

EAP Clean Stove Initiative Knowledge Exchange Series

Towards Universal Access to Clean Cooking/Heating Solutions:

Key findings from Clean Stove Initiatives (Phase I) in China and Indonesia

Yabei Zhang

Energy Economist, PhD
East Asia and Pacific Region
The World Bank

February 11, 2013

Outline

- Overview of EAP Clean Stove Initiative (CSI)
- Key findings from China CSI
- Key findings from Indonesia CSI
- Comparisons of the two countries
- Lessons learned and key recommendations
- Plan for the next steps

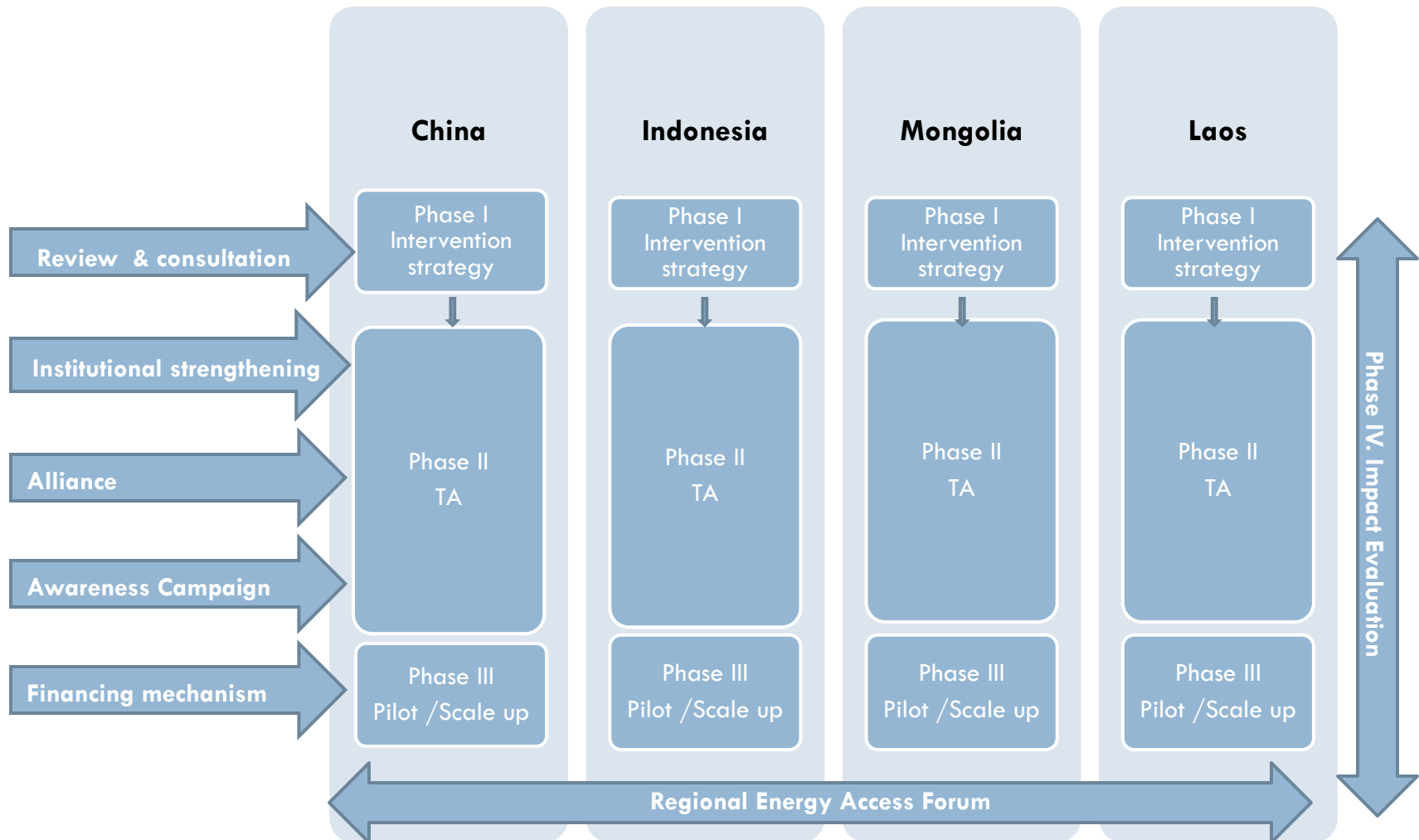
EAP CSI Overview

3

- **Context:** a follow-up regional program to the Flagship Energy Report, ***One Goal, Two Paths: Achieving Universal Access to Modern Energy in East Asia and the Pacific*** (1G2P).
- **Objectives**
 - To help scale up access to clean and efficient stoves in EAP countries through capacity building, policy development and supporting selected government action plans.
 - To promote regional collaboration, learning and knowledge sharing on access to household modern energy through the establishment of regional energy access forum.

