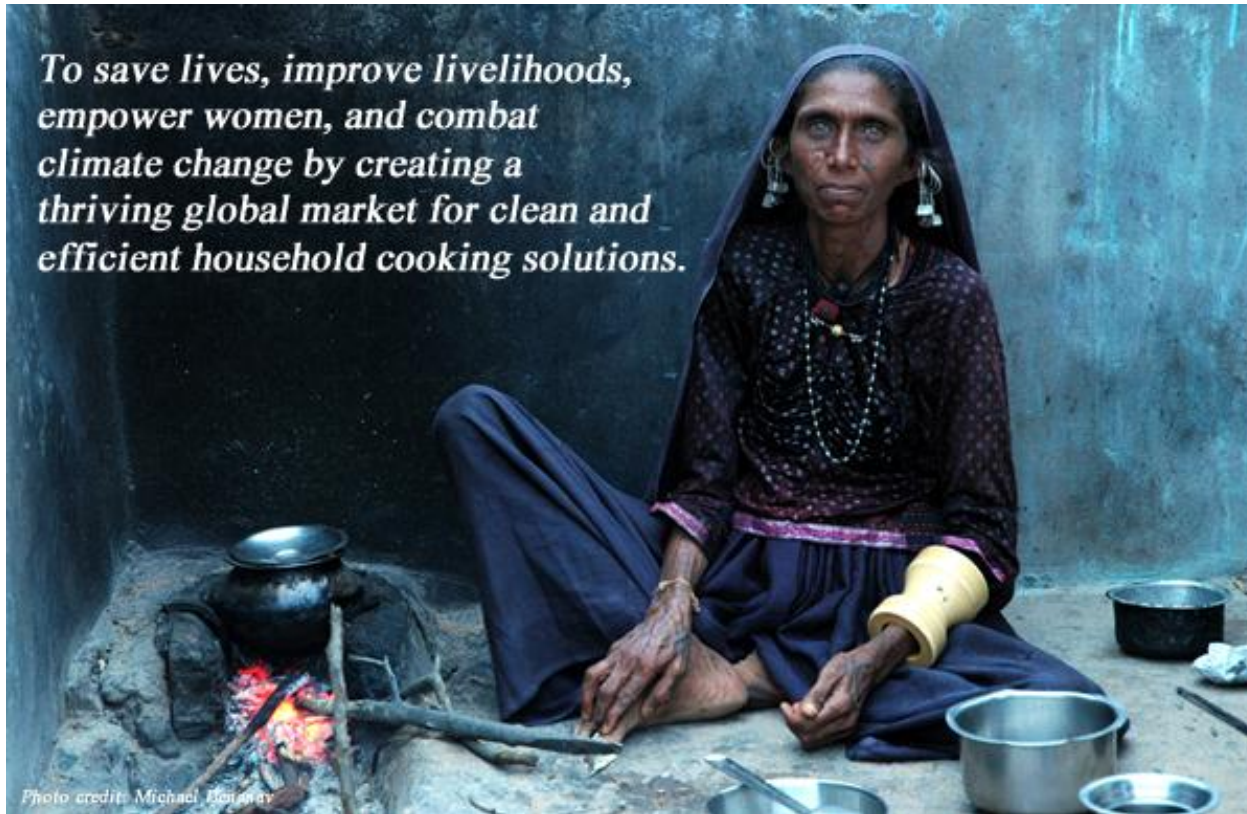




Measuring Progress During Phase I:
Building on the IWA Interim Guidelines
Sumi Mehta and Ranyee Chiang

Key Milestone: 100 million households adopt clean and efficient stoves and fuels by 2020

