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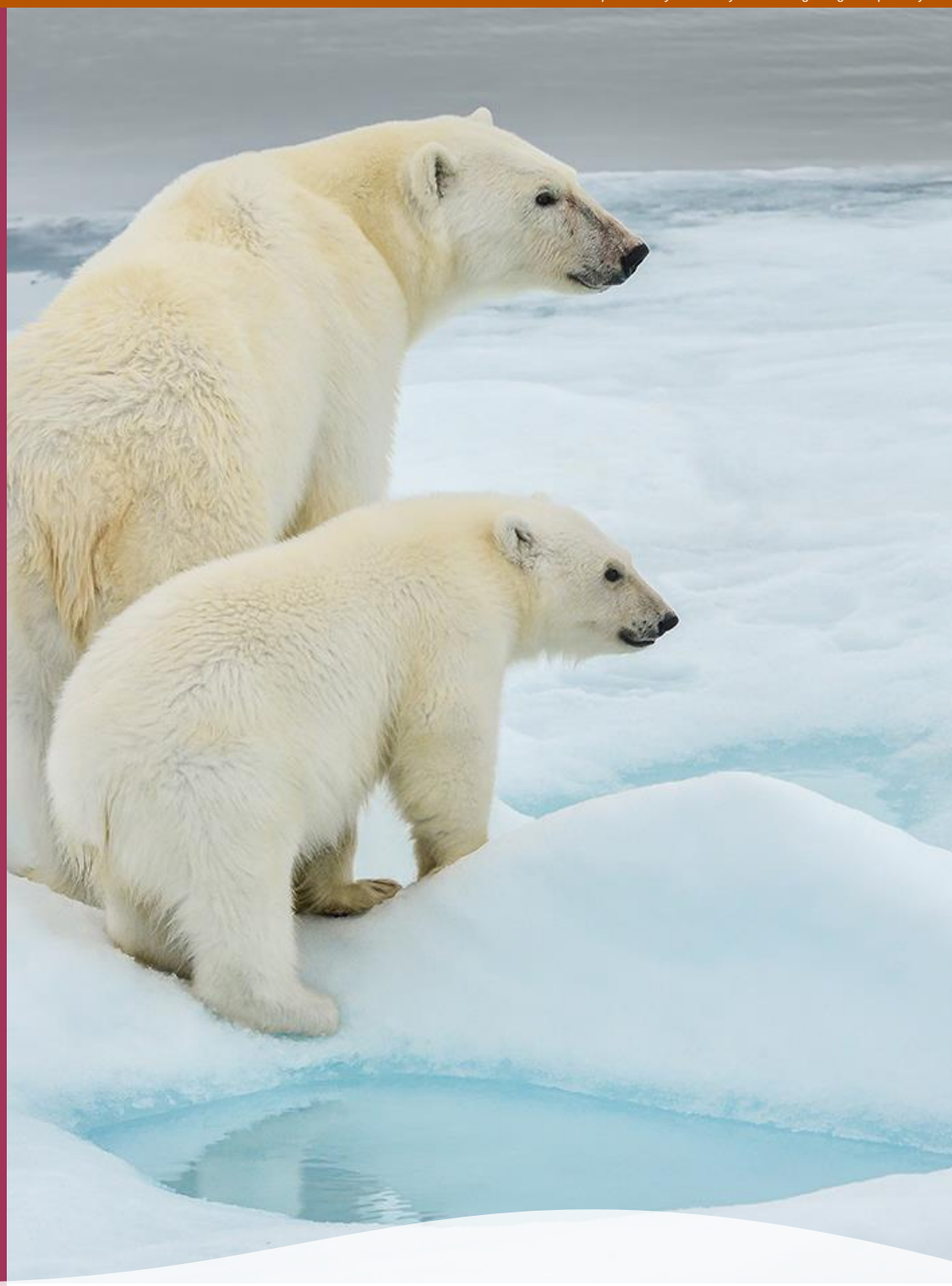

05/2021

BEHAVIOURAL SCIENCE, DECISION MAKING AND CLIMATE INVESTMENTS

Emma De Roy, Chaning Jang, Cornelius Krüger, Mathilde Lugger, Fatima Moussas, Wairimu Muthike, Alina Ojha, Nathanial Peterson, Martin Prowse, Dhwani Yagnaraman and Jyotsna Puri

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Behavioural science, decision making and climate investments

Emma De Roy, Chaning Jang, Cornelius Krüger, Mathilde Lugger, Fatima Moussas, Wairimu Muthike, Alina Ojha, Nathanial Peterson, Martin Prowse, Dhwani Yagnaraman and Jyotsna Puri

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About this IEU Learning Paper

This paper builds a bridge between how climate interventions are conceived and implemented and the nascent field of behavioural science as a practical, low-cost but potentially rewarding route for increasing the effectiveness of climate interventions.