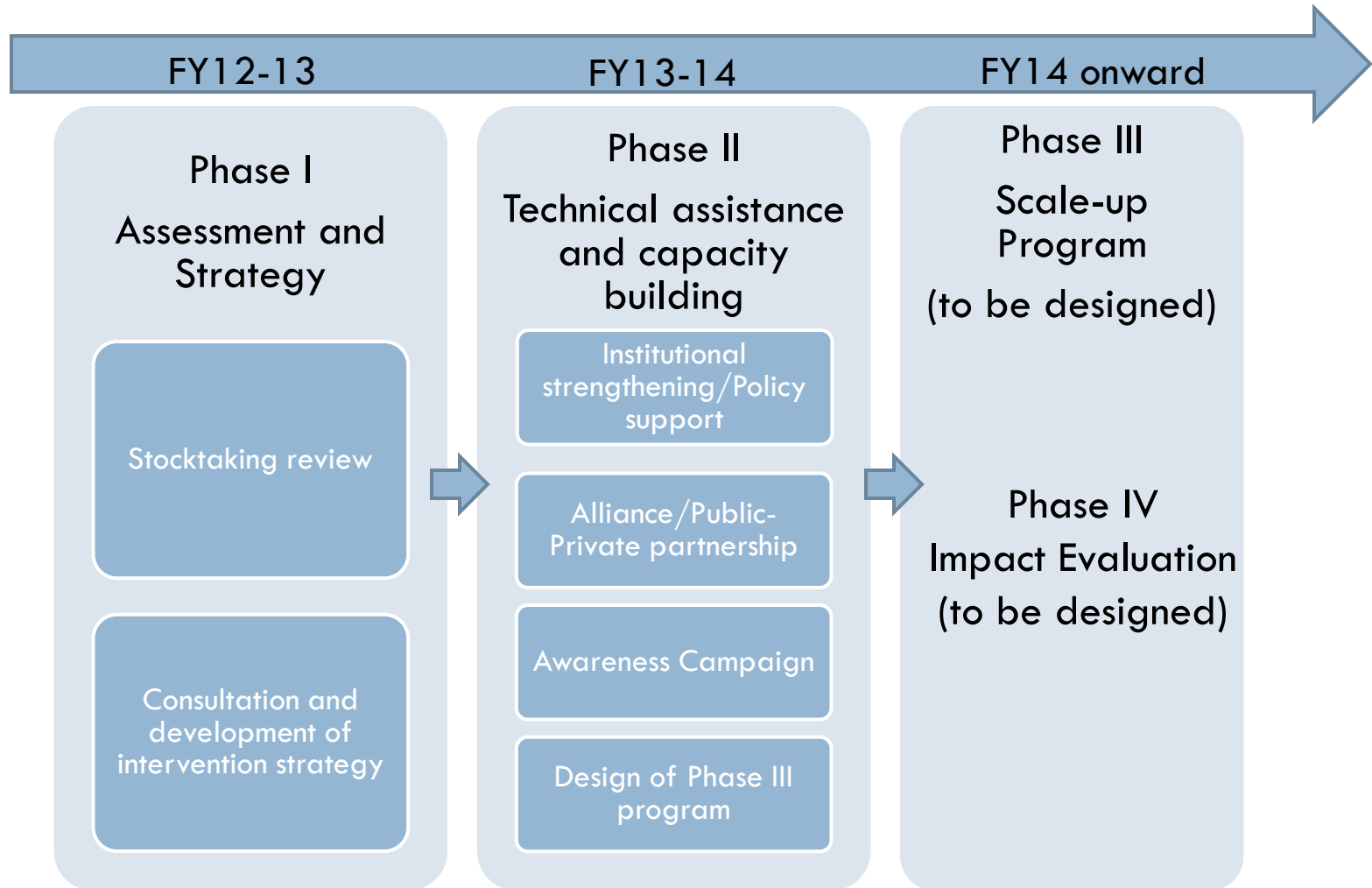
Overall Program Structure

4



Approach

5



CSI Phase I in China and Indonesia

- In-depth assessments of the existing stove market (demand and supply) and review of the sector's institutions, policies, and key programs.

	China	Indonesia
Key market segments	Biomass, coal, biogas, and solar cookers	Biomass, LPG, and biogas
National survey of the <u>biomass stove</u> supply chain	Including 89 manufactures, about 72% of total production.	Covers 17 provinces, ~200 producers, ~40 wholesalers, and ~400 retailers.
Two national stakeholder consultations	<ul style="list-style-type: none">• April 24, Gaobeidian city• July 20, Beijing	<ul style="list-style-type: none">• May 7, Yogyakarta• July 12, Jakarta

Outline

- Overview of EAP Clean Stove Initiative (CSI)
- **Key findings from China CSI**
- Key findings from Indonesia CSI
- Main similarities and differences between the two countries
- Lessons learned and key recommendations
- Plan for the next steps

China Context

- More than half of China's population still relies on solid fuels for cooking and heating, mostly in rural areas.
- Most of the improved stoves promoted during 80s and 90s have become obsolete or damaged already.
- IAP causes more than half a million premature deaths per year in China (WHO and UNDP, 2009).
- Most biomass wastes are burnt in the field, causing significant air pollution.



Demand Mapping: Overview

- Household cooking and heating accounts for 90% of rural household energy use.
- 86% of rural households use solid fuels as their primary cooking energy.
- Heating accounts for more than one-third of rural energy consumption. Demand for heating is growing with improving living standards and request for more comfort.

Structure of China's Rural Household Energy, 2010

Sources: China Agriculture Statistical Yearbook 2010; China Energy Statistical Yearbook 2011.

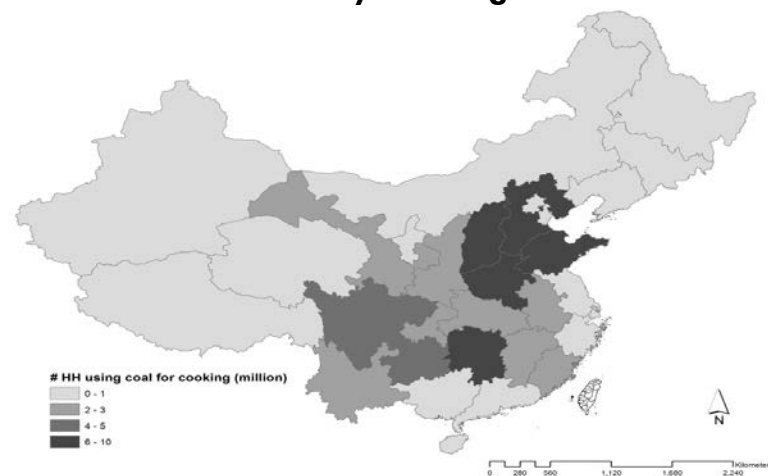
Demand Mapping: Solid fuels for cooking

Distribution of Households Using Biomass as Primary Cooking Fuel



Source: National Bureau of Statistics 2008.

