

# Behavioral Insights to Reduce Open Waste Burning in Lao PDR

## BEHAVIORAL INSIGHTS AND POLICY OPTIONS



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# ACKNOWLEDGEMENTS

The Advisory Services and Analytics (ASA) on behavioral insights to reduce open waste burning in Lao PDR aims to support the government of Lao PDR to generate and convene knowledge that informs the development and implementation of policies, plans, and investments for Lao PDR's green growth transition and helps the country build natural and human capital from better management of pollution, waste, and renewable natural resources.

This ASA is a deliverable under the Lao PDR Resilient Green Growth Programmatic ASA (P171011) implemented by the World Bank. Sister ASAs address related topics important for Lao PDR's green growth agenda, such as solid and plastic waste management, priorities for environmental management, promotion of nature-based tourism, sustainable forest management, landscape valuation and importance of biodiversity. The World Bank task team for

this ASA is led by Maurice Andres Rawlins and at the time of delivery includes Kaysone Vongthavilay, Rieko Kubota, Souksavanh Sombounkhanh and Anorath Douangphachanh. A team from the World Bank's Mind, Behavior & Development Unit (EMBED) directed by Renos Vakis, and composed of Ailin Tomio and Daniel Alejandro Pinzón led the behavioral analysis.

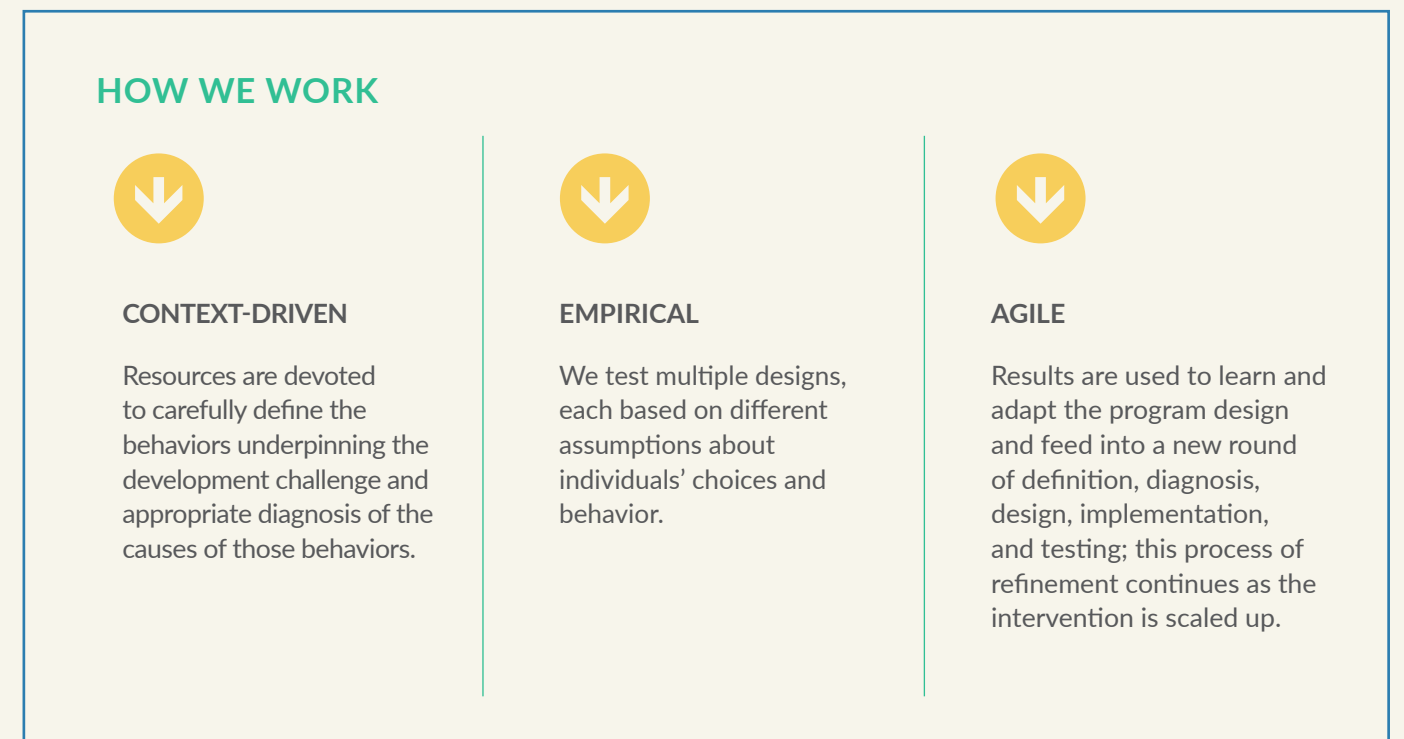
Funding for the ASA was gratefully provided by the Korean Green Growth Trust Fund (KGGTF) which was complemented by World Bank operating budget.

# CONTEXT

In order to promote environmentally friendly behaviors, it is fundamental not only to consider and modify already existing infrastructure and facilities, or rethink physical prompts and cues in the environment, but also contemplate and target the cognitive traits inherent to any human being. Sustainable behaviors such as recycling, reusing and composting are driven by different motivations and beliefs. In the past few decades, scholars have

also devoted significant attention to identify and describe major socio-psychological and situational determinants of sustainable behaviors, such as age, gender, cultural background, attitudes, knowledge, motivation, social influence and others<sup>1</sup>. In this report, we provide a description of how behavioral science was used to generate insights on factors that influence open burning in the population of Lao PDR.

Figure 1: How we work in our projects.