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ABSTRACT

This paper seeks to build a bridge between how climate interventions, especially adaptation interventions, are conceived and implemented, and the nascent field of behavioural science as a practical, low-cost but potentially rewarding route for increasing the last mile effectiveness of climate interventions. It has two parts: the first part offers a theoretical background and highlights why and how behavioural science can be used in climate interventions. This first part describes behavioural biases and heuristics, summarises how behavioural science generates data including through the use of lab experiments, introduces decision theory, including risk elicitation as a particularly promising approach to closing the intention-action gap. It describes both descriptive and prescriptive processes within decision theory. The second part illustrates how such approaches can be applied using a range of case studies. It offers a fine-grained assessment of how behavioural insights can be integrated more fully in four existing GCF projects. It subsequently offers examples, one on climate insurance in Malawi and Zambia and one on climate resilient agriculture interventions in Nigeria, to highlight how project interventions need to be carefully tailored to the social context in which they are embedded. Simple guidance tools to conduct early, formative investigations into the dispositional, social and cognitive factors that underpin decision-making may be used to improve the effectiveness and efficiency of climate interventions.

A. INTRODUCTION

Until the 1990s, little attention was paid to the environment within economics. This was partly due to a belief in an environmental Kuznets curve: at the early stages of the growth process and increases in income, citizens and policymakers view pollution as an acceptable side effect and environmental damage, especially of common pool resources, is tolerated. It is only at the later stages of structural change, when incomes sufficiently rise to meet basic and supplementary needs, that priorities change and citizens and policymakers start to place greater value on the environment, including the air that citizens breathe and the water they drink. Rates of environmental harm then start to decline.

Such a view might be acceptable if all forms of pollution only had short-term costs solely within national boundaries: then, it may be the case that a majority of citizens would view pollution as a price worth paying for higher incomes, better healthcare, improved infrastructure and better schools for their children and grandchildren. But not all pollutants are like this. As Arrow et. al (1995) pointed out over a quarter of a century ago, some pollutants, such as greenhouse gases, have long-term costs, can lead to non-linear changes, leak across national boundaries and ignore future generations. Managing such pollutants, including greenhouse gases, requires a way of managing the global commons through the provision of global public goods. But this is more easily said than done due to four interlinked reasons.

First, sovereignty. Nations, whether of democratic or autocratic flavours, do not easily accept constraints on activities and choices within sovereign territory. Second, differing preferences and priorities. Some nations have considerable assets within the current energy mainstream: shifting from a brown to green economy challenges vested interests, which resists forms of change. In addition, whilst some nations such as low-lying and small island states are particularly exposed to climate impacts (through sea-level rise from both ice melt and thermal expansion), other nations, such as those at high latitudes, may see an increase in agricultural potential through changing contours of permafrost and seasonality. Third, the free-rider problem. Why incur the costs of mitigation when others can do it and you can carry on with business-as-usual? Fourth, the weakest link and summation problems intertwined. Whilst all countries can sign up to a global institutional architecture for mitigation, it only takes one or two large emitters to renege on their commitments to undermine the progress made by others. As a result, despite the intricacies of the Kyoto Protocol with its cap-and-trade flexibility mechanisms and the progress made since the Paris Agreement with Nationally Determined Contributions, we are heading towards a much more uncertain world without radical change. Furthermore, the scope of the change required is significantly greater than the public sector can manage.

A relatively new and underappreciated approach to tackling climate change is based on behavioural science. This has emerged over recent decades as a way of accounting for discrepancies between neoclassical economic models and actual human behaviour. Since the early work of Tversky and Kahneman (1974), behavioural insights have been applied to many social issues, including environmental conservation (Goldstein et al., 2008). This body of work sits at the cross-section of several disciplines and has emerged as one of the most promising areas for improving public policy. However, its application within climate interventions is relatively nascent.

Despite a desire for optimal decision-making, people are often constrained by their cognitive limitations (Simon, 1956). Behavioural science attempts to understand predictable irrationalities underpinning human decision-making which oscillates between two autonomous systems of thinking. The first system produces quick and intuitive (unconscious) choices, while the second encourages (conscious) methodical decisions (Kahneman, 2011). The ease with which the first

system operates, coupled with inherent limitations of rationality, perpetuates reliance on semi-automatic yet sub optimal choices. All individuals rely on these cognitive biases (termed heuristics in the literature) when making decisions.

Numerous external factors influence decisions, including an individual's beliefs and motivations as well as their surrounding environment and the social norms to which they're subject (Behavioural Insights Team, 2013; Bryan et al., 2013; Hobbs et al., 2016; Thornton, 2008). These factors may encourage decisions that deviate from rational expectations of economic models. Understanding the limitations and failings of rational behaviour – including the context in which behaviours take place – can help researchers apply behavioural insights. Ultimately, this knowledge can be used to both guide (i.e. nudge) and improve (i.e. boost) decision-making competencies (Benhassine et al., 2015; Thaler & Sunstein, 2008; Grover et al., 2018).

As Krüger and Puri (2020) argue that using behavioural science approaches in climate change is especially important if challenges in climate initiatives are to be dealt with. Climate change interventions most frequently require changes in the "last mile" of their interventions. This is because most climate change related interventions must deal with two important considerations. First, the constant presence of uncertainty which plays a very important role in decision-making. Second, in almost all cases, there is a change in behaviour that is required either at the individual level or at the institutional level. Most programming so far has assumed that training and knowledge will help bring about a change in "practices." However, according to Krüger and Puri (2020), this is far from certain. So far, despite the cross-disciplinary application of behavioural science and its potential for influencing the effectiveness of most initiatives globally, most research operates in western, educated, industrialised, rich and democratic (WEIRD) countries (Arnett, 2008; Henrich et al., 2010). This is problematic when considering that applications of this research often take place in diametrically distinct contexts in which individuals have divergent social, cultural, and political ideologies (Henrich et al., 2010). Indeed, principles of behavioural science from developed countries must be appropriately translated to developing country contexts in order to be relevant.