Distribution of Households Using Coal as Primary Cooking Fuel



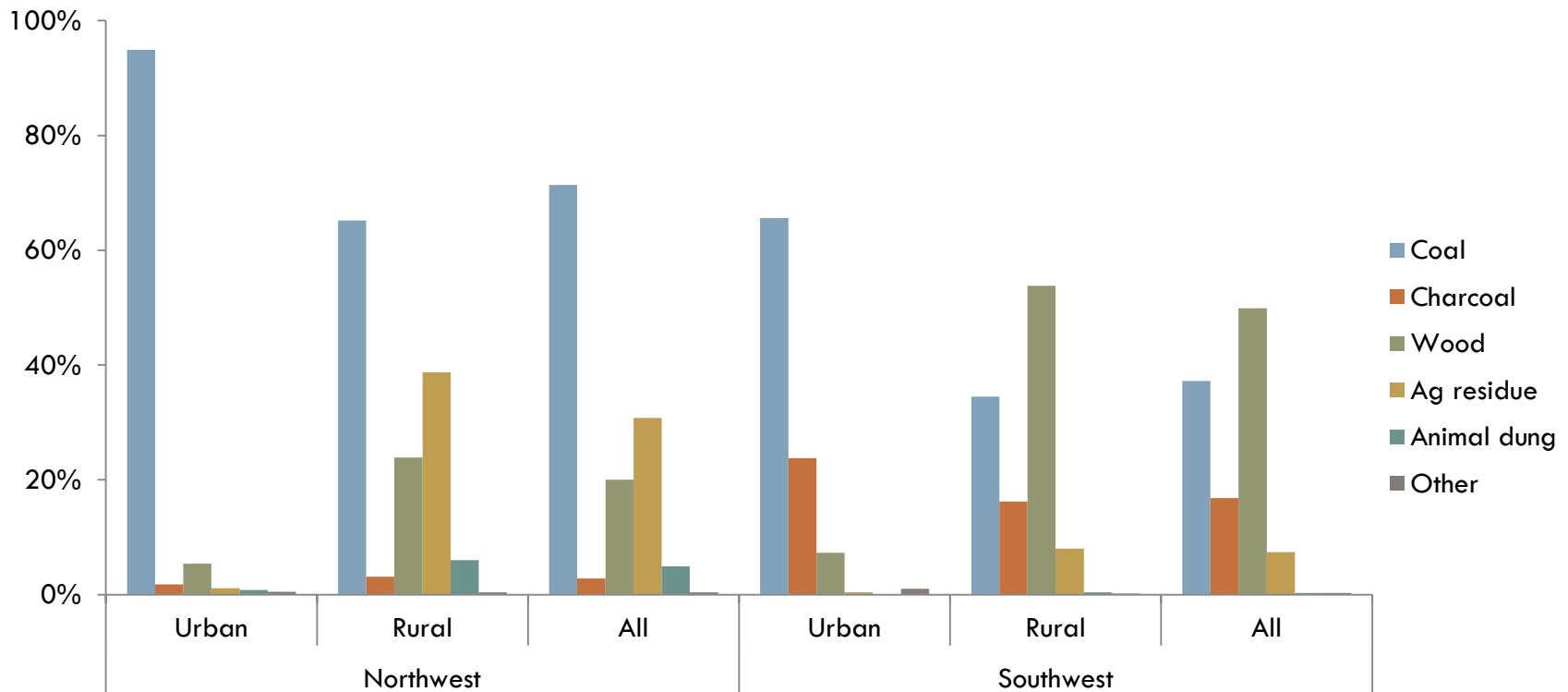
Source: National Bureau of Statistics 2008.

Top Six Provinces Relying on Solid Fuel for Household Cooking

Province	Biomass		Coal		Solid Fuel	
	Million HH	%	Million HH	%	Million HH	%
Henan	10	47	10	50	20	97
Sichuan	15	73	4	21	19	94
Shandong	14	65	5	24	19	89
Hunan	7	46	8	51	15	97
Hebei	7	49	7	44	14	93
Anhui	11	80	2	13	13	93

Demand Mapping: Heating

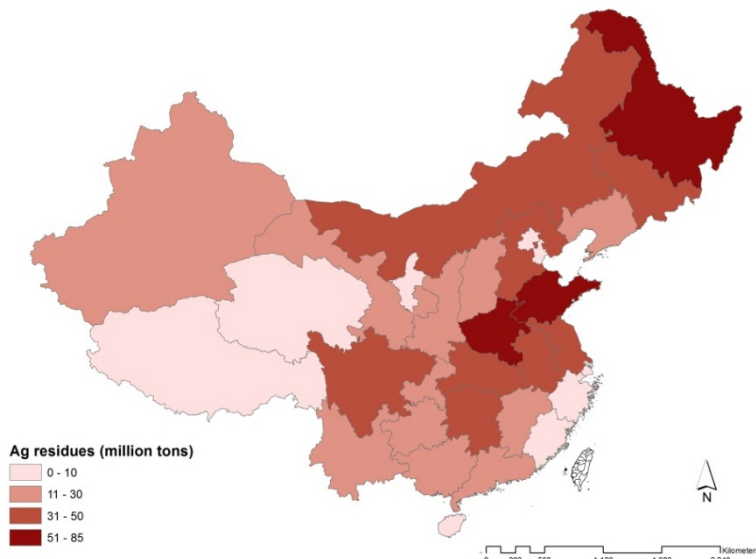
- Coal and wood are respectively the dominant heating fuel in the northwest and the southwest.
 - More than 70% of northwestern households rely on coal for heating and about half of southwest households rely on wood for heating.
- Urban and rural households differ in using fuels for heating in both north and south of the west region and the difference is even larger in the South.



Demand Mapping: Key Driving Factors

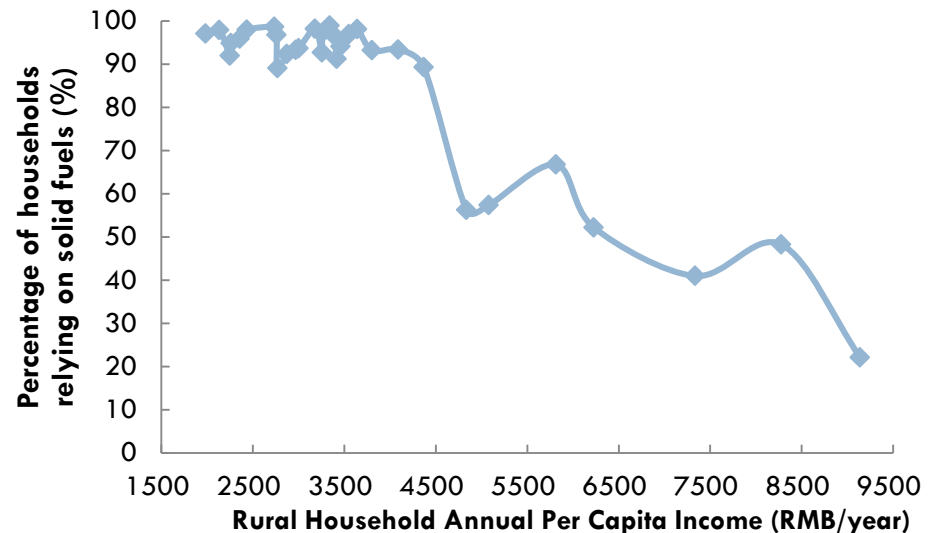
- Households' selection of cooking and heating fuels depends on the interdependent factors of availability, accessibility, affordability, and cultural acceptability.
- It is expected that solid fuels will continue being widely used in rural China in the near future- 280 million users by 2030 (IEA, 2010).