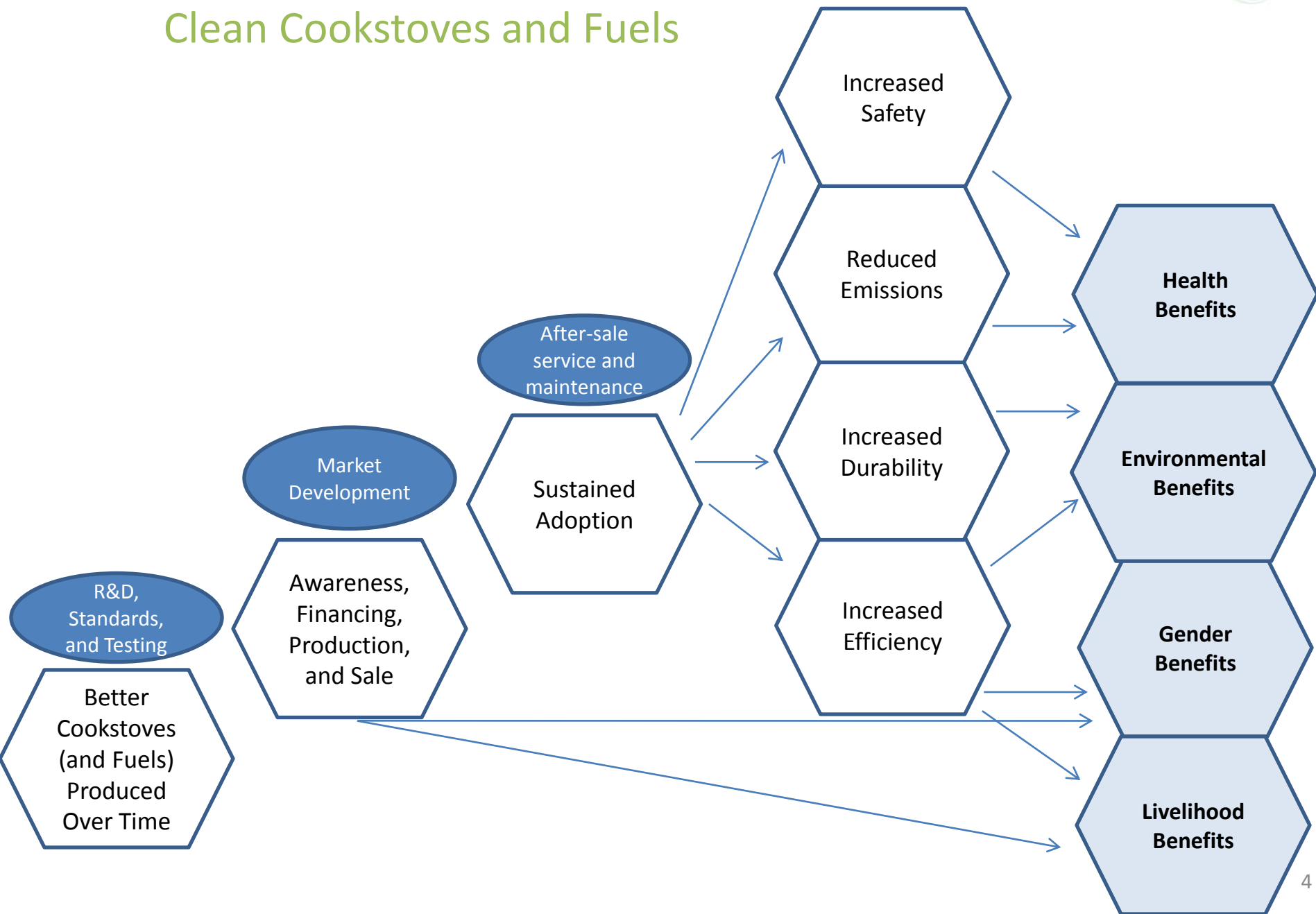


→ How Will We Measure Progress and Success?

Developing M&E Framework and Implementation Strategy for Phase I (2012 – 2014)

- Define the Baseline
- Identify Key Indicators to be Evaluated
 - Example: sales by emissions, efficiency, and safety tiers
- **Develop Measures of Progress**
 - How will we actually measure indicators?
- Identify capacity gaps to be filled, and strategies to fill them
- Develop User friendly M&E Tools

Simplified Results Chain for Adoption of Clean Cookstoves and Fuels



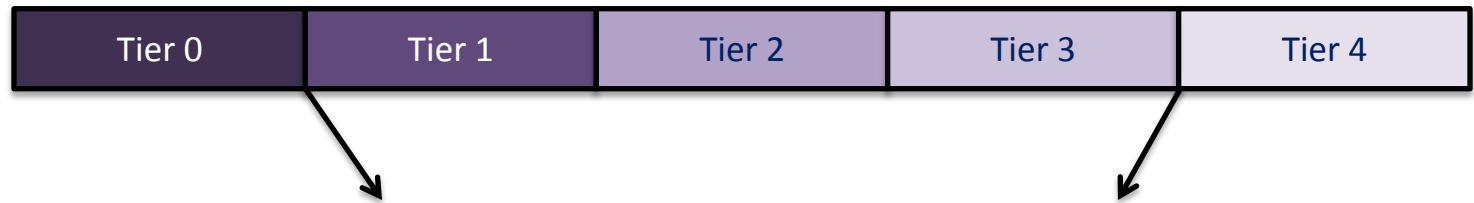
Measuring Progress – Monitoring and Evaluation Approach

- Recognizing that improved cookstoves and fuels are designed to deliver a wide spectrum of benefits (efficiency, time savings, safety, health, etc)
 - M&E must be context specific and hold technologies accountable only for achieving the outcomes for which they were designed
 - At the same time, the Alliance encourages continuous improvements across the range of performance indicators over time
- In Phase I, the Alliance’s M&E approach will be aligned with the performance tiers recently defined by the ISO International Workshop Agreement (IWA)