AN OVERVIEW OF THE PAPER

This paper seeks to build a bridge between how climate interventions are conceived and implemented, and the nascent field of behavioural science as a practical, low-cost but potentially rewarding route for increasing the last mile effectiveness of climate interventions. It has two parts: the first part offers a theoretical background and highlights why and how behavioural science can be used to mitigate some of the effectiveness and efficacy challenges of adaptation interventions in developing countries. This first part consists of the following four sections. Section 1 describes behavioural biases and heuristics in depth. Second, we summarise how behavioural science generates data including through the use of lab experiments. The third section focuses on decision theory, including risk elicitation, which is one aspect of behavioural science that shows particular promise in relation to reducing the intention-action gap. Fourth, we then describe both descriptive and prescriptive processes within decision theory.

The second part of the paper illustrates these methods and how they are applied using a range of case studies. First, it offers a fine-grained assessment of how behavioural insights can be integrated more fully four existing Green Climate Fund (GCF) projects. It subsequently offers two case studies, one on climate insurance in Malawi and Zambia and one on climate resilient agriculture interventions in Nigeria. The paper concludes by highlighting how embedding behavioural insights into interventions requires project interventions need to be carefully tailored to the social context in which they are embedded. In this respect, early, formative investigations into the dispositional,

social and cognitive factors that underpin decision-making may be used to help design climate interventions. We now turn to the theoretical and conceptual background of behavioural science.

B. PART ONE: A THEORETICAL BACKGROUND

1. BIASES AND HEURISTICS

We start with biases and heuristics. These describe how humans deviate systematically from perfectly rational judgments and decision-making. A bias is a systematic error in thinking. It can either be the result of an error in processing information or be based on a self-serving motivation. Heuristics, on the other hand, are cognitive shortcuts that simplify decisions, especially under uncertainty. Heuristics are not a form of optimization. Instead, they look for an option that appears to be good enough, thereby minimising computational effort. Therefore, heuristics can also lead to cognitive biases.

The list of catalogued biases and heuristics is too expansive to be covered within the scope of this paper. However, most of them share the feature of attempting to replace a complicated question with an easy one. We now explain a few biases and heuristics that we consider important in the context of climate projects. First, the availability heuristic is where information that readily comes to mind is utilised to make a decision rather than using a comprehensive set of facts that evaluates all options. This explains why people's beliefs in climate change are, in part, influenced by the recent weather, instead of taking into account the changes in temperature over the past years (Egan and Mullin, 2012). Second, the anchoring effect shows how people are heavily influenced by the first piece of information they receive, even if it is completely irrelevant to the decision at hand. Third, the affect heuristic describes the tendency of individuals to base their decisions on emotional reactions to an option, rather than conscious deliberation (Finucane et al. 2000). Fourth, present bias is the tendency of individuals to prefer immediate gains, even if foregoing greater gains in the future. In behavioural economics, it is often referred to as hyperbolic discounting after a type of utility function that models this phenomenon. Lastly, framing is the presentation of a choice with a focus on either positive or negative aspects that result in differing responses. For example, stronger support for emission reduction policies can be garnered when the costs were framed as "foregone gains" rather than "losses" (Hurlstone et al. 2014). Behavioural scientists have developed a menu of methods to uncover these and other psychological traits which we turn to now.

2. HOW DO BEHAVIOURAL SCIENTISTS GENERATE DATA?

Whilst applied behavioural science often relies on field experiments and evaluating the causal effect of interventions (such as nudges or boosts), games through lab experiments are often used to isolate key mechanisms of interest, particularly through attention to preferences. These are important concepts that help us choose between competing options given the constraints and tradeoffs that we face. The most common behaviour science experiments can be broken down into three categories. The first category includes those that are concerned with time preferences; in other words, how much we value things today versus tomorrow. This is fundamental in daily decision-making. Time consistency and inconsistency are key concepts that make decisions vary from person to person mainly due to present bias, as discussed above.

The second category involves risk preferences. These experiments examine the extent to which people are willing to take risks and help classify people into three categories: those who are risk averse, risk neutral and risk loving. Several methods are used to measure risk preferences including questionnaires, multiple price lists and the Eckel Grossman method.

Within the third category, experiments often examine social preferences that concern other-regarding preferences such as altruism, fairness, trust and reciprocity. There are countless social preference experiments and we introduce four of the most common types here. The “dictator game” measures altruism by measuring how individuals split an endowment with another. The typical finding in this game is that individuals will on average transfer around 20% of the endowment. The “ultimatum game” measures both gifting and acceptance by assessing the proposer’s fairness (in terms of the proportion of an endowment gifted) and the responder’s inequity aversion (whether the gifted amount is accepted). A typical outcome is that the proposer offers between 20-50% while the responder usually rejects offers below 20%.

Third, is the trust experiment. This measures the proposer’s trust and the responder’s trustworthiness/reciprocity. Typically, the proposer offers around 50% of an endowment with the responder’s repayment rate usually very similar at around 50%. Fourth, the public goods experiment; an example being the provision of global public good climate mitigation as explained in the introduction. This measures altruism, fairness preferences and conditional reciprocity. It is a standard in experimental economics. In essence, subjects choose how many of their private tokens will be put into a public pot. The tokens in this pot are then multiplied by a factor (greater than one and less than the number of players) and this "public good" payoff is evenly divided among players. These games illustrate the types of methods used in behavioural science to assess trust, preferences and underlying heuristics and biases. We now turn to the third section of Part One of the paper which focuses on decision theory, including risk elicitation.

