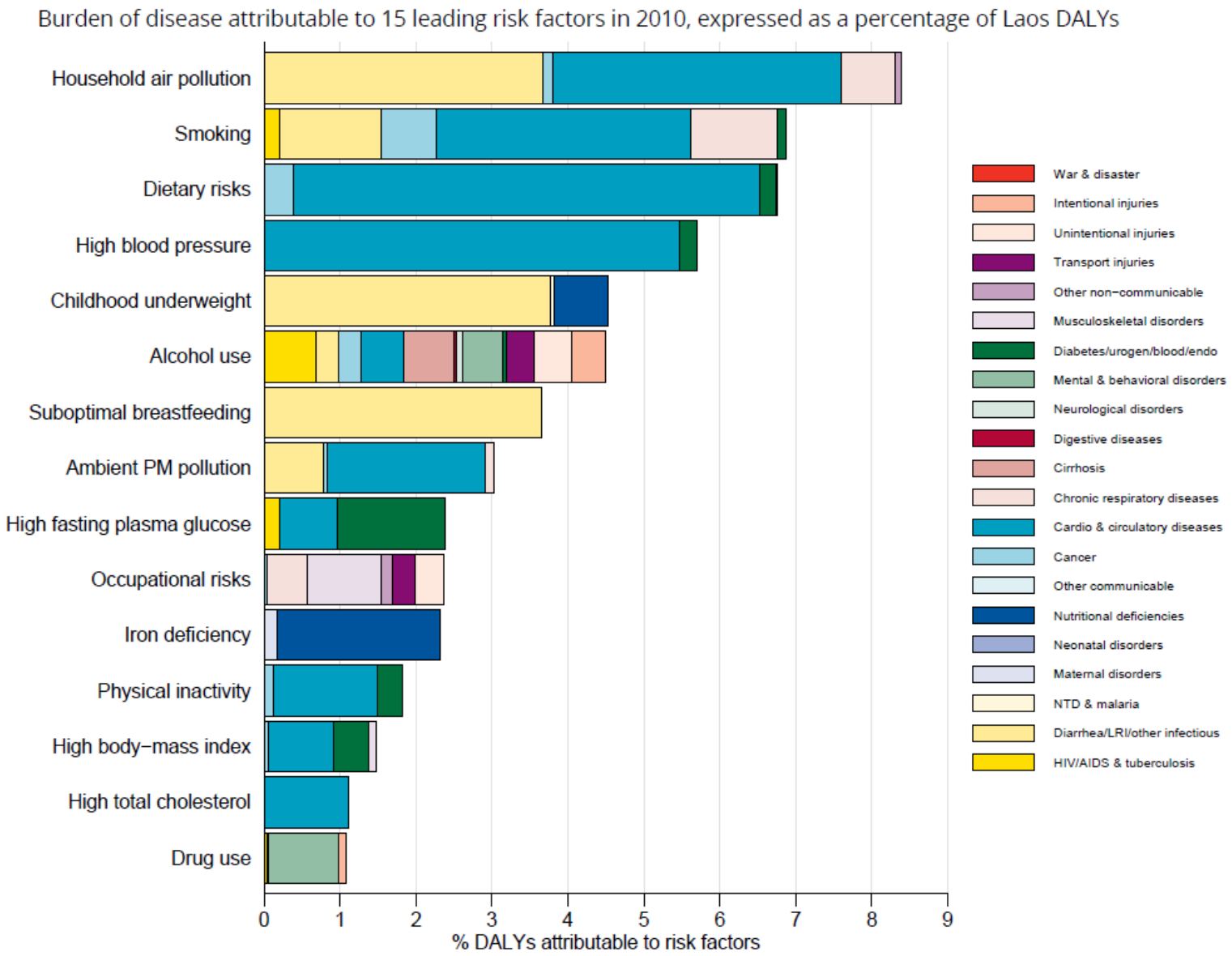


> 6% of global deaths

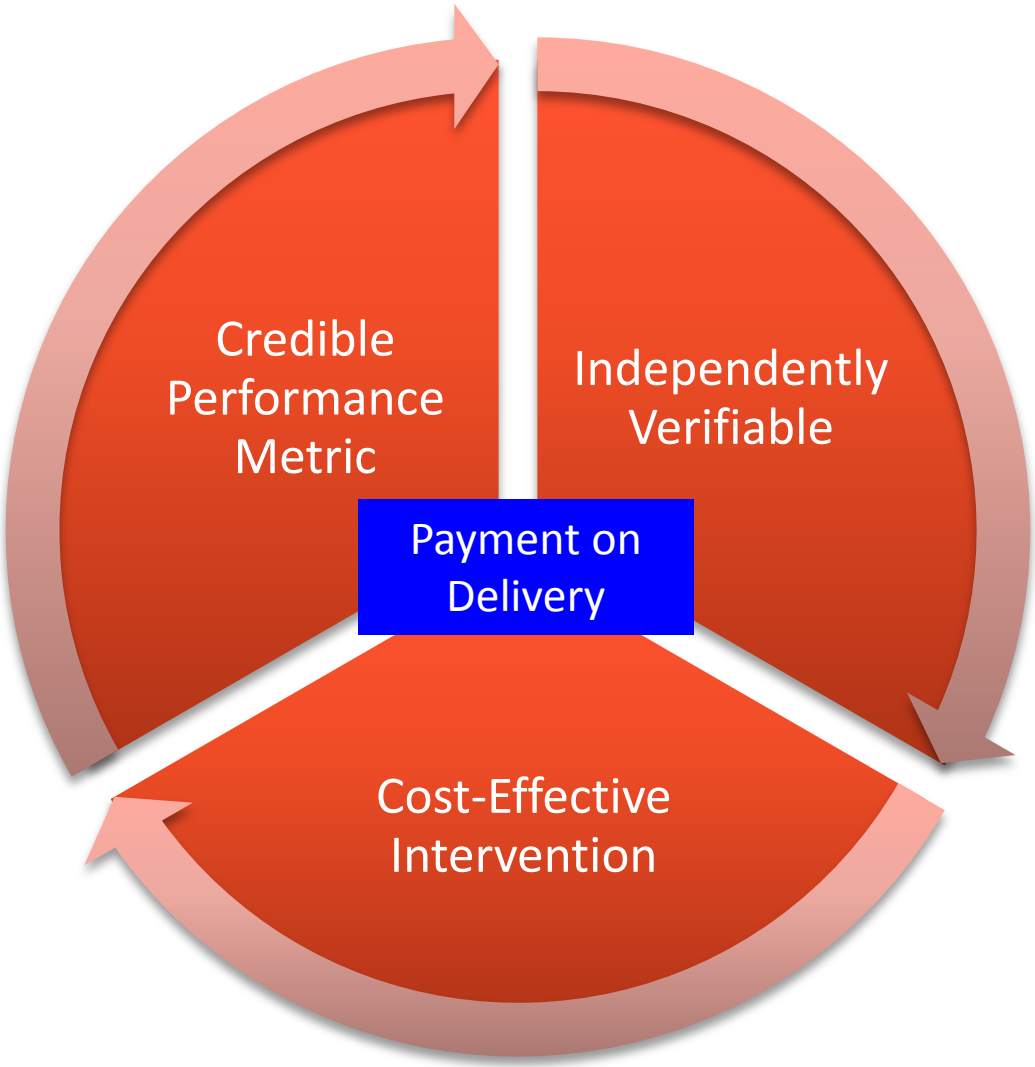
Main causes of death:

- **Child pneumonia**
- **COPD**
- **Lung cancer**
- **Cardiovascular disease**

The leading risk factor in Lao PDR is household air pollution from solid fuels



Foundations For Results Based Financing



CQuestCapital

Foundations for Results Based Financing

1. **A Transparent and Credible Metric of Performance**
   - Averted DALYs

2. **Third Party Verification of Outcomes**
   - United Nations Accredited Auditors under the Clean Development Mechanism with Capacity to verify the Health Benefit

3. **A simple economically efficient means for achieving results**
   - To be determined by Lao CSI stage II.
   - Current evidence is compelling

4. **Payment on Delivery Opportunity for Outcomes**
   - Payment on delivery of averted DALYs estimated either by credible proxy or simple annual confirmation of impact of intervention

HOW CAN WE MAKE A SALABLE HEALTH BENEFIT?