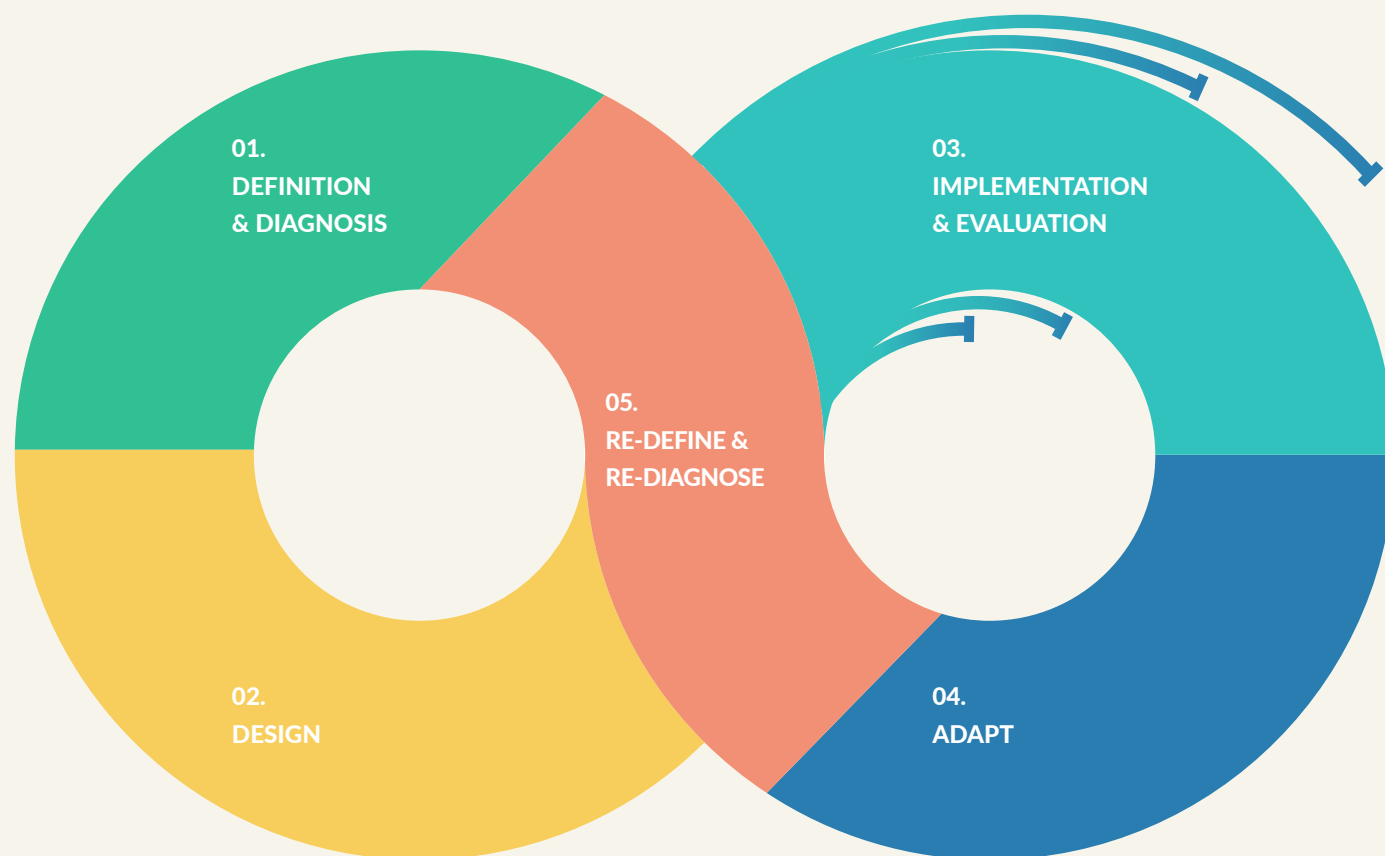


<sup>1</sup> Miafodzyeva, S., Brandt, N., & Andersson, M. (2013). Recycling behaviour of householders living in multicultural urban area: a case study of Järva, Stockholm, Sweden. *Waste Management & Research*, 31(5), 447-457.

# OUR METHOD

This report will walk the reader through the different phases of the behavioral method applied to open burning in Lao PDR (Figure 2). In the definition phase the behavior is outlined, and the social, psychological, and contextual factors that influence it are studied. In the second phase, an intervention based on the hypotheses is designed. Finally, the intervention is implemented and evaluated in order to adapt the solutions to the current reality of the population.

Figure 2: The project's phases



# DEFINE AND DIAGNOSE

Behaviorally-informed policy emphasizes the importance of context for decision-making and behavior. The social, psychological, and economic factors that affect what people think, as well as how people behave while using a service, are key insights that inform behavioral interventions. This project was focused on a specific waste management (WM) issue present in Lao PDR: open burning of waste by households. According to a 2020 World Bank report<sup>2</sup> every year in Lao PDR there are 10,000 deaths attributed to environmental health risk factors, and household air pollution alone represents 44 percent of those deaths. The 10,000 deaths represent 21.6 percent of all deaths in the country, without mentioning the illnesses they cause.

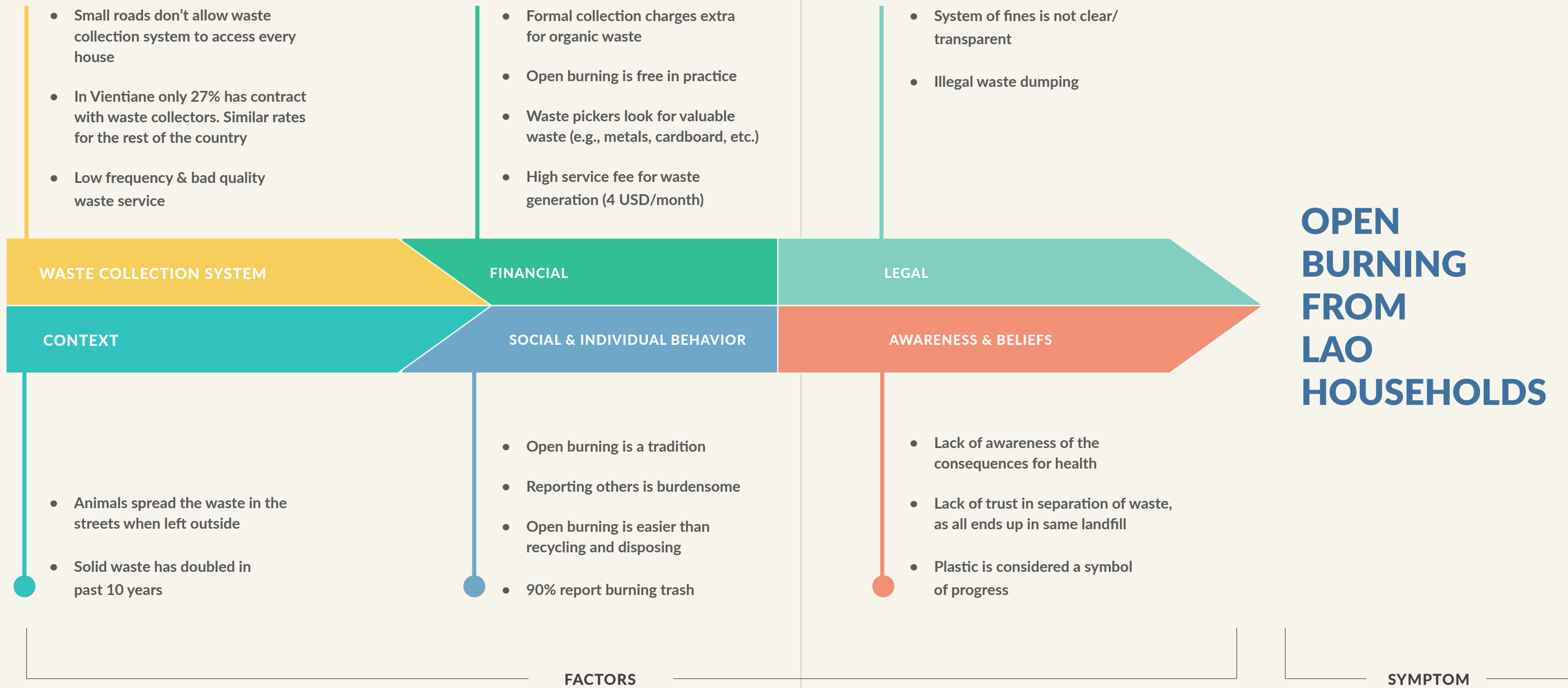
To understand the context, a desk review of all materials and available information on the incidence of the issue was conducted<sup>3,4,5,6</sup>, as well as several interviews with key stakeholders such as UNDP Accelerator Lab, Zero Waste Laos and the Department of Natural Resources and Environment Inspection in Lao PDR.

Open burning in Lao PDR is a multicausal issue that

is influenced by several factors such as: i) the current state and limited coverage of the waste collection system<sup>7</sup>; ii) financial aspects such as a general lack of incentives and high costs of services<sup>8</sup>; iii) legal aspects such as the lack of enforcement of fines; and iv) social aspects such as the lack of awareness of the consequences of burning and a lack of trust in the waste collection system. Finally, there are specific social and individual behaviors that favor the habit of burning<sup>9</sup> such as consumption patterns and cleanliness habits (see Figure 3).