Distribution of Agriculture Residue, 2010

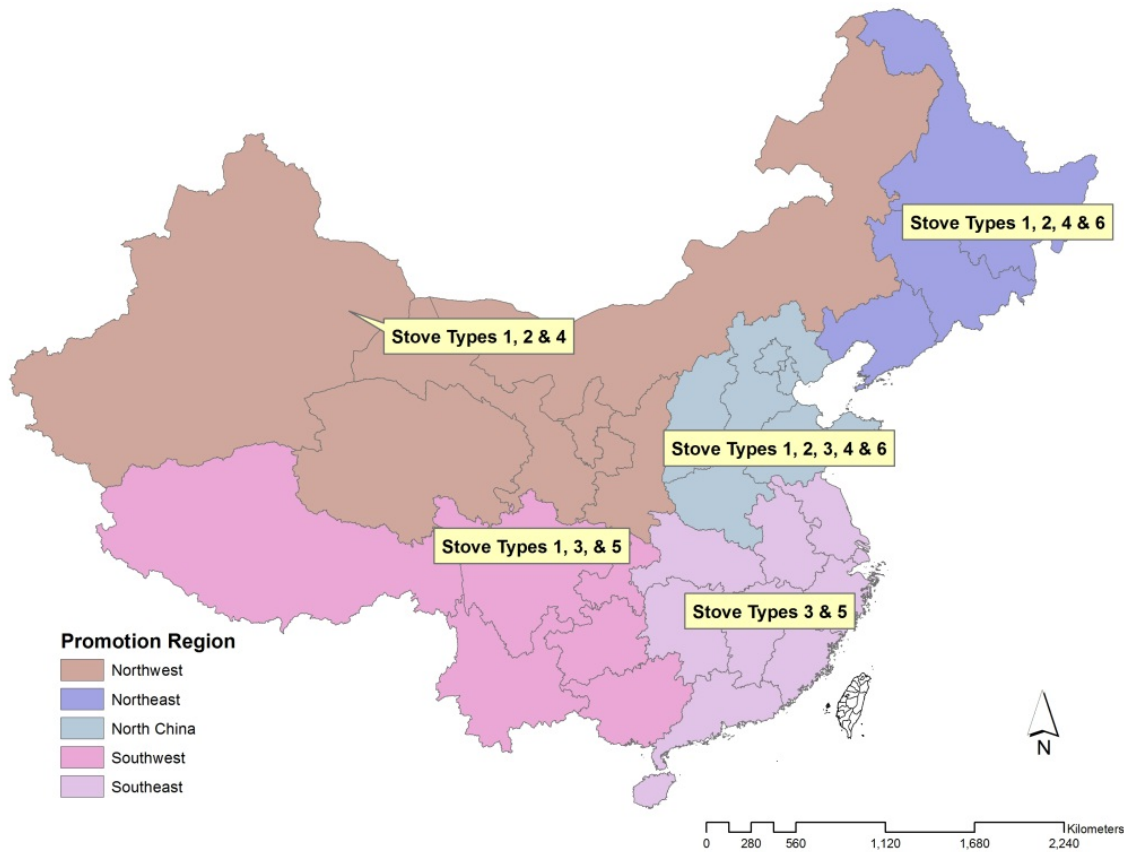


Source: China Agriculture Statistics Yearbook 2010.

Percentage of Rural Households Reliant on Solid Fuels by Income Level



Demand Mapping: Suitable Clean Biomass Stove Types



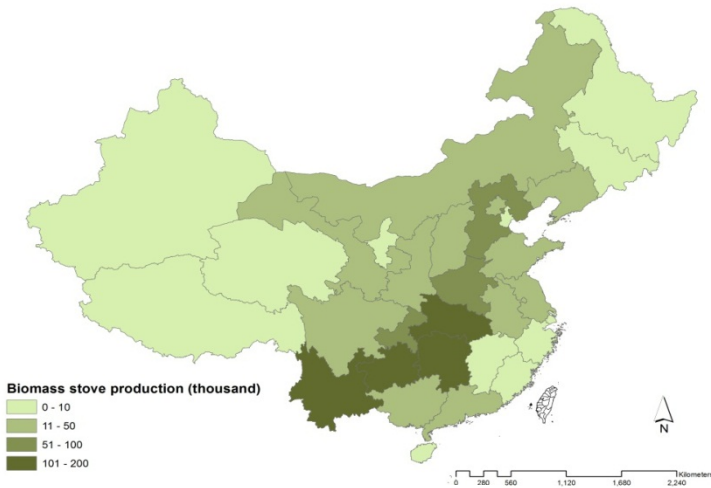
Stove number/type	Picture
1/Improved In-situ Stove	
2/Improved Kang	
3/Clean Cooking stove	
4/Clean Cooking and Water Heating Stove	
5/Clean Cooking and Heating Stove	
6/Clean Heating Stove	

Supply Mapping: Key Market Segments

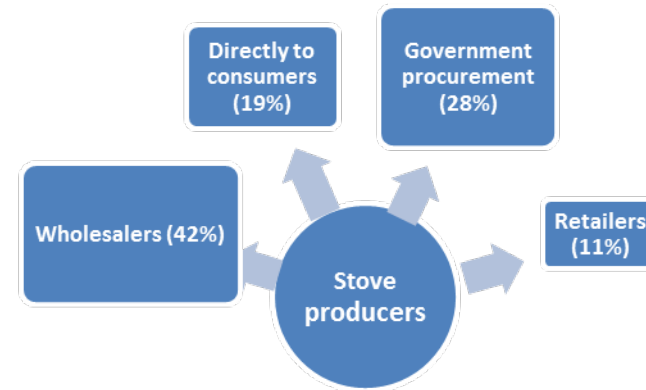
- **Biomass stove industry** (production: 1.6 m in 2011, ~300 manufactures)
 - ▣ One of the world's largest but heavy reliance on government procurement and subsidies.
- **Coal stove industry** (production: 20 m in 2011, ~1500 manufactures)
 - ▣ Highly commercialized, patchy product quality, considerably varied performance, and widely dispersed demand.
- **Biogas industry** (HH using biogas in 2010: 40.27 m, one-third of all potential users)
 - ▣ Rapid growth over the last ten years but decreased enthusiasm for using or constructing biogas systems among households
- **Solar cookers** (production: 0.2 m in 2010, ~20 manufactures)
 - ▣ Largest stock in the world but heavy reliance on government procurement and subsidies.