3. DECISION THEORY

Decision theory studies the reasoning underlying agents’ choices. Whereas the rational approach assumes that managers operate logically and rationally, the behavioural approach to decision-making acknowledges the important role of human behaviour in the decision-making process. One crucial concept in decision theory is that decision makers operate with bounded rationality which causes a deviation from perfect rationality assumed in neo-classical models. Bounded rationality suggests that although individuals may seek the best solution to a problem, given their limited computational capabilities and the complexity of the environment, information processing demands and generating the optimal solutions are beyond the capabilities of most decision makers. Decision-making is bounded by a four-part process: desire, intention, action and outcomes. Intention is a necessary precondition for, but seldom guarantees, behaviour change (Sheeran, 2002). As discussed above, the failure to follow through on intended actions is manifested in the intention-behaviour gap (Sheeran, 2002).

Three key central elements of decision theory include judgements, preferences and choices. Judgements help predict outcomes when different choices are made and (similarly to preferences) can be evaluated on the basis of accuracy or consistency. Accuracy refers to how well people understand the world around them and can be assessed by ascertaining knowledge, calibrating findings and then pooling results. Consistency refers to describing observed behaviours often under the assumption that decision-making agents are behaving under consistent rules. However, since agents usually think about tasks in fundamentally different ways, several methods are often used to balance questions, such as using triangulation as well as multiple and open-ended tasks.

The second key element of decision theory, preferences, describes attitudes towards an object or a set of objects. It involves weighting the importance of choices based on how desirable they are (and is also assessed in terms of accuracy and consistency). Choices, the third element of decision theory, involve a combination of judgements and preferences to make decisions. Experiments (which isolate

the influence of one factor) and modelling (which considers the importance of a range of factors) are two complementary approaches that are used to study how people make decisions.

Decision-making operates under both uncertainty and risk, with the latter reflecting the probability of an adverse event (Reisinger & Mavondo, 2006). An individual's understanding of a risk, their risk preferences, risk perceptions and the interaction of these factors are likely to govern their choices and promote or impede action. Risk preference denotes the extent to which an individual can tolerate risk. It is a multidimensional construct (Wilson et al., 2019), often predicated on the subjective severity of an event's perceived consequences (Slovic et al., 2004). Numerous factors influence risk perception, including the salience of the perceived risk, its likelihood, familiarity, timing and perceived control (McCright & Dunlap, 2011; Slovic et al., 1981; Sunstein, 2003; Sunstein, 2007). Collectively, judgements of perceived risk have strong influences on individual behaviour, or lack thereof (Spence et al., 2011). Subjective risk perceptions must be married with objective probabilities of risk, which often disregard affective components of decision-making (Wilson et al., 2019).

Numerous measurement tools are available to assess risk perception and preference, which differ markedly in their complexity. Risk preference elicitations may include open-ended questions about risk-taking proclivity, or through tasks in which participants are forced to make decisions under variable probabilities of success and failure (reviewed in Charness et al., 2013). Risk perception measures include generic elicitations to cognitive risk appraisals or affective measures (Wilson et al., 2019). The context under consideration as well as the prevailing aims of the researchers are likely to govern the most appropriate elicitation method. We now turn to the fourth section of the paper which focuses on descriptive and prescriptive decision-making processes.

4. DESCRIPTIVE AND PRESCRIPTIVE DECISION-MAKING PROCESSES WITHIN GROUP DECISION-MAKING

Three types of decision-making frameworks currently dominate the literature: normative, descriptive and prescriptive (Bell et al., 1988; Keller, 1989). Normative decision analysis provides an abstract notion of how ideal people behave and act. However, and as we have seen, individuals often deviate from rational decision-making. Both descriptive and prescriptive models are intimately tied to normative frameworks and attempt to increase their realism by considering real human behaviour. Descriptive decision theory explains departures from normative models and may uncover consistent decision-making biases (Bell et al., 1988; Keller, 1989). A prescriptive approach leverages these biases and offers insights as to how decision-making can be improved to counteract their influence (Bell et al., 1988; Keller, 1989). Understanding the motivations behind (in)action can subsequently enhance individuals' decision-making competencies across a range of circumstances. For example, these insights allow us a better understanding of the important decisions that have to be taken by groups (especially those with diverse members). In the context of climate interventions, a project team may consist of experts from relevant sectors, a financial planner, a gender analyst, a risk specialist and a project manager. These individuals may come from different countries or regions and bring their own set of socio-biographical characteristics, technical skills and competences and experiences to the table.[1] In addition to individual biases and heuristics, these teams face two main challenges from a decision theory perspective.

First, the team needs to make judgements on relevant parameters for project planning and expected developments in the project context. Good judgements are gauged against two gold standards. The first standard is coherence, which is the degree to which judgements are consistent with logical or

[1] In this respect, team diversity within a developing country also plays an important role here.

axiomatic principles. The second standard is correspondence, which refers to the degree to which judgements agree with empirical observations. One way to increase group forecasting is through training in reasoning, such as basic probability concepts and the importance to clearly define the objective and timeframe of the forecast. Confidence quizzes can help group members reflect on how much they actually know and what remains uncertain. Finally, there are several methods to counter biases such as making group members aware of specific errors in judgement such as over-confidence or encouraging group members to learn about reasoning strategies that help identify and circumvent biases. Further examples include ensuring groups receive feedback on their judgement strategies as well as providing groups with structured information in a way that facilitates interpretation.