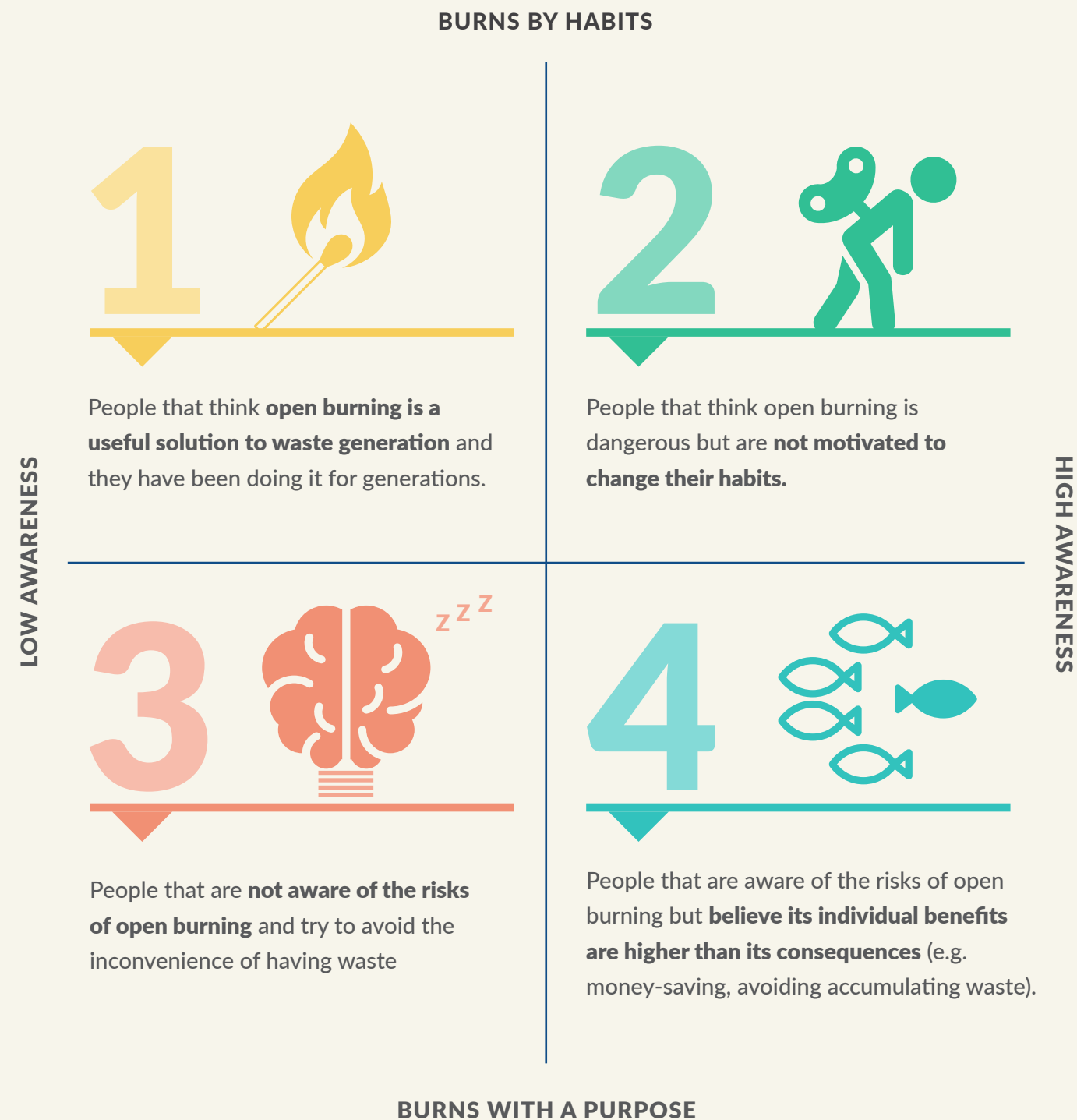
<sup>2</sup> Sánchez-Triana, E. (2021). Environmental Challenges for Green Growth and Poverty Reduction.  
<sup>3</sup> [https://www.la.undp.org/content/lao\\_pdr/en/home/blog/2020/the-journey--collective-intelligence--ci--to-understand-open-bur.html](https://www.la.undp.org/content/lao_pdr/en/home/blog/2020/the-journey--collective-intelligence--ci--to-understand-open-bur.html)  
<sup>4</sup> <https://openjicareport.jica.go.jp/pdf/12345914.pdf>  
<sup>5</sup> [https://www.la.undp.org/content/lao\\_pdr/en/home/blog/2020/before-the-bins--what-s-really-going-on-.html](https://www.la.undp.org/content/lao_pdr/en/home/blog/2020/before-the-bins--what-s-really-going-on-.html)  
<sup>6</sup> Sánchez-Triana, E. (2021). Environmental Challenges for Green Growth and Poverty Reduction.  
<sup>7</sup> Household waste management in the nation's capital stands at only 27 percent, while the remaining 73 percent of households in the capital do not use municipal waste collection services, retrieved from: <https://openjicareport.jica.go.jp/pdf/12345914.pdf>  
<sup>8</sup> The service fee is relatively high (4 USD/month) when compared to the minimum wage of local people (80 USD/month) [https://www.la.undp.org/content/lao\\_pdr/en/home/blog/2020/the-journey--collective-intelligence--ci--to-understand-open-bur.html](https://www.la.undp.org/content/lao_pdr/en/home/blog/2020/the-journey--collective-intelligence--ci--to-understand-open-bur.html)  
<sup>9</sup> According to several surveys on waste management conducted by The Asia Foundation in 2017 in rural areas of Khammouane province, 90 percent of respondents said they burned their waste <https://asiafoundation.org/2017/04/19/love-laos-keep-clean/>

Figure 3: Archetypes: the different dimensions that influence waste burning in households



Based on the literature review two hypotheses around open burning were stated: i) households have different levels of awareness in relation to the negative outcomes of burning their waste, and ii) some households have the habit of burning based on tradition or social norms, while others burn to fulfill certain purposes such as the need to maintain their houses and front yards clean or saving the money from the waste collection fee (see Figure 4).

Figure 4: Hypothetical Arquetypes: reasons we think people burn their waste



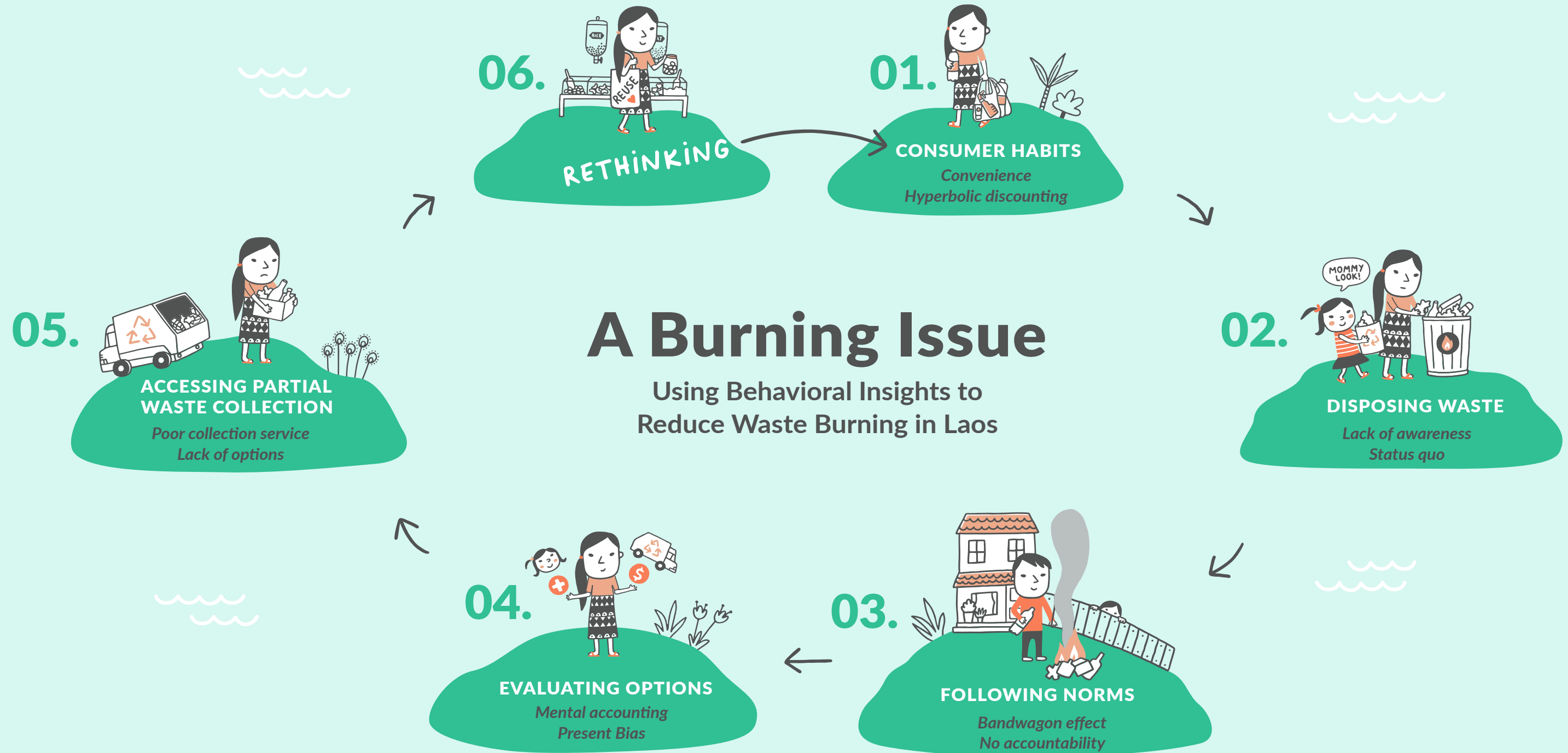
Even though the focus of the study was on the households' waste burning behavior, our research<sup>10,11,12</sup> suggests open burning is the outcome of a series of previous behaviors that lead to the generation and poor management of waste. To illustrate this, a journey map of the decision process of waste management was developed. The journey (Figure 5) illustrates the different stages of waste generation that lead to waste accumulation and burning, as well as the most frequent biases present during each stage. Modern consumption habits tend to favor the purchase of several small plastic products, that are barely reused once consumed and cannot be recovered by recyclable industries. Excessive cognitive load, as well as the focus on present needs over future needs (hyperbolic discounting), tend to become a barrier to a sustainable planification of daily purchases. At home, households are not used to segregating their waste and therefore throw it in