Focusing on Biomass Stoves Industry

Distribution of Biomass Stove Production, 2011

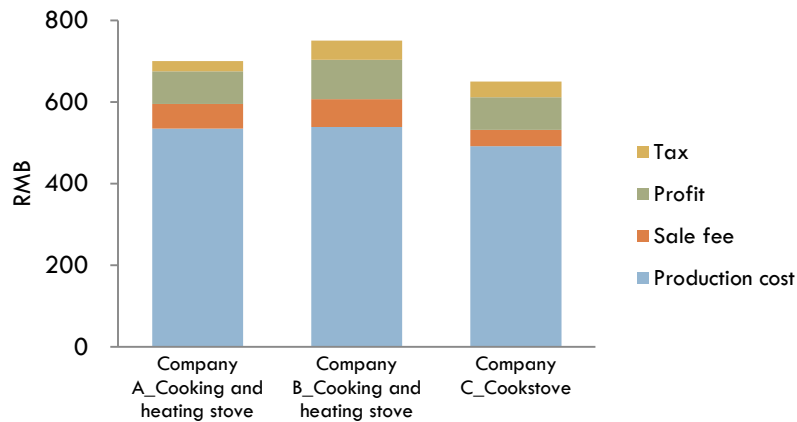


Main Stove Sales Models



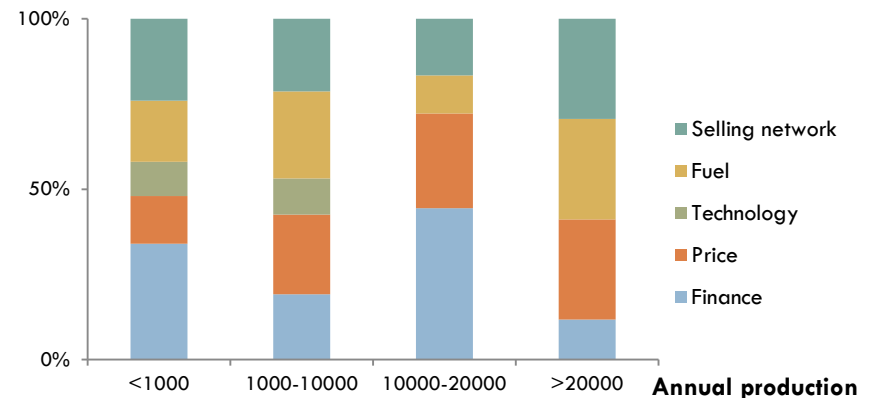
Note: Most sales to wholesalers and using own sales network fall under government procurement program.

Typical Cost Compositions for Biomass Stoves



Source: China CSI survey.

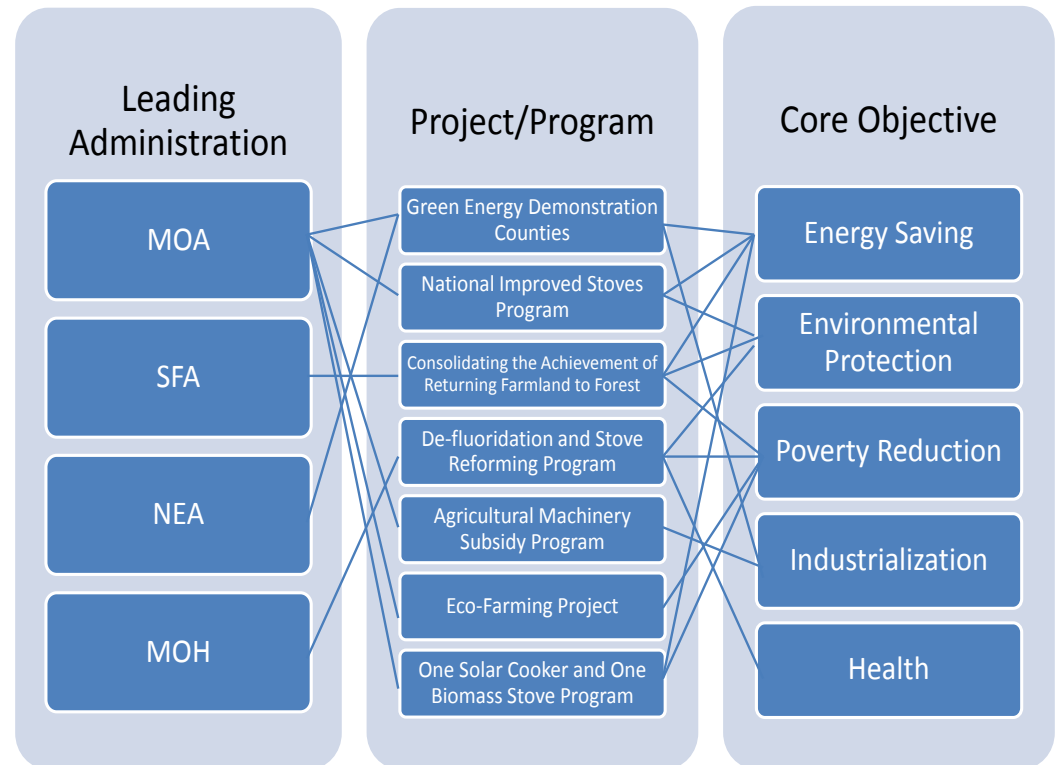
Main Obstacles for Biomass Stove Producers



Source: China CSI survey.

Policies, Programs, and Institutions

- China's government has made significant efforts at various levels in issuing policies and implementing programs to promote clean rural energy solutions.
- Issues remain that impeding the potential for large-scale success and long-term sustainability:
 - Need more systematic programs.
 - Require strengthened cooperation and coordination among key departments at all levels.
 - Need more flexible subsidy schemes that incorporate M&E.
 - Need more effective awareness campaigns and support for research and technology development.



Outline

- Overview of EAP Clean Stove Initiative (CSI)
- Key findings from China CSI
- **Key findings from Indonesia CSI**
- Comparisons of the two countries
- Lessons learned and key recommendations
- Plan for the next steps

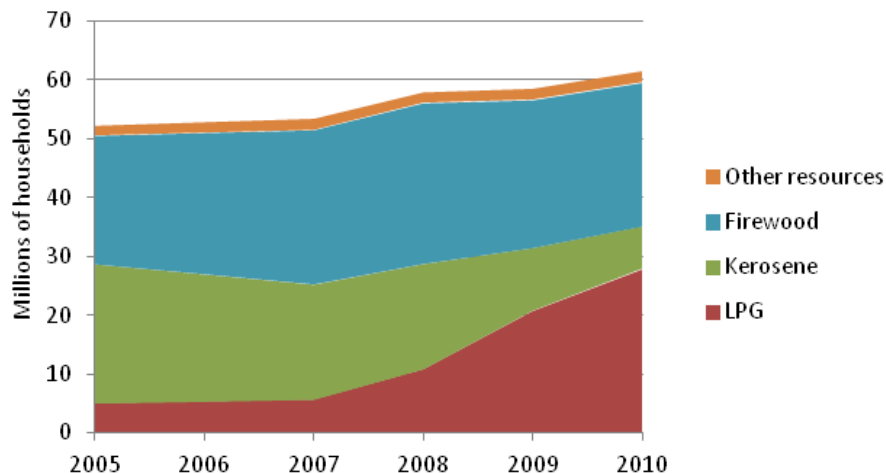
Indonesia Context

- Most households in Indonesia are shifting to modern cooking energy thanks to the government's recent Kerosene-to-LPG Conversion program, yet 40 percent of households still rely on traditional biomass cooking.
- Over 45,000 premature deaths can be attributed to IAP from cooking with solid fuels (WHO and UNDP, 2009).
- A few cookstove programs have recently developed by NGOs and donors, but total number disseminated remain very imited and sporadic.