The second main challenge for group decision-making consists of bringing together information from team members with different backgrounds and fields of expertise. Teams with task-relevant abilities have a higher potential to perform compared to teams composed of generalists. However, integrating experts into a team can create social dynamics that compromise team performance. Teams including experts may focus too much on the perspective of the "expert" members, failing to combine information effectively or even omitting pieces of critical information. Effective collaboration, therefore, requires a sound strategy for coordinating and integrating the work of team members. Another challenge, regardless of the presence of experts, is the possibility of representational gaps. Coming from different backgrounds, people have a different understanding of the team's strengths and weaknesses, even when using the same language.[2]

This need for effective collaboration of multi-stakeholder groups is particularly important within the GCF's business model. The Fund delivers climate finance through approved projects submitted by accredited entities and which have met the approval of national authorities. Both proposals and entities are subject to strict due diligence procedures. Implementation on the ground is conducted by executing entities who are contracted by the accredited entities. Project management and implementation teams are therefore composed of a wide range of actors. This is especially the case for adaptation projects which often tackle the constraints that beneficiaries face across a range of sectors and scales. Adaptation tends to have more complicated governance systems and are harder to implement and evaluate than mitigation projects (Binet et al, 2021). Effective collaboration and closing representational gaps are particularly important here, but is reliant on a willingness to learn by team members and sufficient psychological safety such that members are motivated to understand each other. We now turn to part two of the paper which offers examples from four GCF projects on how project developers and implementors can utilize the insights of behavioural science. Four more examples are included in the annexes.

C. Part two: Applying behavioural insights in eight GCF projects

Many GCF projects engage a wide range of stakeholders and share an emphasis on training, risk management and long-term delivery of the project intervention. Balancing these aspects can be challenging, given the behavioural barriers relevant stakeholders are prone to at every stage of the projects. The assessment of four current GCF projects detailed below highlight seven key behavioural barriers, some of which were introduced to the reader above.

Intention-action gap: Training and planning sessions are effective ways to directly work with communities and expose them to new information. However, they may not be the most effective

[2] Practice followed by reflection can lead to better learning outcomes here than transmission models of explanation and instruction.

way for individuals to apply that knowledge in their daily activities. It is quite likely that participating in training and workshops will generate interest and create the intention to change their own practices. However, it is much less likely that this will lead to action. In order to overcome this barrier, it is vital that the training is easily applicable and there is some form of accountability or contact over the following months to translate the momentum into something actionable.

Present bias: Projects as well as climate change mitigation and adaptation in general, function over multiple-year horizons. Coupling this with the high risk and uncertainty regarding food security, livelihood and income generation, and natural disasters that many of the projects' beneficiaries are vulnerable to beneficiaries will often make decisions focusing on short-term instead of long-term needs. This could lead to low uptake of climate resilient methods or a desire to divert income from resilient investments towards essential purchases or immediate needs. Moreover, it is challenging to see the value of a long-term intangible investment in the present. This may exacerbate the hyperbolic discounting or present bias displayed by target beneficiaries. Further complicating matters for smallholders is the incredible amount of uncertainty and ambiguity in prospective risks. Will there be locusts, drought, government price intervention or input shortfalls that drive up prices? To what extent are mitigation interventions relevant for the here-and-now or do beneficiaries see these as far removed from present needs? All of these questions make the long term not just further away in time, but further away in certainty, making short-run thinking all the more comfortable.

Loss aversion: In line with hyperbolic discounting, farmers and other key stakeholders will face the behavioural barrier of loss aversion each season. Investments in inputs are often thought of as an investment in growth. Farmers typically prefer this mindset, thinking of a bumper harvest and meeting their various financial obligations, such as their children's schooling fees. Taking a loss frame would likely mean investment in loss-prevention and mitigation mechanisms, such as insurance, irrigation, post-harvest storage and vaccination regimens. Loss framing and the resultant loss aversion reaction would likely be quite adaptive, but focusing on losses can also seem harsh when a family depends on meeting immediate needs through increasing or at least maintaining productivity. Furthermore, putting farmers in a loss frame of mind can even reduce willingness to invest in inputs in the first place. For this reason, it is important to understand exactly where to flip thinking from an investment and gains perspective to a loss aversion perspective.

Self-efficacy and identity: For vulnerable and indigenous communities that have been steeped in traditional ways of conducting activities, changes in their methods of working may not be easily accepted. A strong sense of community identity and togetherness may cause resistance to adopting new methods of cultivation or resource management. The associated identity and its spillover effects can also take the form of social norms, which greatly impact how people interact with one another and update their own belief system. Many farming practices are based on customary practices, so individuals may not perceive themselves as effective individuals with regard to implementing new technologies and practices. Therefore, self-efficiency could be promoted for individuals who wish to challenge and change social norms and set a new example for their community. Alternatively, adoption of new methods can be promoted through clear communication which stresses the responsibility of the collective to evolve and shape responses to future challenges (which is framed appropriately through local messengers).