the same waste container. Social norms and status quo may be factors impacting the lack of sustainable management at home. Finally, since waste collection doesn't happen every day, waste is piled up and households are faced with the decision to burn it, dump it on the streets or wait the necessary time to handle it to the collection trucks if available.

Outlining these stages of waste generation and management, uncovered the need to develop a household survey to understand not only open burning but also alternative behaviors that could help people rethink their consumer and waste management habits and shift them into sustainable alternatives

<sup>10</sup> Desk review of online materials mentioned on page 3, as well as insights from key stakeholder's interviews and relevant literature on behavioral science and waste management.  
<sup>11</sup> Hoensheid, M. (2021). Long-Term Effects When Educating Elementary Students on Waste Reduction in Minnesota.  
<sup>12</sup> OECD Report (2008). Household Behaviour and the Environment Reviewing the Evidence.

Figure 5: Household decision journey in relation to generating and managing waste.



Addressing structural and behavioral barrier to recycle, reduce, and rething waste in Laos will reduce waste burning, leading to a healthier and more eco-friendly community.



## Biases present during the journey of waste generation and disposal

- **Cognitive load:** Our attention span and short-term memory have limited capacity to process information and retain it. Factors such as too many stimuli in the environment, stress, or lack of sleep reduce people's capacity to process and retain information. At the stores, when there are too many products to choose from, people will prefer those that are most salient and easy to access.

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- **Hyperbolic discounting:** We are inclined to choose immediate rewards over rewards that come later in the future, even when these immediate rewards are smaller. In this case, people may choose small plastic products instead of bigger reusable packages that seem more expensive in the short term but are cheaper in the long term.

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- **Bandwagon Effect:** This is the tendency that causes people to think or act a certain way if they believe that others are doing the same. The bandwagon effect can influence people's tendency to litter. For example, people are more likely to litter if they're in an environment that's already littered, and less likely to litter if they're in an environment that's clean.

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- **Status-Quo Bias:** The status quo bias is one type of cognitive bias that involves people preferring that things stay as they are or that the current state of affairs remains the same. In waste management, habits and social norms tend to become a barrier to behavioral change.

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- **Present Bias:** A tendency to skew our attention to the present over the future, leading us to make short-term decisions, procrastinate on our long-term intentions, and adopt risky or unsustainable behaviors that are enjoyable, cheap or convenient now but may be detrimental in the future. Burning waste may be chosen over keeping the waste until the collection trucks come because it's less burdensome and allows households to keep their house clean.

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Based on this journey, and considering the practical limitations of online surveys, the team decided to focus on stages 3 to 5 of the journey to understand household habits and beliefs that lead them to choose between sustainable behaviors (recycling, reusing and composting) or burning waste.

# DESIGN

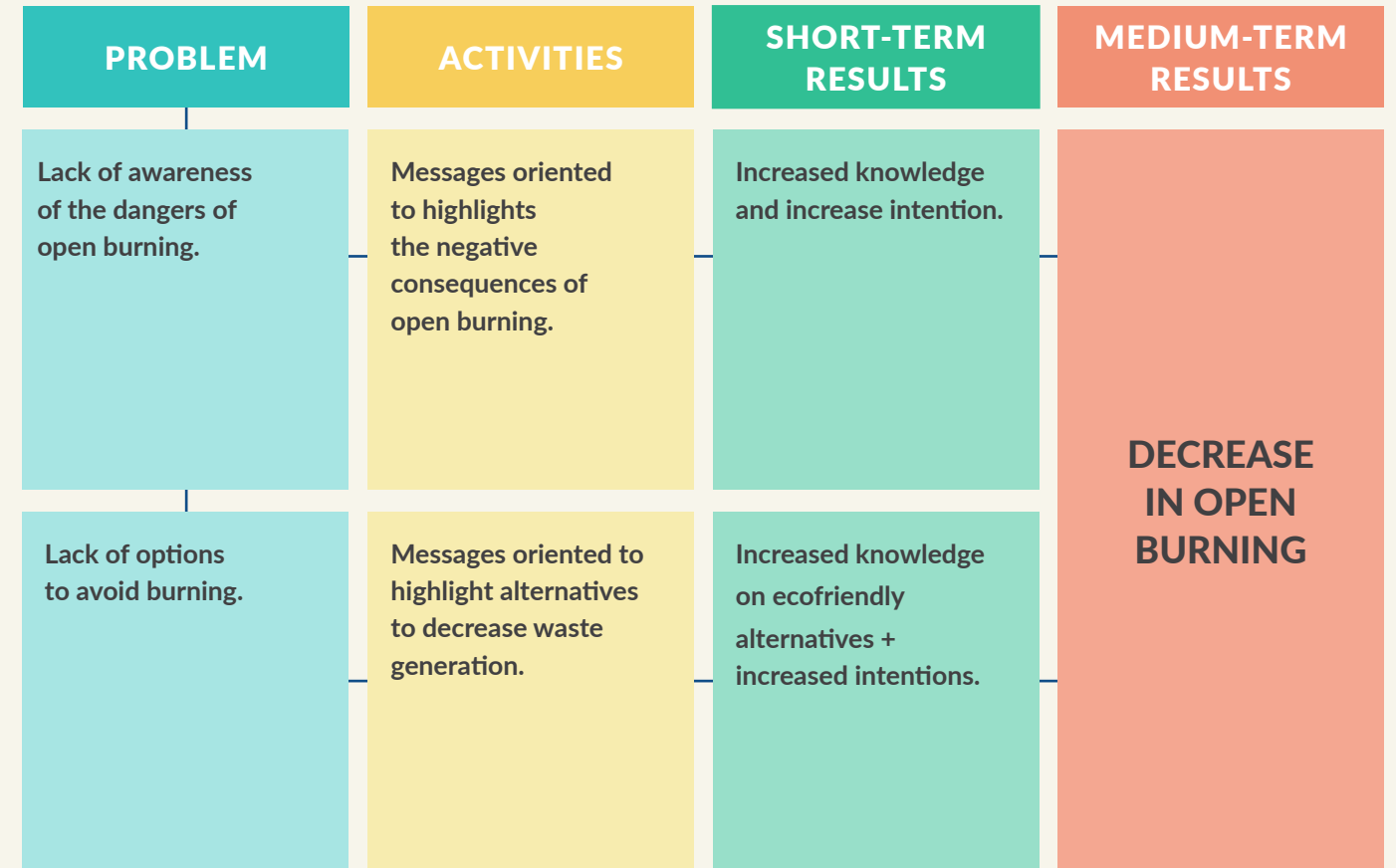
Once defined the problem and objectives, a questionnaire was developed in order to survey the household's most important barriers to sustainable behaviors and test the framing of different messages to discourage open burning.