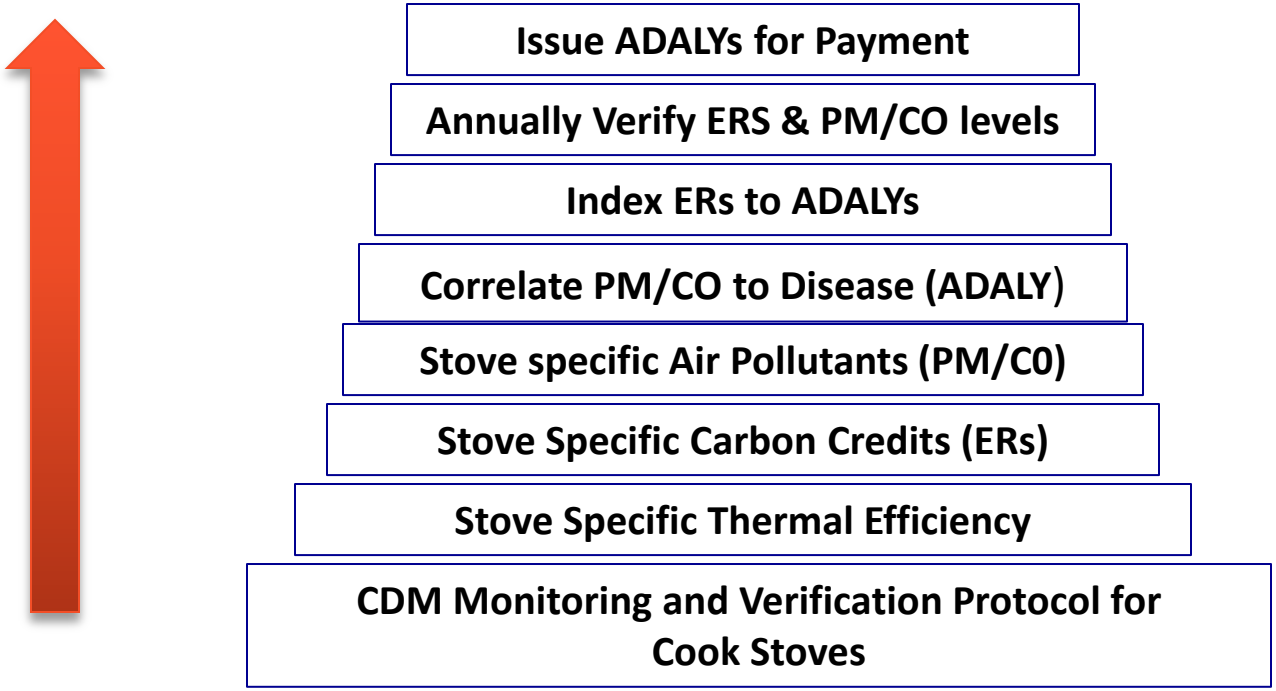
Adapt and simplify an existing,
well tested process of third party verification of stoves in use
and stove emissions

What do we need know?