Groupthink: Projects often require the coordination and interplay of multiple stakeholders, such as ministries, local administration and community-based organizations. As each organization has its own domain of expertise and incentives, they might find it challenging to think laterally or critically about new domains of the problem they are attempting to solve together. This may pose issues when multiple stakeholders work together and are unable to see one another's point of view. This is

especially important for collaborative projects that need to accommodate the needs of diverse and vulnerable populations.[3]

Cognitive overload: Projects frequently have a component for capacity building. While training sessions and workshops are extremely efficient methods of disseminating knowledge, they can sometimes overload people with too much information. People tend to become overwhelmed by large amounts of information, especially if they don't find the information relevant and applicable. This differs between developing contexts especially when information is not presented in a manner that is tailored to the audience. Cognitive overload can lead people to delay or not take action, especially when the communication style is not conducive for learning.

Intrinsic and extrinsic motivation: Projects often have components of technical capacity building to some degree. It is important to consider how training can change people's intrinsic and extrinsic motivation to apply and engage with new knowledge. Projects should try to target stakeholders' intrinsic motivation as this can be a sustainable way to encourage new desired behaviours even after the project ends.

These barriers may potentially impede projects by affecting the uptake and adherence of project activities, which will have rippling effects for forthcoming and interconnected components. The following four examples illustrate key areas where behavioural science can be incorporated within eight GCF projects. It is worth noting that the highlighted areas will require some formative research into the exact behavioural barriers at play before a solution or intervention can be devised. Nevertheless, the areas highlighted represent aspects of the project where the potential exists to dive deeper and explore the behaviours of individuals and groups. For readers who wish to see further examples, Appendix 1 holds four further examples.[4]

1. SAP007: Integrated climate risk management for food security and livelihoods in Zimbabwe

A key part of SAP007 is developing and sharing an insurance product with vulnerable farmers in the Rushinga and Masvingo districts. This project has already considered the local context and knowledge that could have a great impact on how the insurance product is developed and shaped by incorporating consultations with stakeholders, key personnel and communities. This will go a long way in ensuring that the insurance product providers understand the context it is expected to work in. However, it is worth noting that the target beneficiaries of these regions face cognitive bandwidth issues, especially in times of great stress or risk. It is highly likely that the farmers will be unable or unwilling to rationalise parting with cash towards insurance even though it should benefit them in the long run. Moreover, given that agricultural yields are stagnating, it may not be possible for them to make this investment at all.

New agricultural products are prone to challenges in uptake (Busara, 2018). To ensure that this project does not face similar barriers, we recommend conducting a short, formative research exercise that understands the risk profile of potential consumers and how they may react to the insurance. This can be done through 15-20 in-depth interviews or by using lab games that allow you to capture risk and the prioritisation of different financial decisions. Insurance bundled with other agricultural products such as seeds or fertiliser may be more appealing or viable to farmers. Another way to ensure that the insurance is more accessible is to allow purchase through in-kind or a part of the yield. Ensuring that there is adequate uptake of insurance is a key component of this project and

[3] See the work of the New Economics Foundation on groupthink
[4] The projects described in Appendix 1 are: FP118 Building a resilient Churia region in Nepal; FP076 Climate friendly agribusiness value Chains sector project; SAP008 Extended community climate change project-flood; SAP011 Climate-resilient food security for women and men smallholders in Mozambique through integrated risk management.

will not only determine its success but also the ability of the project to incorporate an evaluation of adequate power and sample.

Another key component of the project includes creating risk plans and committing to them. This already makes use of the behavioural science concept of "hot-cold empathy gaps," where people underestimate the effect of being in a visceral state such as anger, hunger or fear, on their behaviours or preferences (Lowenstein, 2005). By creating plans in the "cold" state, the project hopes to reduce the decisions made under the "hot" state. While this is a promising step towards improving outcomes during climate-induced shocks, it may still be challenging for individuals or groups to stick to the decisions they made during the "cold" state. It may be worth considering how to make this pre-commitment salient and binding, keeping in mind a few extenuating circumstances under which the decision can be altered. This can be slightly challenging to implement but may lead to better outcomes for the project in the long run. However, it is worth acknowledging that financial stress and insecurity are challenging issues to deal with and require sensitivity in the time of crisis. Plans may need to be altered to accommodate the consequences of such events.

Dissemination of key information from national and local authorities to households forms a backbone of increasing resilience. This comprises two key elements that may be examined further. Firstly, the distribution channels selected will have to match the level of access individuals have. Secondly, the information ought to be conveyed in a way that provokes immediate action on the part of the receiver. There is a strong case to be made for testing different ways of phrasing the message through several channels in order to determine which ones work best for which populations. Given the scale of the project, it should be easy to randomise messages and channels across demographics. In recent years, behavioural segmentation has opened the doors to not just understanding how different demographics perceive and respond to an event, but also how their risk, trust and other behavioural makings play a role in their response (Fishbein and Ajzen, 2010). This can serve as a useful method of capturing detailed insights on different subgroups before considering the most appropriate intervention for them. For example, young women may need a different type of channel and messaging than an elderly couple.

This project mainly focuses on increasing food security within households. As an evaluation method is selected and developed, it may be useful to think about the best methods to measure this outcome of interest. While measuring agricultural yield and purchases made may seem quite straightforward, it could be challenging for households to recall and correctly share this information. In addition to collecting self-reported data, it would be helpful to make provisions to measure and weigh some of these outcomes. Tracking the flow of income and food within the household would be an ideal way of comparing the impact of the project year on year, possibly through diaries or other retrospective qualitative approaches.