The main hypotheses were that the lack of awareness of the negative consequences of open burning and the lack of better alternatives to fulfill their objectives (clean their homes, save waste collection money) led them to burn their waste. Therefore, messages targeting those barriers would help change beliefs, increase intentions, and promote alternative behaviors related to reusing, recycling, composting and thus avoiding waste burning.

The survey consisted of two parts with a total of 22 questions. The first part of the survey was separated into seven sections: i) introduction ii) background questions, iv) experimental messages intervention v) belief questions vi) intention questions vii) final questions. In the

introduction section, an explanation of the survey and informed consent were outlined. Relevant information about waste collection access, location and education level was asked in the background section. The experimental section included different messages regarding the consequences of waste burning, which were randomized among respondents (See Implement and Evaluate section). The following two sections tested the respondents' beliefs and commitments in relation to open burning and sustainable behaviors such as reusing, recycling, and composting. Finally, the last section of the survey focused on current behaviors and needs concerning open burning. One week after the first part of the survey was completed, people received a second set of questions about their last week's behaviors in terms of reusing, recycling, composting and burning.

Figure 6: Theory of change



## Experimental design

For section iv, five experimental messages targeting behavioral barriers were designed. Treatment 1 showed an informational message on alternative

behaviors to burning such as using the collection system, reusing, recycling, and composting (See Figure 7).

Figure 7: Treatment 1: informational message



*As I said before, my job is to share recommendations to have a better environment. By the way, did you know there are options to waste burning that might help us all generate less waste?*

**For example:**

- **Use the system** if it is available to you.
- **Compost:** Use food and organic waste to enrich the soil and plants.
- **Recycle:** Give the recyclables to waste pickers or recyclable companies.
- **Reuse:** refill containers and bottles, carry reusable bags in the market, avoid single-use plastics.

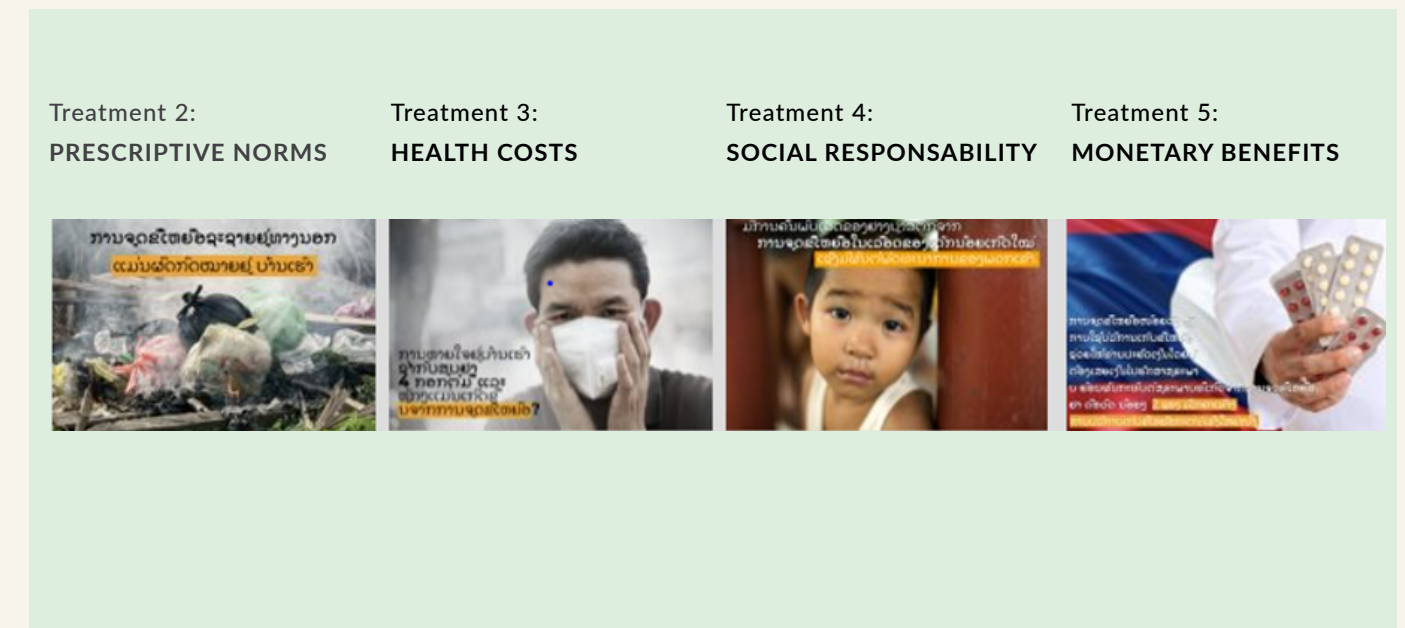
Treatments 2,3, 4 and 5 included a vignette where a character called Noy was introduced as a waste burner and the respondent was asked to choose a reason to tell Noy to stop burning. Before choosing the reason, a picture with a message was displayed (see figure 8). Depending on the treatment arm assigned to each respondent a different message would show. Each respondent of the survey would be randomly allocated to one of these five treatment messages or a control (no message) condition. The rest of the sections were identical for all respondents.

The survey was collected through social media via Facebook Messenger, in partnership with Virtual Lab, which created the optimization algorithm and survey chatbot. Participants 18 years and older were recruited using Facebook ads and targeted by age, gender, and region. If they clicked on the ad, they were taken to a chatbot in Facebook Messenger, where they completed the survey. After finishing

the survey, participants received a message asking if they agreed to be re-contacted. For those who agreed, the second part was sent over the same chat on Facebook Messenger one week after.

The advantage of the algorithm is that it allowed some recruitment of hard-to-reach subpopulations in order to make the sample more representative of Laos. As the survey is rolled-out, algorithms ensure that the ads focus on the clusters that are below their expected population share (i.e. male, above 50, from Vientiane). The ad budget was reallocated as surveys were completed, to optimize the share of respondents in each cluster while achieving the total desired sample and staying within budget. With the Messenger chatbot, we were able to reach the respondents without asking personal or sensitive questions in a friendly and user-known interface.

Figure 8: The images were included in the experimental section.