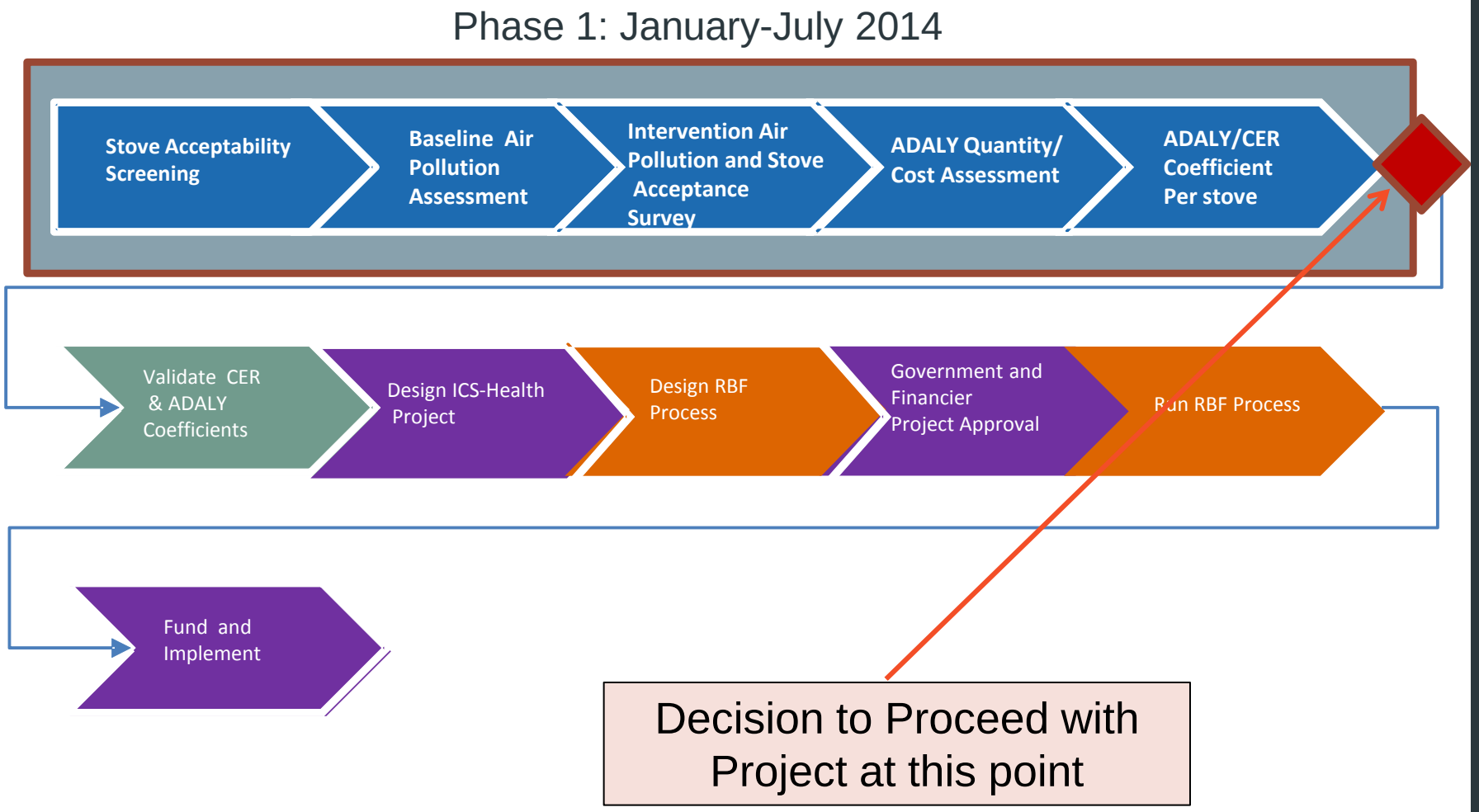
1. Where the stoves are and they are in use
2. What air pollution is in the baseline (PM 2.5, CO)
3. What reduction in pollution occurs with constant stove use
4. Whether this reduction is material to improved health outcomes
5. How cost-effective clean stoves are in reducing the burden of disease
6. How to measure and demonstrate sustained improvement in air quality over time
7. How to quantify and verify for payment the improved health product under RBF

Creating Independently Verifiable Health Benefit: ADALYs

The Building Blocks



Process for RBF Project Preparation



CQuestCapital

Stove Acceptability Assessment

Step 1: Social Acceptability Assessment – Two Phase

Objective: determine if there are any clean efficient cookstoves that the target population prefers over traditional cooking methods ("preferred stoves").