2. FP116: Carbon sequestration through climate investment in forests and rangelands in the Kyrgyz Republic (CS-FOR)

One of the primary activities in the CS-FOR project is conducting training sessions and workshops on forest and rangeland management at both the national level by training those within the State Agency for environmental protection and forestry and at the local level by training 50 communities and institutions. The project is incorporating training of trainers to close the last mile gap here. This is a good approach, but there are some considerations to be mindful of.

First, it is important to remember that people have a limited mental capacity; that is, people can only process and retain so much information. The mental effort required to process vast amounts of technical details can often put people off and cause disengagement. Thus, if training sessions overwhelm people with too much complex information, then there is a risk of poor understanding

and hence, bad decision-making (or simply, a return to the status quo). Thus, the content of the training should largely be based on how and where the information would be applicable to the national and local stakeholders (BETA, 2019).

Second, it may also be important to consider the timing of these training sessions. For example, if you are conducting a training session for government employees in the closing week of a fiscal year, then they may suffer from decision fatigue and may not pay close attention to the training or its content. It is important to choose a time and setting that is conducive to learning and concentration to ensure an effective training session. Second, it may also be important to consider the timing of these training sessions. For example, if you are conducting a training session for government employees in the closing week of a fiscal year, then they may suffer from decision fatigue and may not pay close attention to the training or its content. Thus, it is important to consider if the designated trainer for these capacity building workshops is suitable and the right choice for the given audience. Moreover, another way to make training sessions effective is to make the content more visual: research suggests that visual images are easier for people to understand and to recall (Paivio et al, 1968).

This project also seeks to increase investment in pasture rehabilitation and livestock production. These activities involve rotational grazing and a contribution to carbon sequestration via planting trees in small areas on municipal pastures. This might be easy to monitor during the timeframe of the project due to the available budget and human resources to track these activities, but this will not be the case once the project ends. It is important for community members to adhere to these new practices; however, we know that this may not always be the case. Thus, the project should identify ways to ensure that project adherence is intact even after the project is ends. For example, projects can identify community leaders who can be put in charge of these programmes and will continue to rally for rotational grazing, even after the project wraps up. It may also be interesting to create social norms around them, so that people are expected to engage in activities by creating pressure for adherence in order to fit in society (Bhanot, 2018).

3. FP048: CLIMATE SMART AGRICULTURE RISK SHARING FACILITY FOR MICRO-, SMALL-, AND MEDIUM-SIZED ENTERPRISES

A significant part of the activities to be financed under the proposed risk sharing facility will be related to increasing crop resilience through improved agricultural technologies such as irrigation systems and resistant species. Research has shown that such adaptation decisions are influenced by a range of factors such as perception of climate change, farm, household, socio-economic, geographical and institutional factors (Pachauri et al., 2014). Some relevant factors include the age of the farmer, farm size, gender, access of credit facilities, years of education and non-farm income (Taruvinga, Visser, Zhou, 2016). Likewise, self-efficacy is important when contemplating whether to adopt new behaviour. Individuals are unlikely to take action unless they believe in their ability to produce an effect by their actions. Research has found that self-efficacy is a strong predictor of pro-environmental behaviours among farmers (Keshavarz and Karami, 2016). Thus, understanding farmers' preferences for adaptation strategies and the factors that influence their choices should be considered. Conducting formative research and/or a pilot is the most effective way to gather this information from the target population. This research will elicit insights into the barriers and motivators to farmers accessing and using these technologies that will help them cope and adapt to the threats of climate change.

This project identifies only certain types of activities as eligible for support from the risk sharing facility. To that end, it is important to understand social norms that may be influencing local stakeholders. For example, if others in the neighbourhood have been found ineligible, they may

mistakenly conclude they are too (BETA, 2019), or they may be less inclined to seek project assistance when no one else around them is seeking it.

In addition, the project also has a large component of capacity building for stakeholders. Technical capacity building exercises are an extremely useful tool to disseminate knowledge; however, the project should be mindful that people tend to become overwhelmed by large amounts of information. Such cognitive overload can lead people to delay or not take action (BETA, 2019). Likewise, farmers experiencing the extreme threats of climate change must make immediate decisions that affect their daily operations on the farm. There is a tendency among such individuals dealing with and experiencing scarcity to become engrossed in current issues and not look at the bigger picture, which can limit their ability to understand the long run effects of immediate decisions (Fleming et al., 2015). Hence, if information presented during these capacity building sessions is not seen as practical, easy to apply or relevant, individuals will become disengaged. People, in general, tend to engage with information only when it is relevant to them. Thus, the aforementioned formative research should also consider the content of capacity building sessions, collect feedback on what information would be relevant and essential, and identify the best ways to promote the application of this information in their day-to-day lives.

4. SAP010: MULTI-HAZARD IMPACT-BASED FORECASTING AND EARLY WARNING SYSTEM FOR THE PHILIPPINES

One of the key pillars of the multi-hazard impact-based forecasting and early warning system project is the broadcasting of clear and actionable information on upcoming climate-induced shocks. This information will be compiled through a number of robust and advanced forecasting techniques, which will ensure that the information shared is credible, accurate and backed by evidence. However, for the collected information to reduce socio-economic impacts, it not only must reach all local authorities, organizations and communities, but also must be lucid and simple enough to prompt action.