ISO IWA Interim International Standards: Designed to meet multiple challenges

- **Multiple performance indicators**
(Efficiency, Emissions, Indoor Emissions, Safety)
 - Programs can select stoves based on their priorities
 - Demonstrate strengths and weaknesses of each stove/fuel
- **Stepped tiers**
(Tier 0 to Tier 4+)
 - Appreciate advances that have been made
 - Set aspirational targets to achieve additional needed improvements
- **Accommodate multiple protocols**
("Rosetta Stone")
 - Address multiple stove types and regions
 - Different players can meet regulations and use familiar tests while being able to translate results

Bookended, Stepped Tiers

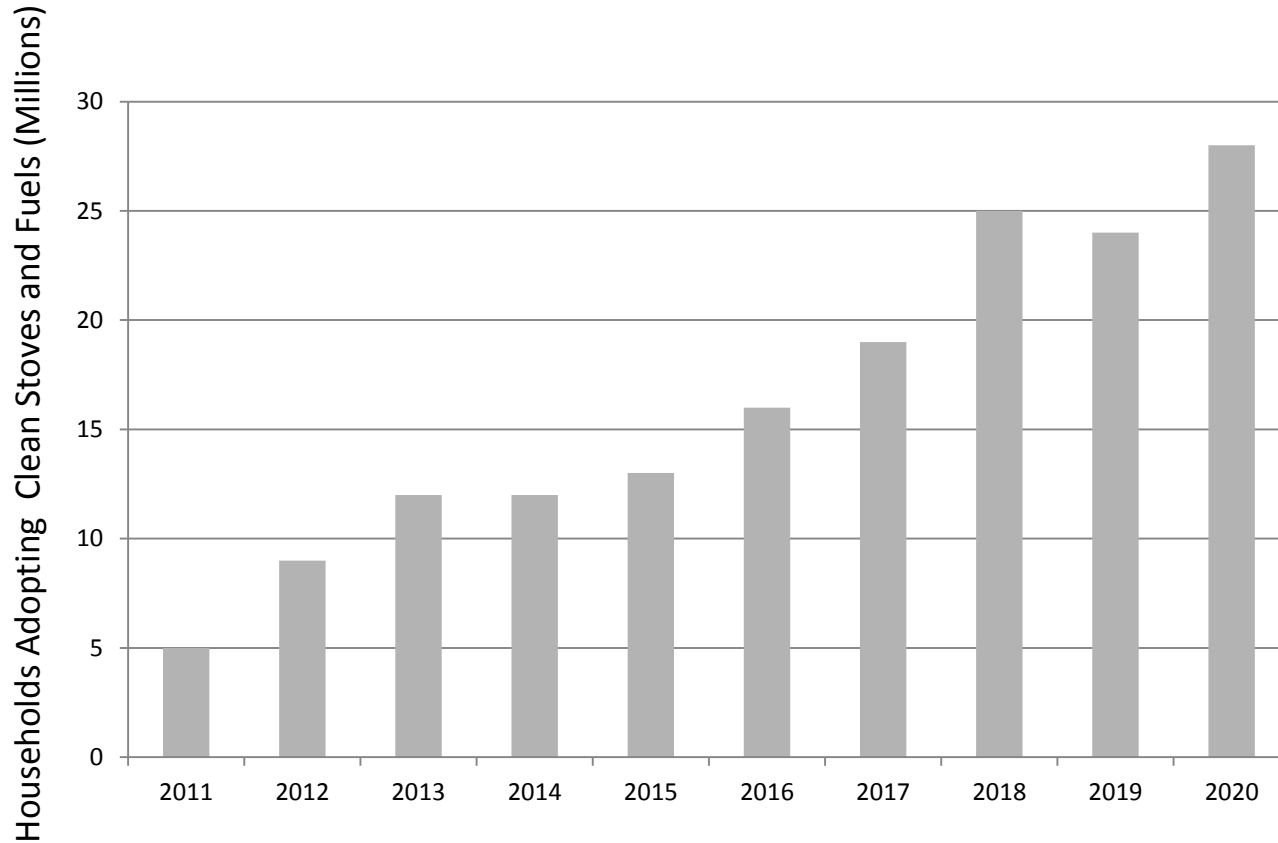


| Performance Indicator | 3-Stone Fire | Aspirational Goal |
|-----------------------|--|---|
| Fuel Use (Efficiency) | Low Power Specific Energy Consumption: 0.017 MJ/(min x L) High Power Thermal Efficiency: 15% | Low Power Specific Energy Consumption: 0.050 MJ/(min x L) High Power Thermal Efficiency: 45% |
| Emissions | Low Power CO: 0.20 g/(min x L) High Power CO: 16 g/MJ delivered Low Power PM _{2.5} : 8 mg/(min x L) High Power PM _{2.5} : 979 mg/MJ delivered | Low Power CO: 0.09 g/(min x L) High Power CO: 8 g/MJ delivered Low Power PM _{2.5} : 1 g/(min x L) High Power PM _{2.5} : 41 mg/MJ delivered |
| Indoor Emissions | CO: 0.97g/min PM _{2.5} : 40mg/min | CO: 0.40g/min PM _{2.5} : 2mg/min |
| Safety | Biomass Stove Safety Protocol: 45 | Biomass Stove Safety Protocol: 95 |