Phase I: In-Depth Observations of 20-30 Households

Phase II: Representative Sample survey: ~ 100 households

1. **Select efficient "clean" cookstoves for testing**
   - ✓ Efficient is not necessarily clean
2. **Select target population**
   - ✓ Rural poor, using firewood, no heating
3. **Measure likely extent of stove use**
   - ✓ Stoves use metered

Hmong
Kitchen

Khmu
Kitchen

Xieng KhouangKitchen

Household Air Pollution Assessment (before and after)

Step 2: Baseline & Intervention Household Air Pollution Study

Objective: ***determine levels of PM 2.5 and CO in baseline and with Clean burning Cookstoves***

1. **Select households from target population**
   - ❑ Households numbers in sampling method depend on variability in the population and the level of statistical confidence required in the outcome. ~100 total households, split between stove types.

2. **Pre-Test Training of Women on proper stove use**
   - ❑ Including grilling utensils

3. **Set up and test measurement devices**
   - ❑ Meters in cooking area for continuous measurement of PM 2.5, CO, CO2
   - ❑ Heat sensitive stove use monitoring devices on stoves

4. **Measure pollution with and without and stove use**
   - ❑ Area meters – 4-5 days before stove placement
   - ❑ Train women to use stove; wait 2-3 weeks, and
   - ❑ Install are meters again for 4-5 days.

5. **Data gathered also enable estimates of Short-Lived-Climate-Pollutants (SCLPs) from small incremental effort (Methane, Black Carbon, VOCs)**

Health Product Cost-Benefit Analysis

Step 3: Analysis of Averted DALYs associated with each stove

Objective: ***determine the level and cost-effectiveness of reductions in the burden of disease from cooking on smoky fires using clean burning cookstoves.***

1. **UC Berkeley applies Household Air Pollution Intervention Tool (HAPIT) to the results of baseline and intervention assessments**

    - ADALYs assessed using default values from the 2010 Global Burden of Disease country level data for Lao PDR
    - Analysis will use integrated exposure-response functions for chronic obstructive pulmonary disease, lung cancer, acute lower respiratory infections, stroke and ischemic heart disease;
    - Due to expected 5 year project life, reduced **acute lower respiratory infections and heart disease will dominate benefit stream**.
    - ADALY/stove estimated for a year of stove use
    - Determination of cost effectiveness for Laos based on stove and dissemination costs;

Note: Study will not cover burns to infants in the baseline or in interventions.

Carbon and ADALYs per stove assessment

CQuestCapital

Step 4: Determine of Carbon per Stove and calculate ADALYs per Stove Carbon Coefficient

Objective: ***define the number of VERs per ADALY's achieved for each type of stove per year***

1. **Complete the baseline firewood consumption survey and stove use behavior for the target populations;**
   - ❑ Following CDM Efficient Stoves Project Methodology and standardized baselines survey requirements (100-200 households survey)

2. **Utilize standard CDM Methodology algorithms to determine Carbon Emissions Reduction per stove type per year**
   - ❑ Uses available data on stove efficiency, non-renewable biomass fraction and the baseline firewood consumption

3. **Calculate Carbon per ADALY using HAPIT analysis outcomes of ADALYs for each stove type**

If proceeding to project preparation……..

Step 5: Monitoring and Verification Protocol for RBF Health Product

Objective: ***design a credible protocol for annual verification and certification of ADALYs***

If the consensus is that reduction in household air pollution resulting from clean burning wood stove use is cost-effective compared to other means of reducing the burden of disease in Lao PDR, the next step is to develop a Monitoring and Verification Protocol that is

- ✓ **Logistically practical;**
- ✓ **Affordable**
- ✓ **Credible to stakeholders and buyers**

What will be measured and verified annually?