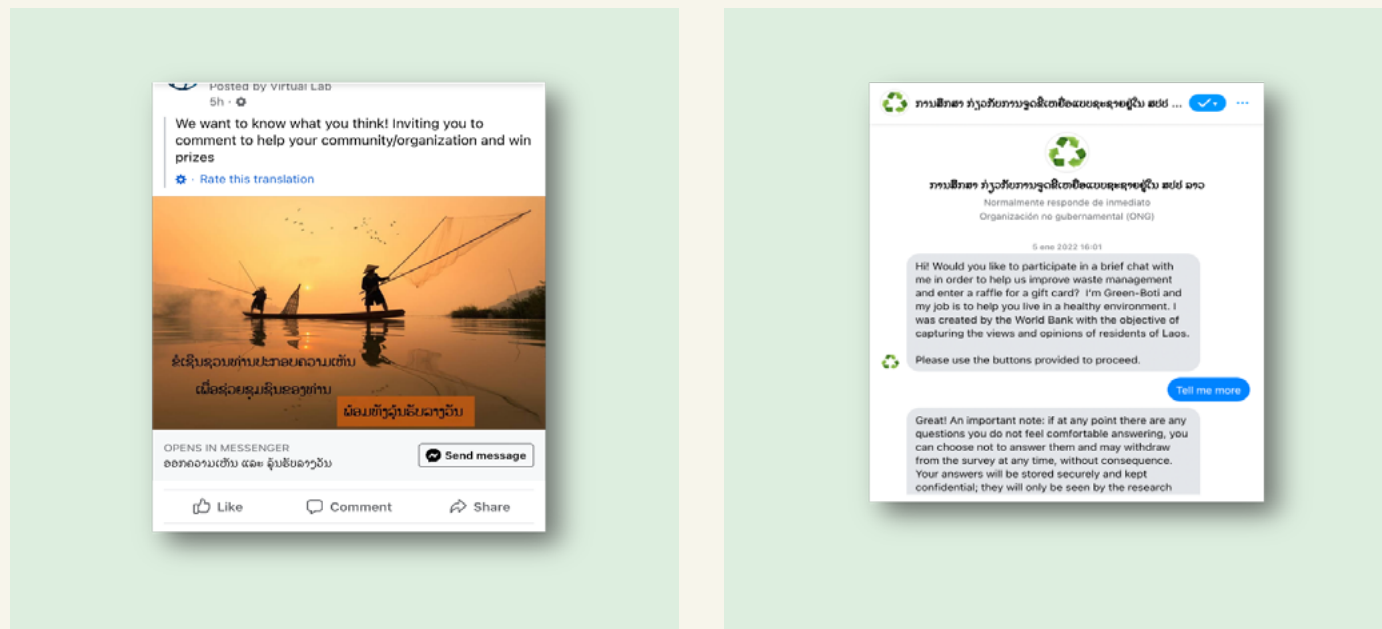
# IMPLEMENT & EVALUATE

The first part of the survey was launched in February 2022, and the second part was programmed to be launched one week after the respondents finished the first part. The survey was promoted in the Facebook® platform where it reached 1,438,786 people, of which 5,217 clicked on the ad and 3,169 completed the survey. From that sample, only 2,924 accepted to be contacted the following week and 1,920 completed the second part of the survey. Those who finished both surveys entered a raffle for a K500,000 top-up phone card as an incentive

to collect more answers.

All respondents received the same survey questions except for the experimental section which was randomized across users that started the chatbot. Each respondent had a 14.3 percent chance of getting each of the five treatment arms or a 28.6 percent chance of not getting any of them (control group).

Figure 9: The advertisement on Facebook



## Main results

Our sample consisted mainly of young, educated people from Lao PDR. Forty percent of our sample was between 18 and 29 years old, 59 percent were males, and 90 percent had incomplete secondary education or above. Forty percent of the sample was from Vientiane Capital while the remaining 60 percent was from the rest of the country.

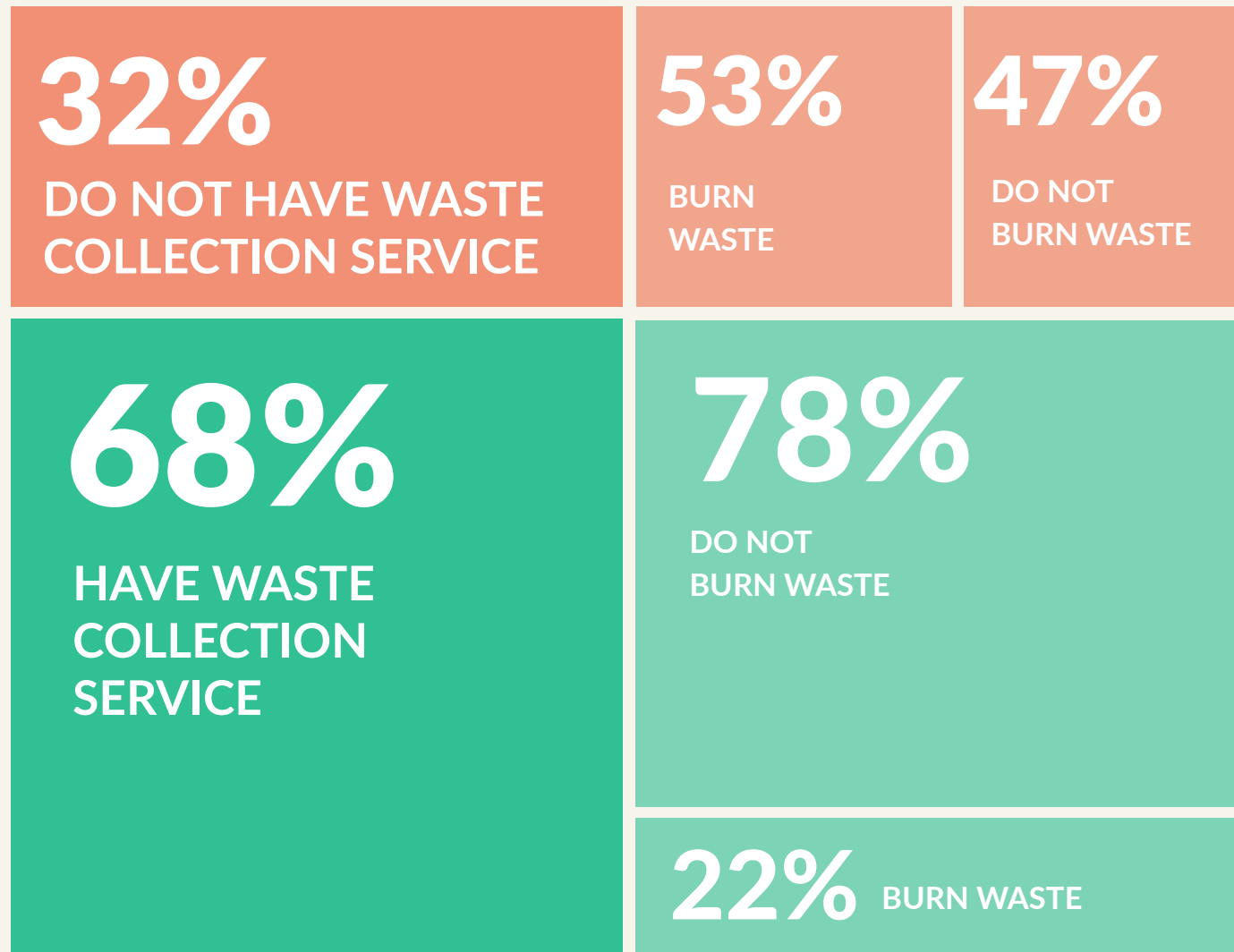
Results showed that 7 out of 10 households generate two or fewer bags of waste a week, and when asked what they had done with their waste in the past week 65 percent of respondents used the waste collection services, recycled, or reused their waste, which shows that a good amount of people practice sustainable behaviors. Thirty-two percent of the total sample mentioned that in general waste was burned in their homes and this was more pronounced for those who do not have waste collection access<sup>13</sup>. In terms of frequency, 22 percent reported having burned a few times in the past week, while 78 percent reported that they did not burn at all.

# 65%

**of respondents used the waste collection services, recycled, or reused their waste, which shows that a good amount of people practice sustainable behaviors.**

<sup>13</sup> Since the data collection was carried out through Facebook, the sample of respondents was skewed towards young, educated people, which indicates we should be careful when extrapolating the data to the country's population.

Figure 10: Green circles show the percentage of people that have access to waste collection systems and those who do not. Orange circles show the percentage of people that burn waste and those who do not within each group.



Within our sample, one in three people did not have waste collection service. This is important since our survey shows that using waste collection services strongly predicts waste burning: 53 percent among those that do not have this service report burning compared to 22 percent that have it (see Figure 10). When asked why they did not have the service, the top reason was lack of availability. Still, 1 in 4 respondents mention lack of awareness, high costs, and other reasons as the causes of not having it.