Alliance Proposed Framework for Annual Reporting During Phase I

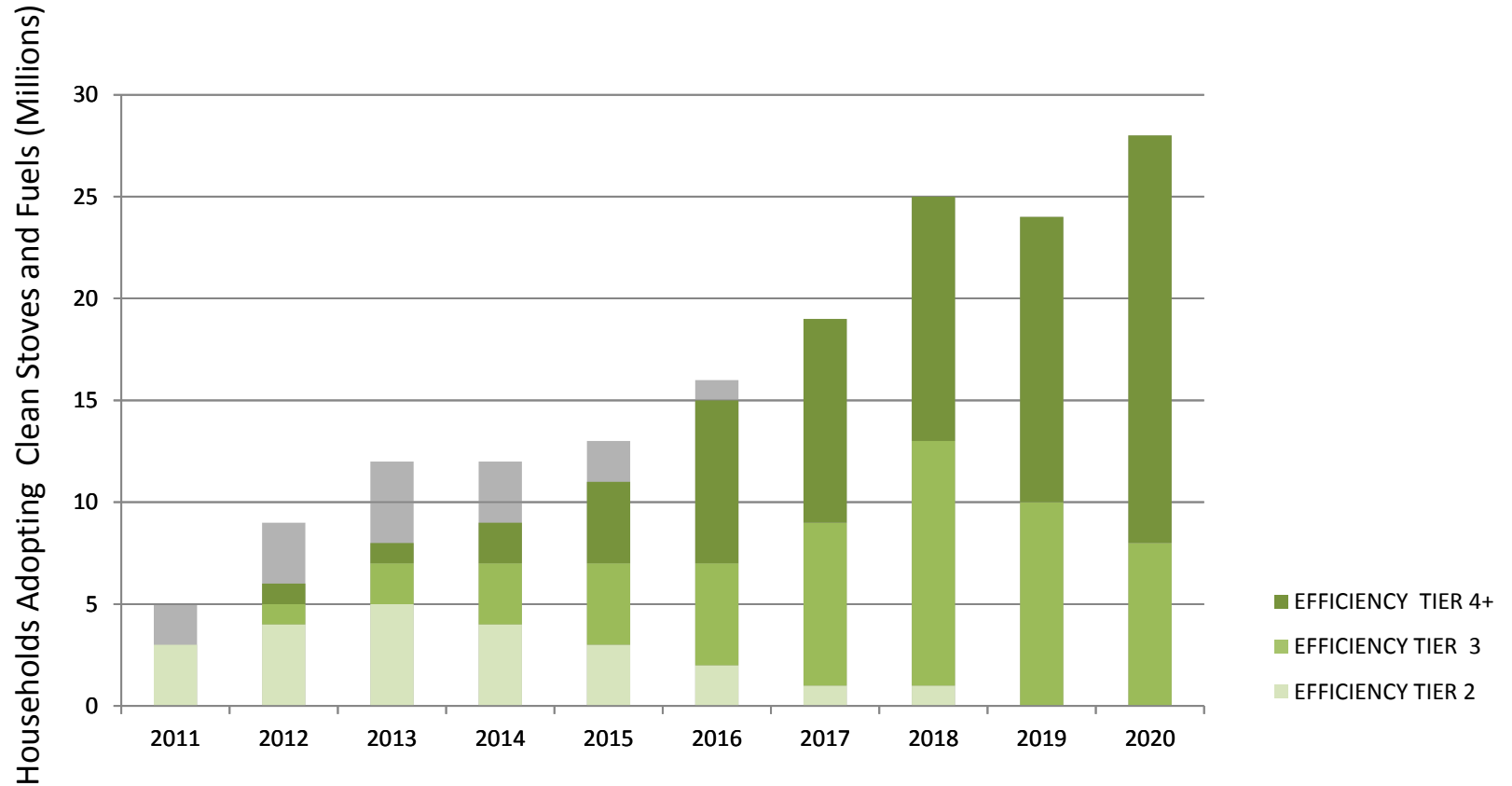
- Track households adopting clean **and/or** efficient cookstoves and fuels across all tiers for efficiency and emissions
- Assess progress towards the 100 M ‘clean **and** efficient cookstoves and fuels’ target
- To be counted towards the target, sustainable adoption of cookstoves and fuels should be demonstrated
 - Appropriate measures of ‘sustainable adoption’ will be defined