1. **GPS location of stove/household and photo of woman and stove**
2. **Efficiency of a sample of stoves**
3. **Level of air pollution (PM 2.5 and CO) in a sample of households using stoves**

Design Clean Stoves, Clean Air Health Project for RBF

CQuestCapital

Step 6: Design ICS Health Project

Objective: if requested by GoL, ***to prepare and appraise a project to finance distribution of economically significant number of stoves to target population, enabling results based financing***

Decision Logic*: greatly improved air quality at the households level improves the success of currently proposed Maternal and Chile Health and Nutrition Interventions*

1. **Key Policy Issues**
   - Decision to give priority to clean burning cookstove distribution as a means of reducing burden of disease in target population
   - Supporting policies on fiscal incentives to consumers and on other duties and taxes on designated stoves;
   - Target communities and eligibility criteria

2. **Key Operational and Logistical issues**
   - Location, nature and scale of intervention (number and type of stoves, households)
   - Price offer to the consumer
   - Modalities for public awareness, stoves marketing, sales and distribution
   - Incentives for stoves tracking, monitoring and after sales service by distribution agents
   - Near 100% adoption of clean burning stoves at target village level

Common Household Arrangement

Cooking and Sleeping in same space

Sick Child Sleeping Next to Open Fire in this house.

CQuestCapital

Design Results Based Financing Process

Step 7: Design of Results Based Financing Process

Objective: ***to obtain donor/financier support for a health product design enabling payment on delivery for verified health benefits***

Outcomes financed

- **Averted Disability Adjusted Life Years (ADALYs),** or a year of healthy life based on an agreed and independently validated Monitoring and Verification Protocol

Proposed Process

1. Add household air pollution reduction component to planned FY15 Maternal and Child Health Project ($3-4 million for stoves/cleaner air component; 20-30,000 households)
2. Prepare and agree process for RBF component during project appraisal
3. Identify potential health product financiers when/if cost-effectiveness is confirmed
4. Agree a transparent process for obtaining contractual commitments to pay on delivery for the health product.

Step 7: Design of Results Based Financing Process

Options on Process:

- **Obtain Expressions of Interest from Health Sector Financiers**
  - ❑ Bilateral donors, Foundations, High Net Worth Family offices
  - ❑ Develop a process for determining participation and extracting the greatest willingness to pay and to support the innovative initiative.
- **Pre-negotiation**
  - ❑ **Identify a** lead health sector donor or donors and agree a fixed price for ADALYs delivered
- **One Financing Option**
  - ❑ The Clean Cookstoves Focused entity, BIX* to lend on a non-recourse basis against a creditworthy commitment to pay on delivery for the health product

*BIX is a spin-off of the Shell Foundation to catalyze and support innovative financing of clean cookstoves and achieve the health and environmental benefits accruing fro heir deployment. BIX plans to raise Euros 100 million by end 2014.

SUPPLEMENTAL SLIDES

Linking Carbon to Averted Disability Adjusted Life Years:
The Building Blocks

1. CDM Stove Methodology IIG has a rigorous Monitoring and Verification Protocol to check that stoves are tracked and in use before verifying they have reduced carbon emissions (ERs). We can borrow and adapt that to ADALY verification.

2. Each cookstove has a unique thermal efficiency, reconfirmed annually, that determines how much carbon emissions are credited to its use annually.

3. Each stove has a unique profile of PM 2.5 and CO production that wil be assessed by UC Berkeley, and can be indexed to its carbon credit value (ERs/stove in use/year);

4. Berkeley (Prof. Kirk Smith) models Averted DALYs/stove type using a generic exposure-response relationship derived from global exposure response data;

5. ADALYs can be indexed to ERs/stove/year for stoves found in constant use.

6. Annual sampling of household air pollution in households with stoves re-confirms the ADALY/CER index;

7. An accredited third party auditor verifies both ERs and averted DALYs per stove

C-Quest Capital (CQC)

Transformation Carbon Project of C-Quest Capital – transforming lives of the poor through sustainable energy and land management solutions

CQC and Partners in Stoves:

- **Mexico and Guatemala: 20,000-30,000 stoves/ year**
- **Sub-Saharan Africa:**
  - **Northern Nigeria** Urban Wood-stoves (45,000 stoves by end 2014)
  - **Malawi Rural** – program of 64,000 stoves through 2016. Current rate of installation 5000/month
  - **Malawi Urban** – project distributing 5000 stoves per year
  - **Zambia** – 60,000 rural stoves project beginning March, 2014
- **Designed and Seeking Carbon Buyers for carbon credits from** one million additional stoves through 2020 across 7 countries

CQuestCapital