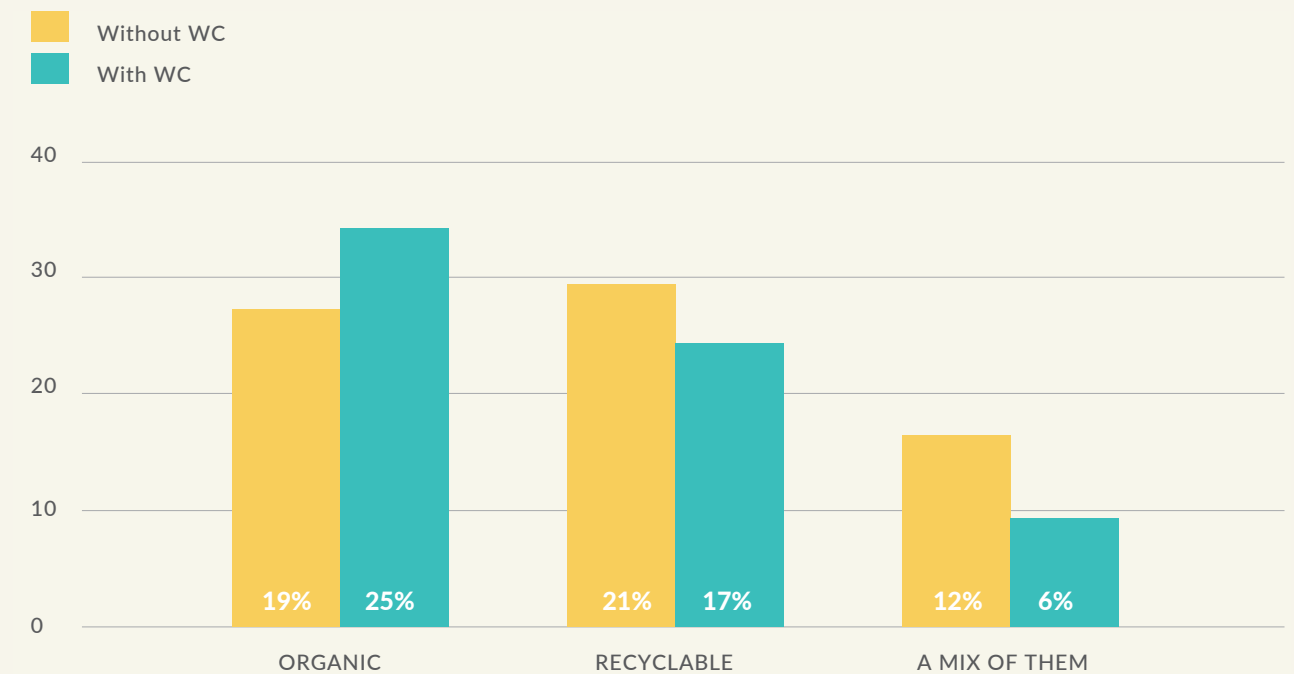
In addition, those who have waste collection reported burning more organics while those who

don't burn more recyclables.

70 percent of those who burn, do it in their backyard, highlighting the private modality of this behavior.

When asked for the reasons to burn waste: 32 percent of those who burn responded that they did it to keep a clean house; 22 percent did not know other alternatives; 14 percent did it because people around them do it; and 13 percent did it because of a lack of access to collection service. The rest (18 percent) chose other reasons.

Figure 11: Type of materials burned.



## Experimental results

Results from the experiment showed that different framings on messages can influence beliefs, intentions and behaviors. However, they impact differently in people with or without waste collection services. In terms of behaviors, having access matters: messages were not successful in changing behaviors in those who do not have access, while they were in those who have. In general terms, focusing the communication on the health consequences and monetary costs of burning waste showed greater impact in changing beliefs and intentions regarding burning and other waste management practices than other framing.

	PEOPLE WITH WASTE COLLECTION SERVICE	PEOPLE WITHOUT WASTE COLLECTION SERVICE
HOW THE DIFFERENT MESSAGES IMPACTED BELIEFS:	<ul style="list-style-type: none"> <li>• People mostly think about <b>air pollution</b> when making recommendations. This means the consequences of burning tend to be detached from personal consequences. The experiment refined people's concepts about burning since messages increased <b>awareness about damages to the environment and illegality</b> as well as to the <b>personal costs to their health and financial costs</b>.</li> <li>• More personalized messages seem to work well:               <ol style="list-style-type: none"> <li>1. <b>The message focusing on health costs</b> increased the belief that stopping burning waste is important by six percent in comparison to no message condition.</li> <li>2. <b>The message focusing on monetary benefits</b> increased the belief that burning is bad for health by seven percent.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• The experiment <b>refined people's concepts about burning</b> 2 of the 5 messages successfully increased the belief that burning is bad for health in seven percent relative to no message.</li> </ul>
HOW THE DIFFERENT MESSAGES IMPACTED INTENTIONS:	<ul style="list-style-type: none"> <li>• Messages tested were not successful at changing <b>intentions</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>The experiment shifted people's intentions to stop burning and manage waste correctly:</b> <ol style="list-style-type: none"> <li>1. The information message made people commit more to stop burning</li> <li>2. Both messages on monetary benefits and health costs made people commit more to reusing and avoiding single-use plastics</li> </ol> </li> </ul>
HOW THE DIFFERENT MESSAGES IMPACTED BEHAVIORS:	<ul style="list-style-type: none"> <li>• Messages encouraged people to try other WM methods:               <ol style="list-style-type: none"> <li>1. Three of the five messages successfully increased the <b>reuse</b> of materials and <b>avoidance</b> of single-use plastics by eight percent relative to no message.</li> <li>2. Monetary benefits message increased <b>recycling</b> and <b>composting</b>, seven percent and ten percent.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Messages tested are not successful at changing burning waste behaviors in general.</b></li> <li>• The message about health costs increased <b>reuse</b> practices and <b>reduced</b> use of single-use plastics. The prescriptive norm message also <b>reduced</b> the use of single-use plastics.</li> </ul>

# What do people need to stop burning waste?

Better waste collection time, closer points of service and communal composting sites could help reducing burning. Information can also help.

The perceived high costs of the service is more relevant among those with waste collection service.

Fines are not perceived as useful.

## LEARN AND ADAPT

Results from the survey suggest that different types of respondents have particular beliefs, intentions and behaviors. In light of the results, five types of personas were characterized. A persona is a characterization of an average type of respondent with particular beliefs and behaviors. Different

types of personas should be receiving different interventions according to their preferences. These personas are non-exclusive, which means that a singular person can be characterized by more than one persona and that some characteristics may be shared by different personas.

Figure 12. This graph shows how the different Personas are ordered according two dimensions: burning and accessing waste collection services.





## The No-Burners 68% of the sample

**This is the group of people that do not burn waste.** They tend to be older, living in small households (<5 persons), in Vientiane or large cities, and with high education levels. They do have suggestions for those who burn. Particularly, they choose to highlight that it is illegal to burn. They commit to recycling but are reluctant of composting.

**The government should focus on enabling them to help others around WM. This can be achieved by facilitating venues for community interaction or knowledge exchange and making visible this group's contribution to Laos sustainability.**



## The Uninformed 18% of the sample

**They burn waste because they do not know how to access the waste collection system; do not think they need it; are unaware of the harm of burning waste or do not know how to handle the waste.** This group is integrated by young people living in rural areas with low education levels. In the experiment, they choose to not give a suggestion and are averse to responding that burning waste is illegal. They do not think burning waste in Laos is bad for health as much as the other personas. They tend to generate two or fewer bags of waste weekly and actually compost more and recycle less than the other personas.

**The focus should be on offering them information about how to manage their waste and best practices in terms of segregation and disposal. In addition, they should be taught the benefits of not burning waste.**



## The Ones Who Need Access+ 24% of the sample

**This group presents similar characteristics to The Uninformed, but the main reason they burn waste is that they don't have access to waste collection or part of their waste gets rejected.** It is integrated mostly by young males living in rural areas. In the experiment, they choose not to suggest anything and are averse of responding that burning waste is illegal. They do not think it is important to stop burning waste in Laos as much as the other personas.