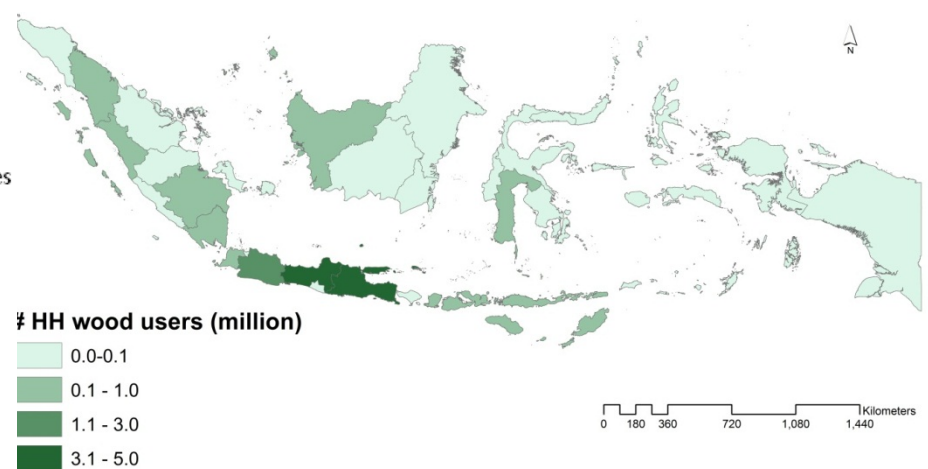


Demand Mapping

- Primary cooking fuels use
 - LPG: well on its way to replacing kerosene as a result of Kerosene-to-LPG Conversion Program, yet limited mainly to urban and peri-urban areas
 - Kerosene: replaced by LPG, limited future
 - Biomass: sustained levels of firewood use
- Regional variations and mixed fuel use
- Factors driving households' fuel and stove selection:
 - Resource availability, accessibility, household affordability, and cultural acceptability
 - Biomass: renewable, abundant, and affordable to the poor



Households relying on fuelwood as primary cooking fuel in 2010



Household Biomass Stove Supply

- ❑ **Stove market and production capacity:** commercial market for biomass stoves is quite limited and there are no existing markets for biomass stoves in many rural and remote areas; production capacity varies widely from 5-10,000 per month. Women dominate the stove business.
- ❑ **Business models and limitations:** mostly artisan production, family-owned, long standing business relationship, strong regional variations in business and stove purchasing practices, lacking skills in business management, informal business arrangement, and little after-sale service.
- ❑ **Production costs and supplier profits:** production costs range from \$0.5-\$5. Relatively low profit margins at each level of the supply chain.
- ❑ **Knowledge and attitudes toward new stoves:** lack of knowledge about better stove models and a new model's acceptability depends on its potential to be sold.

Policies, Programs, and Institutions

- To date, Indonesia's policies and programs have failed to address household biomass cooking energy and health issues in an integrated manner
 - Policies providing a high-level policy framework, but lacking specifics on biomass cooking energy and cookstoves
 - Programs were small, fragmented and sporadic and in virtually all cases ended when funding ceased.
 - This agenda has not been institutionalized yet.
- Successful principles from the LPG and Biogas programs
 - Kerosene to LPG Conversion Program:
 - Strong government commitment and a firm policy objective,
 - Effective marketing and public awareness campaigns,
 - Assured availability of an uninterrupted fuel supply, and
 - Effective monitoring and evaluation
 - Indonesia Domestic Biogas Program
 - Market-based approach
 - Financial support to help overcome high upfront costs
 - Quality control and standards, verification of results and procedures
 - Local management

Outline

- Overview of EAP Clean Stove Initiative (CSI)
- Key findings from China CSI
- Key findings from Indonesia CSI
- **Comparisons of the two countries**
- Lessons learned and key recommendations
- Plan for the next steps

Comparisons of the Two Countries

	Similarities	Differences
Demand Situation	<ul style="list-style-type: none"> • Large population rely on solid fuel for household energy. • Very diverse in terms of cultures, cooking habits, resources, and socioeconomic conditions. • Cooking fuel/stove stacking is very common. • Mostly a rural issue. 	<p><u>China:</u></p> <ul style="list-style-type: none"> • Heating demand is increasingly more important as demand for comfort increases. • High electrification rate- electricity for cooking is increasingly used. • Baseline (current stoves and affordability) is relatively high. <p><u>Indonesia</u></p> <ul style="list-style-type: none"> • Basically no heating issue. • Low electrification rate in rural areas-electricity is rarely used for cooking. • Baseline is low (three-stone is commonly used in some areas).
Supply Situation	<ul style="list-style-type: none"> • Market is large enough to create a stove industry. • Profit margin is generally low in the sector. • Women often lead the business. 	<p><u>China:</u></p> <ul style="list-style-type: none"> • Has a commercial market, has a stove industry with high capacity. • Rely on government-supported programs and subsidies. <p><u>Indonesia:</u></p> <ul style="list-style-type: none"> • Commercial market is quite limited, mostly artisan-type production with low capacity, lack entrepreneurs. • No government support
Policy/ Institutions	Not a high priority issue on policy agenda	<p><u>China:</u></p> <ul style="list-style-type: none"> • Significant government support over last three decades. • CAREI/CACS has played an instrumental role. <p><u>Indonesia:</u></p> <ul style="list-style-type: none"> • No government support, sporadic NGO and donor driven activities.