Monitoring Progress towards 100M – Track all households



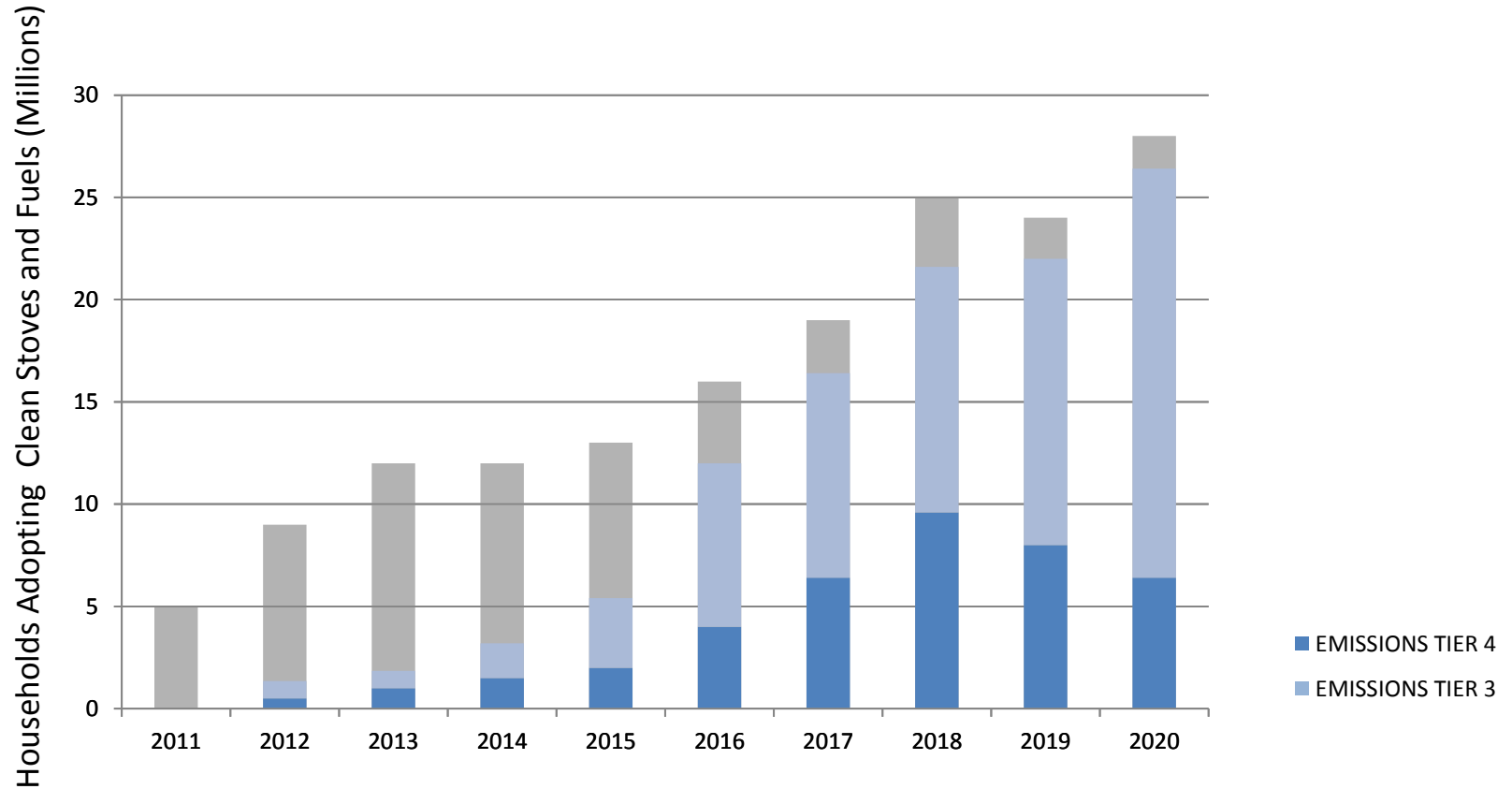
***Numbers are illustrative only**

Monitoring Progress towards 100M – Count Efficient Stoves/Fuels



***Numbers are illustrative only**

Monitoring Progress towards 100M – Count Clean Stoves/Fuels



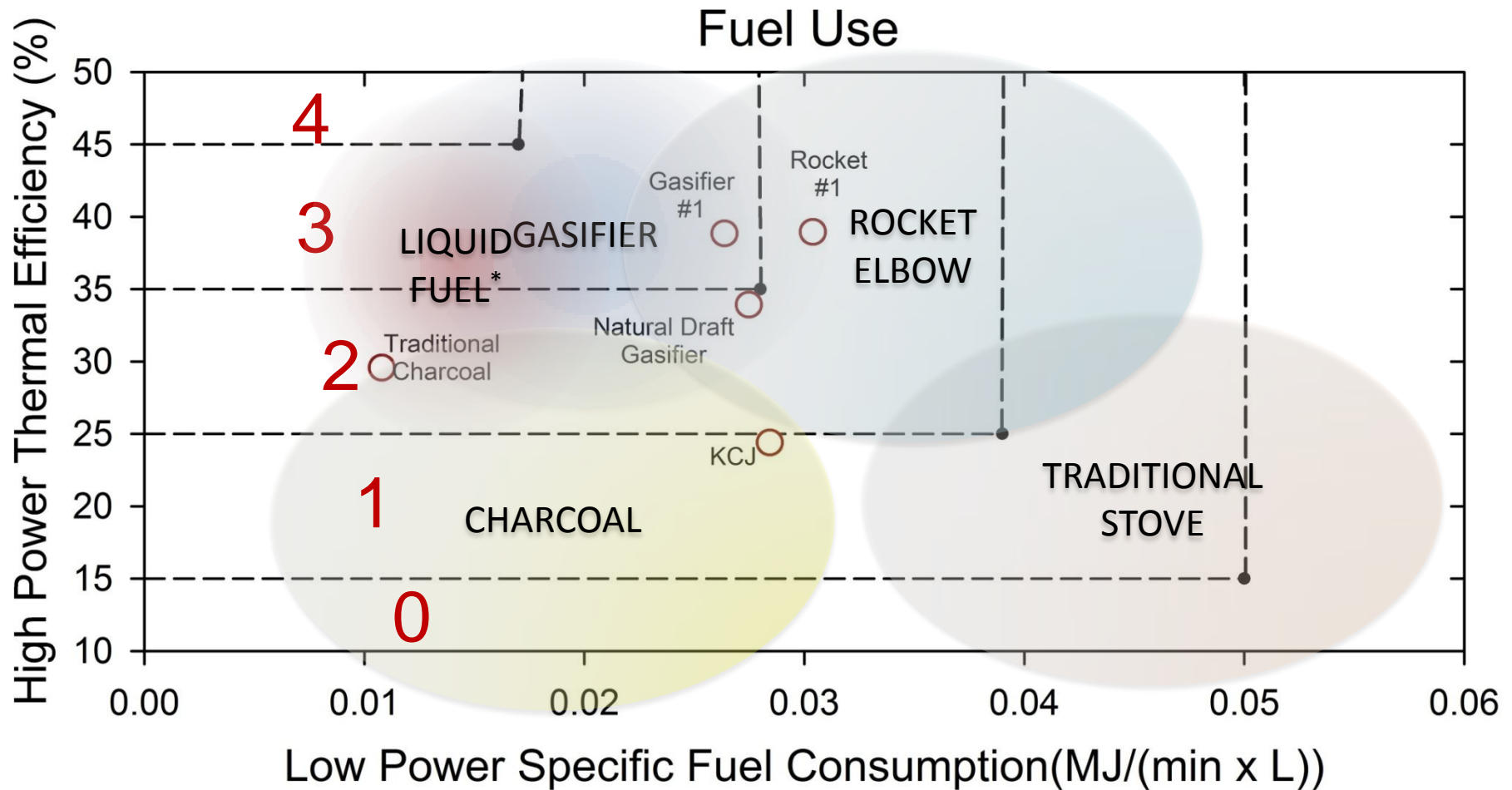
***Numbers are illustrative only**

Efficiency and Fuel Use Tiers of Performance

- Efficiency Tier “Bookends”
 - Tier 0: 3-Stone Fire
 - Tier 4: Aspirational Goal
- Intermediate tier boundaries divided uniformly between Tier 0 and 4

| | High Power Thermal Efficiency (%) | Low Power Specific Consumption (MJ/min/L) |
|--------|---|---|
| Tier 0 | < 15 | > 0.050 |
| Tier 1 | ≥ 15 | ≤ 0.050 |
| Tier 2 | ≥ 25 | ≤ 0.039 |
| Tier 3 | ≥ 35 | ≤ 0.028 |
| Tier 4 | ≥ 45 | ≤ 0.017 |