**The focus should be on bringing access and information on waste management alternatives and benefits of not burning waste.**



## The Follow Your Neighbor 4% of the sample

**They are influenced by social norms, and report burning because family and friends do it.** It is integrated by young people, living in large households (>5 persons), in the rural areas with low education level. In the experiment they do not have a suggestion. They commit to compost but not recycle and did not implement any of them. They also burn waste weekly.

**The government team should focus on highlighting other groups' (such as the No-Burners) positive behaviors in terms of waste management, and make it accessible to these personas, in order to influence them.**



## The Money Mindful 10% of the sample

**They burn waste because they do not want to pay collection fees or are not able to pay them. It is integrated mostly by young, female, living in rural areas.** In the experiment, they don't have a suggestion as much as the other personas. Only five percent think that burning waste in Laos is bad for health, similar to all the other personas. They commit to compost but not recycle and did not implement them.

**The focus should be on providing information about the costs, emphasizing savings, personal and social benefit of waste collection services. Make more salient comparison between service costs and monetary, health and social costs of burning waste.**





# FINAL RECOMMENDATIONS

Our recommendations are based on strategies that have been applied and tested in different contexts and are recommended for Lao PDR in light of the survey results:

## How to communicate with people:

01. Leverage positive emotions and social norms: Taking care of the environment, one's community, home or health, can be a strong motivator for behavioral change. Make use of The No-Burners to highlight new social norms.

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02. Tailor messages to each persona bearing into account their preferences and beliefs (see table 1). Each persona has different access to the waste collection system and their influences and attitudes differ. Personalizing the communication on how to manage with waste can increase the probability of having the desired impact.

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03. Focus on the benefits of not burning waste. Results show many people do not know about the personal costs of burning, and the alternative behaviors that can replace the habit of burning. Communications should emphasize the benefits of recycling, reusing and composting.

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**Table 1: How to design communications for the different *Personas*, so communications and policies can be effectively targeted.**

	The No-Burners	The Uninformed	The Ones Who Need Access +	The Follow Your Neighbor	The Money Mindful
<b>Communication design elements</b>					
Facts about burning waste	●	●	●	●	●
Social norms				●	
Helping others in their communities	●				
Information about composting	●			●	●
Information about recycling		●	●	●	●
Information about reusing	●			●	
How to properly use waste collection system		●	●		
Cost-benefit analysis		●			●
<b>Non communication solutions</b>					
Improve waste collection access			●		
Better collection times and points of service	●		●		
Communal composting sites	●			●	●
Cheaper service					●
Fines (low priority)			●		●

## Recommendations of the waste collection service in general:

01. Improve access to the waste collection system and composting sites, especially in rural areas.  

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02. Improve frequency and points of service of the collection service where the system is already working.  

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03. Refine fees model. People will pay for the service when they believe the fee reflects the quality of the service.  

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04. Revise Waste Collection service practices. Waste management is a systemic issue that has to be solved in a systemic way. Private companies in waste collection, as well as start-ups that focus on sustainable alternatives, should be brought to the table to guarantee that the point of view of every stakeholder is included in the discussion.  

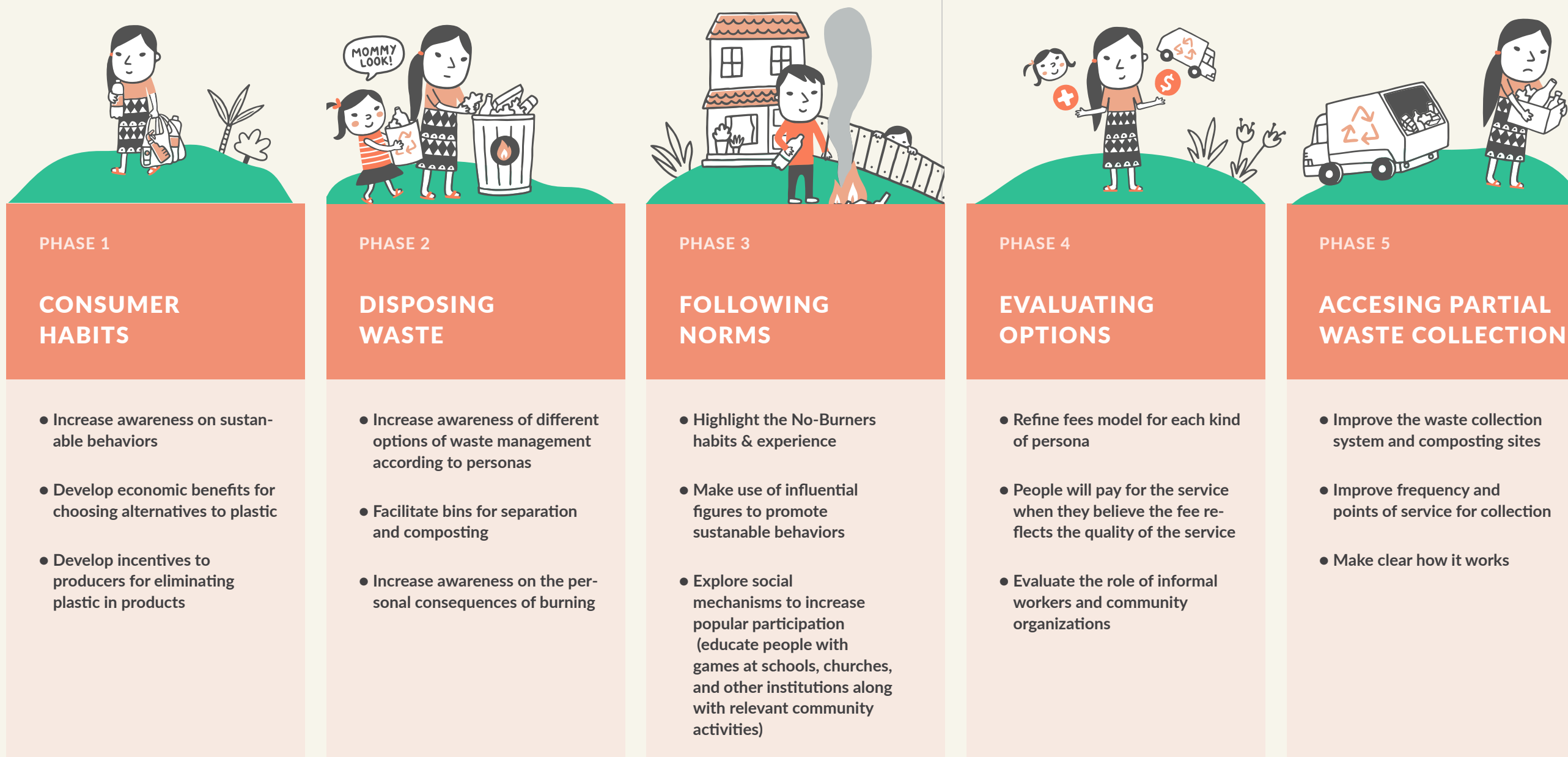
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05. Explore social mechanisms to increase popular participation (educate people with games at schools, churches, and other institutions along with relevant community activities).  

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## The recommendations and the journey

As seen in this report, this study found that different groups emerge in terms of access to the waste collection system and the reasons they do not use it and they burn their waste. Our research highlights an important opportunity: most people commit to stop burning waste and implementing good practices for waste management. In general, people are aware of the consequences of burning waste, but lack alternatives to do otherwise. Messages may be able to modify some behaviors but other actions such as improving the waste collection system and providing alternative options to manage waste are essential.



## ABOUT eMBeD

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The Mind, Behavior, and Development Unit (eMBeD), the World Bank's behavioral science team in the Poverty and Equity Global Practice, works closely with project teams, governments, and other partners to diagnose, design, and evaluate behaviorally informed interventions. By collaborating with a worldwide network of scientists and practitioners, the eMBeD team provides answers to important economic and social questions and contributes to the global effort to eliminate poverty and enhance equity.