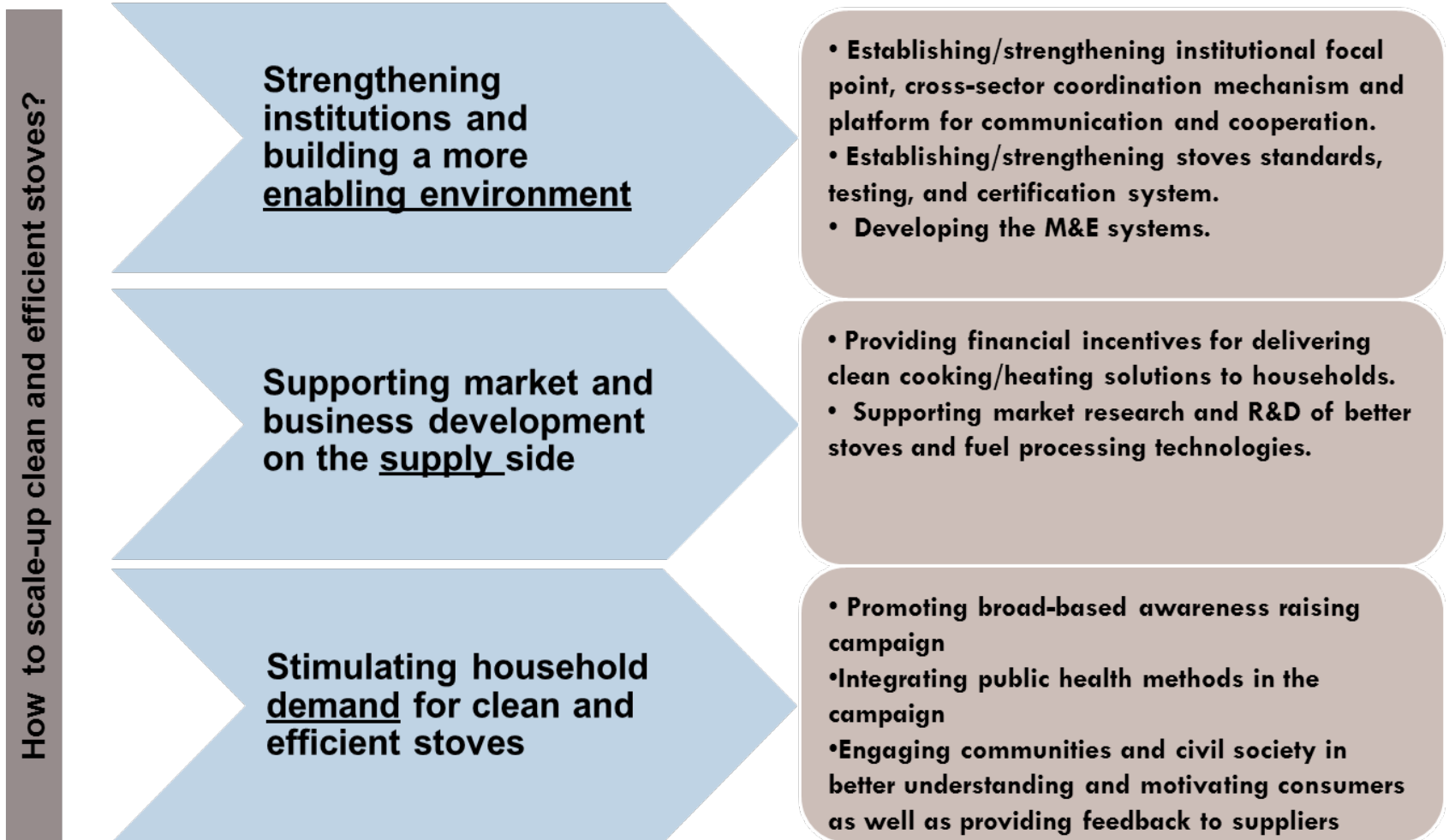
Outline

- Overview of EAP Clean Stove Initiative (CSI)
- Key findings from China CSI
- Key findings from Indonesia CSI
- Comparisons of the two countries
- **Lessons learned and key recommendations**
- Plan for the next steps

Lessons Learned

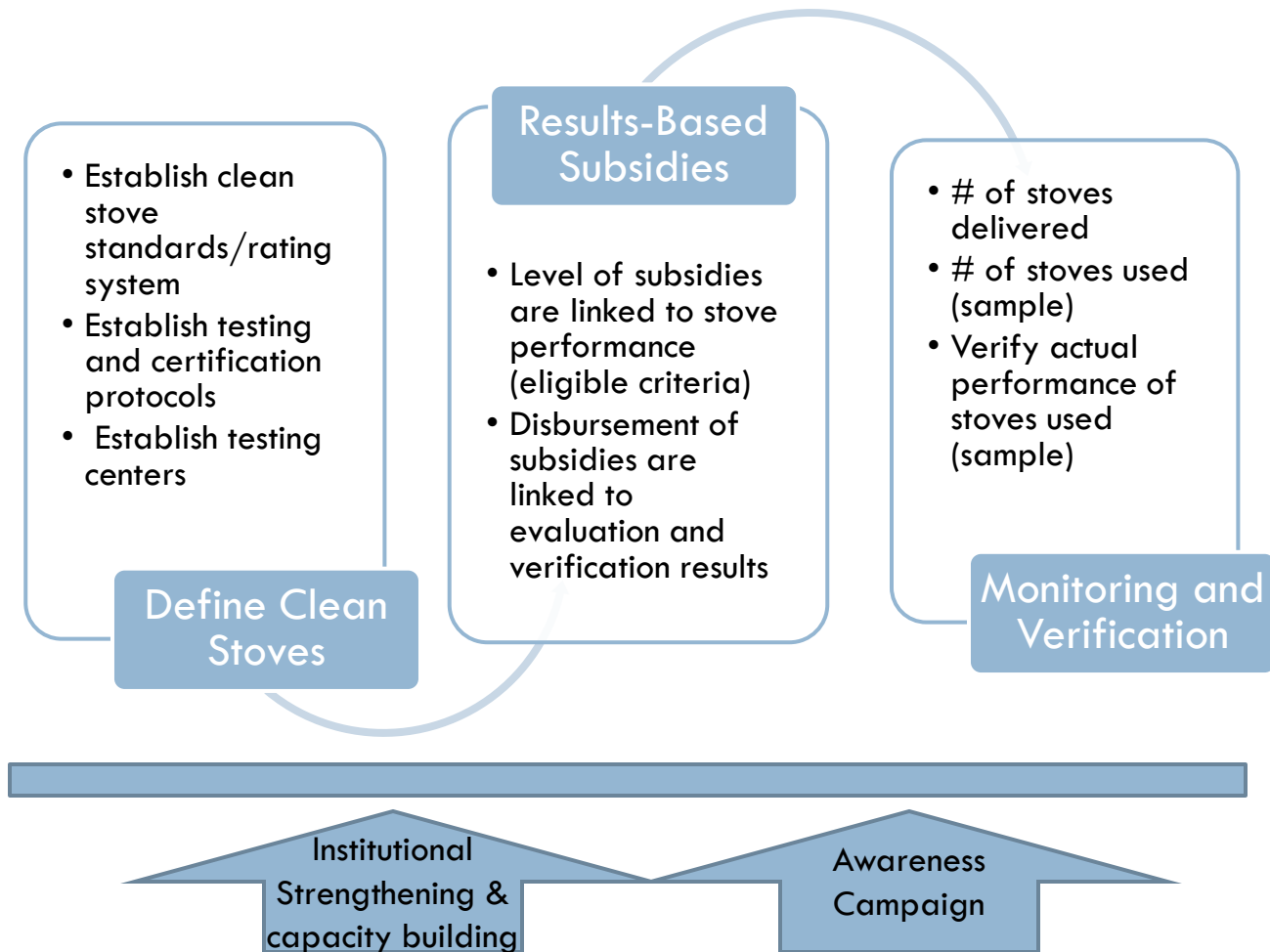
- Government support is essential and strengthening institutions is the first step to create an enabling environment.
 - An institutional champion
 - A cross-sector coordination mechanism
 - A platform for communication, learning and cooperation
- How the government should support matters and a new business model is needed.
 - Government plays a supporting (including financing) and facilitating role.
 - Private sector innovates and develops the stove business based on market mechanisms (incentives). Private sector should be at the center of implementation.
- How can we add values?
 - Raise the dialogue with the government and put the issue on the policy agenda.
 - Provide advice for intervention strategy and setting up the government-supported program.
 - Offer the international platform for learning and exchanges.
 - Offer financing solutions, e.g. P4R, SIL, GPOBA, GEF, CF, IFC financial products.