Efficiency and Fuel Use Tiers of Performance



*Liquid fuels include LPG, kerosene, and ethanol

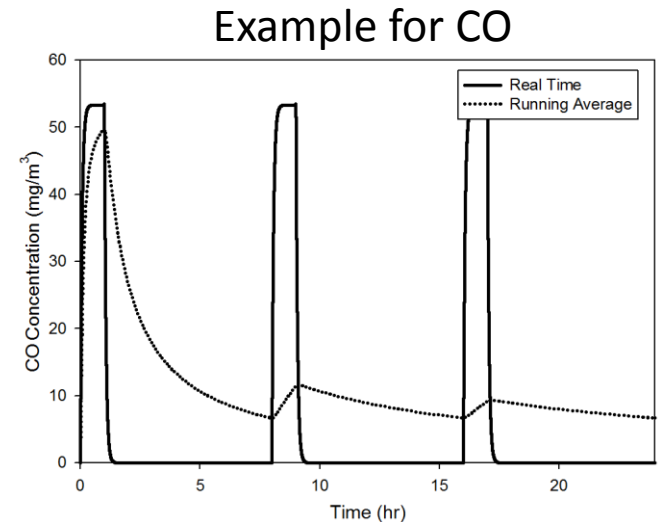
Assessing Progress for “Efficient” Stoves

- Stoves that meet the efficiency requirements for Tier 2 or above will be considered ‘efficient’ during Phase I
 - Sets aspirational target while recognizing that all fuel saved is important
 - Many technologies have progressed to Tier 2 or better

Indoor Emissions Tiers of Performance

Based on WHO Guidelines and modeled indoor air quality

- Constant PM_{2.5} and CO emissions rates
- Stove burns for 60min, 3 times a day
- Room size: 30m³
- Air exchange: 15/hr
- Instantaneous, perfect mixing
- 24hr average does not exceed WHO guidelines of 35µg/m³ for PM_{2.5} and 7mg/m³ for CO. Concentrations



| | WHO Guideline |
|--|---------------|
| PM _{2.5} IAQ (µg/m ³) | 35 |
| CO IAQ(mg/m ³) | 7 |

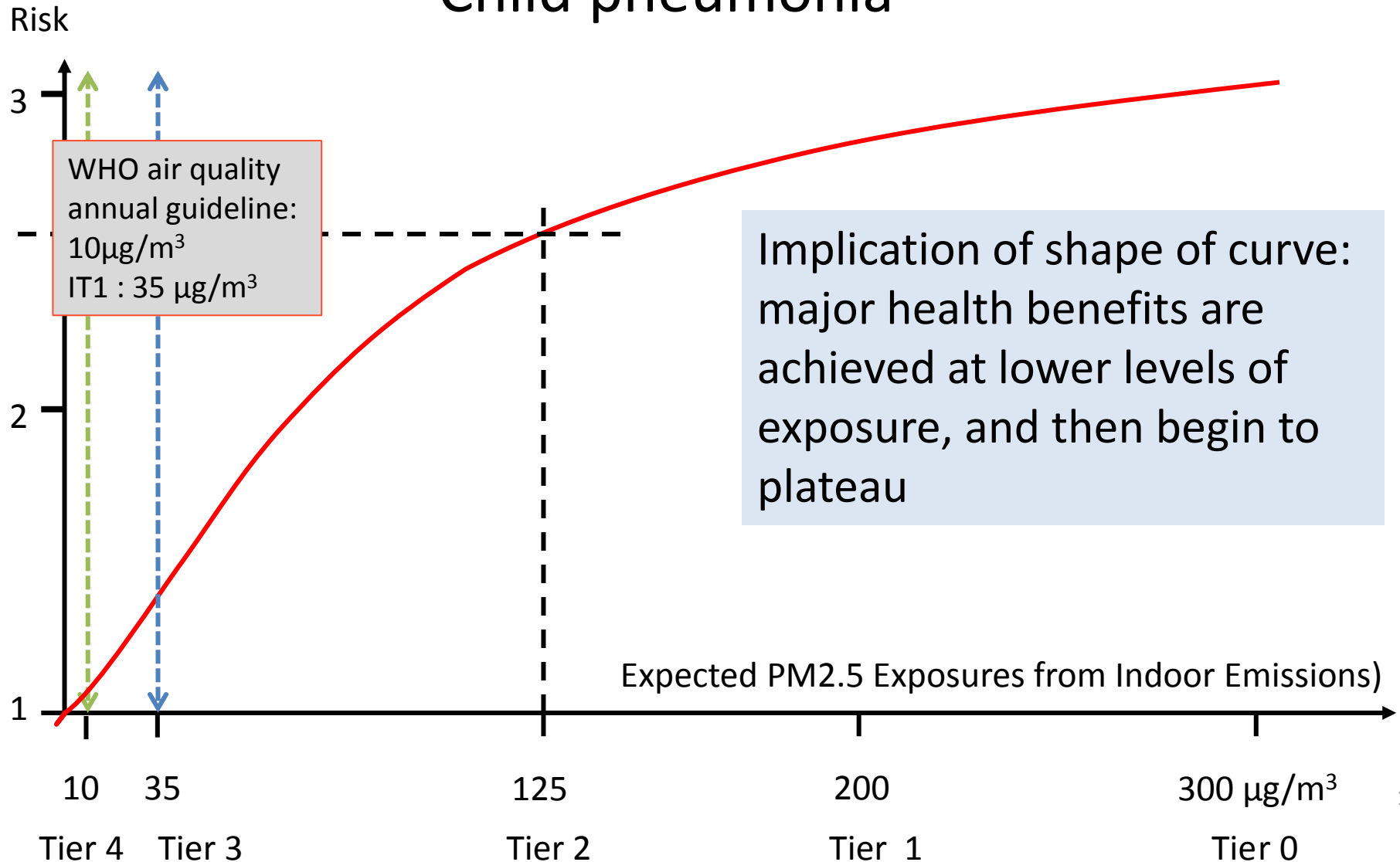
Approximately
Equivalent

Tier 4 Indoor Emission Rates

| | Tier 4 |
|----------------------------|--------|
| PM _{2.5} (mg/min) | 2 |
| CO (g/min) | 0.4 |

Example: exposure-response relationship

Child pneumonia



Evidence from Health Research

- The Alliance acknowledges the emerging scientific consensus that not all reductions in emissions are of equal value to human health.
- Some benefits to health could potentially be achieved with higher indoor emissions
- Existing body of evidence suggests that to achieve powerful reductions in child pneumonia, a leading cause of illness and death associated with household air pollution, clean stoves and fuels must have very low indoor emissions.

Assessing Progress for “Clean” Stoves

- Stoves that meet the indoor emissions requirements for Tier 3 and above will be considered ‘clean’ during Phase I and will count towards the 100 M target
 - Existing body of evidence suggests that to achieve powerful reductions in child pneumonia, a leading cause of illness and death associated with household air pollution, clean stoves and fuels must have very low indoor emissions.

Outlook for Phase II

- Safety
 - Build a larger set of data from safety protocols
- Durability
 - Laboratory protocols being developed
- Updated definitions of clean
 - Some benefits to health may potentially be achieved with higher indoor emissions.
 - The strength of the evidence for additional health outcomes (child and adult) will be reevaluated before Phase II.
- Adoption
 - Refine definitions, metrics, and methods for assessing adoption

Milestones Towards Success

| Sub-Area | Indicators | Target | | |
|--|---|---|--|---|
| | | Phase 1 | Phase 2 | Phase 3 |
| Clean Cookstoves Sold, Adopted, and Used | <ul style="list-style-type: none"> • sales by emissions, efficiency, and safety tiers • extent of adoption and use • field verification of use and performance | 15m | 42m | 100m |
| Lives Saved | <ul style="list-style-type: none"> • reduced exposure, burns, and injury • modelled deaths and DALYs • impacts on severe pneumonia, adverse pregnancy outcomes, and markers of noncommunicable disease • perceived benefits / reduced discomfort from smoke | <ul style="list-style-type: none"> • ↓ exposure • modelled health impacts | <ul style="list-style-type: none"> • ↓ exposure • modelled health impacts • 50% ↓ in burns and injuries | <ul style="list-style-type: none"> • ↓ exposure • modelled health impacts • 50% ↓ in % of major cookstove-related illnesses • 75% ↓ in burns and injuries |
| Livelihoods Improved | <ul style="list-style-type: none"> • increased employment / income generation across value chain • increased wealth / assets • increased education / training | <ul style="list-style-type: none"> • Define baseline • Set targets for indicators | TBD | |
| Women Empowered | <ul style="list-style-type: none"> • reduced drudgery, i.e. time/ labor savings, reduced distance to fuel • # stove businesses who adhere to gender-informed best practices • agency in decision making | <ul style="list-style-type: none"> • Define baseline • Set targets for indicators | TBD | |
| Combat Climate Change (Includes Environmental Impacts) | <ul style="list-style-type: none"> • fuel savings • forests saved | <ul style="list-style-type: none"> • 30% ↓ fuel / stove | <ul style="list-style-type: none"> • 30-60% ↓ fuel / stove | <ul style="list-style-type: none"> • 60% ↓ fuel / stove • 3 – 6 M ha/forests |
| | <ul style="list-style-type: none"> • emissions mitigated | <ul style="list-style-type: none"> • 16 M tons CO₂e | <ul style="list-style-type: none"> • 42 – 168 M tons CO₂e | <ul style="list-style-type: none"> • 100 - 400 M tons CO₂e |

Discussion

- General comments
- Does the available evidence support this approach?
- Additional data to be considered which could lead to choice of another approach?
- Concerns / limitations of the proposed approach?