Key Policy Recommendations: Overall Intervention Strategy



Transformation strategies for scaling up access to clean stoves

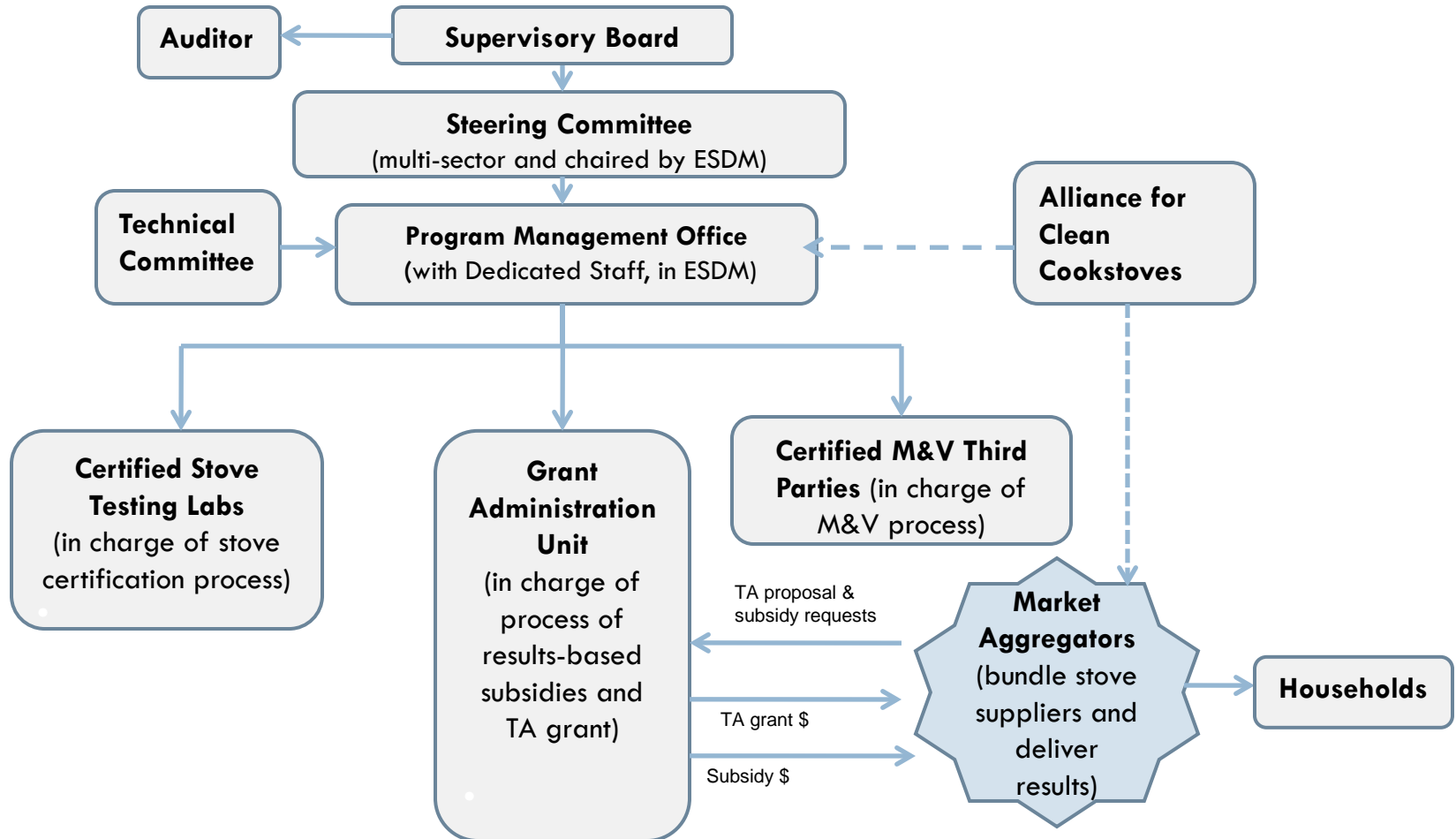
Key Policy Recommendations: Results-Based Financing Framework



RBF Framework:

An Example of Implementation Arrangement

28



Outline

- Overview of EAP Clean Stove Initiative (CSI)
- Key findings from China CSI
- Key findings from Indonesia CSI
- Comparisons of the two countries
- Lessons learned and key recommendations
- **Plan for the next steps**

Next Steps for China CSI

- Improving stove standards, testing, and verification system
 - Review the current system to identify gaps and opportunities for improvement and support China's active participation and contribution in developing international standards.
 - Partner with GACC to support establishment of testing and knowledge and research centers.
- Strengthening institutions and building the capacity of key market players
 - Strengthen institutional arrangements
 - Conduct training activities to key market players
 - Organize regional or international learning activities and promote S-S cooperation
- Supporting pilots
 - Identify and pilot RBF approach in selected areas that representative and scalable
 - Public campaign and provide advisory service to key market players
- Supporting preparation of China's second national clean stoves program and Hebei Rural Energy Project (\$100m IBRD loan FY15)

Next Steps for Indonesia CSI

- Establish stoves standards/testing/certification system
 - ▣ Develop a roadmap for setting up the stove standards, testing, and certification system
 - ▣ Establish testing/certification centers and support initial operating costs
 - ▣ Organize stove competitions and support advisory service for stove design improvement
- Strengthen institutions and build stakeholder capacity
 - ▣ Establish Indonesia Alliance for Clean Stoves and support to key institutional players
 - ▣ Conduct training activities to key market players
 - ▣ Organize regional or international learning activities
- Design and implement pilot program
 - ▣ Identify pilot areas that representative and scalable (e.g. Sumba and Central Java area) and pilot RBF approach
 - ▣ Public campaign and provide advisory service to key market players
- Design and prepare the Master Plan for the National Clean Biomass Cookstove program

A Vision Toward Universal Access to Clean Cooking Solutions in Indonesia

32