To effectively convey this information, the project needs to gain an understanding of risk. The perception of risk and uncertainty by individuals is a prominent topic of interest and expertise in behavioural science, from prospect theory (Kahneman and Tversky, 1979) to its integration into a number of fields today, including decision-making during times of disaster (Haer et al., 2019; Aerts et al., 2018). In addition to being loss averse, people find it challenging to accurately estimate low-probability events such as floods or cyclones, but are simultaneously influenced by the availability heuristic and threshold model heuristic, often neglecting risk if it is below a certain level or using their sharpest memory of similar events to shape how they perceive and respond to risk. It is also worth noting that people's risk profiles may vary over time and with different contexts, making all the more relevant the need for integrating an understanding of human behaviour into risk modelling (Haer et al., 2017). Understanding the risk profile of end users by studying how they make decisions under such circumstances or utilising proxy measures will provide a strong foundation on which communications can be framed and conveyed.

After accurately understanding and accounting for human perception of risk, the project will need to establish an effective system of dissemination, based on impact thresholds and actionable steps. The project has already taken measures to ensure that they are utilising a number of communication channels, including radio, television, door-to-door and internet-based avenues. It will be important to determine the efficacy of these channels during a natural disaster and ascertain whether they are the best modes of communication for this purpose. This can be done through sprints, requiring a response from end users or through formative research. More importantly, the nature of the communication must appeal to a number of different audiences, from local authorities to final-mile

communities. This can be done through a number of different techniques, such as simplification, checklists, framing of messages, different messengers and social norm nudges. It will be ideal to test different messages and alerts to best understand their effectiveness in prompting action.

Communities and community-based organizations constitute key levers of this project, having the potential to fully transform an individual's response and guide them towards a certain outcome (Cialdini et al., 1990; Schultz et al., 2007). Both descriptive norms, namely what others are doing around you, and injunctive norms, that is, what is expected of you, have been powerful tools of behavioural change in conservation and environmental behaviours (Bhanot, 2018). Creating community champions or priming individuals with the actions taken by others may help them make safer decisions during natural disasters. Communities can even work with NGOs and local administration to create community level interventions ahead of time, such as building an emergency food stock, creating a gathering place and securing passage in times of evacuation. Pre-committing to decisions during times of high risk, stress and uncertainty ensures that people are not making impulsive and circumstance-driven decisions during such times. Doing so at a community level can be even more powerful as individuals may be reluctant to break norms or guidelines that they themselves have set. This project balances rigorous scientific evidence with a people-centred approach to adaptation. To be even more successful in achieving its objectives, it would be ideal to think about how to intertwine the two domains further and incorporate an understanding of human behaviour and risk perception within the modelling and dissemination of disaster communication.

These cases highlight a range of entry points for behavioural interventions within existing GCF projects. The first case highlights the need for short, formative research to understand how consumers may react to a new insurance product, bundling this product or allowing payment in kind to increase uptake, creating risk plans and commitments, and the importance of understanding the distribution channels for information and testing what approach works best. The second case shows the need to recognise to threat of cognitive overload when conducting training sessions, alongside the timing and location of training events. Furthermore, the case also flags the vital role of the messenger when conveying information. Case number three reaffirms the importance of substantial, early formative research to understand farmers' preferences (and the factors that influence their choices) alongside the best medium for imparting information when building capacity. The case also highlights the importance of understanding social norms for the uptake of interventions. The final case considered here highlights the pivotal role for understanding the risk profile of end users, the importance of experimenting with the form of early warning communication alongside creating community champions to prime beneficiaries. We now turn to how these behavioural insights have been integrated within two adaptation interventions: the first on insurance and the second on climate resilient agriculture.[5] A further illustrative example on insurance is shown in Appendix 2.

D. Part three: Applying behavioural insights within private sector interventions

1. Case study one: Pula

The first applied example we offer here applies behavioural insights in the domain of agricultural insurance, an increasingly common form of adaptation intervention. The product in question was sold by Pula, a firm that uses insurance and digital products to help smallholder farmers endure climate risks, improve their farming practices and bolster their incomes over time. During the

[5] Readers can also turn to Appendix 2 which includes a further example of integrating behavioural insights within an insurance intervention.

2018/19 agricultural season in Malawi and Zambia, Pula used a referral system to try to overcome the intention-action gap to increase adoption of Pula-insured drought-resistant maize seed (the staple crop in both countries). Advice from behavioural scientists was sought to improve and optimize their farmer referral system as the last mile challenge was threatening firms 'margins. Specifically, behavioural scientists from Busara were engaged to analyse data on Pula's farmer referral system in Malawi and Zambia so that insights on farmer social networks and referrals could be assessed in a different African context, in Nigeria, before the following planting season.

The referral system was based on existing customers receiving a small airtime incentive and seed discount voucher to refer the product to one or more national mobile numbers (which were not validated beforehand). During the first half of the planting season in the two initial countries, sales of around 100,000 products led to just under 50,000 referrals (with each customer being able to refer the product multiple times). Just over three per cent of these referrals led to a purchase, a conversion rate of around three per cent. This figure is also a slight over-estimate as some of these customers would have purchased the product anyhow.

Based on consultations with Mercy Corps Agrifin Accelerate and Pula, Busara highlighted three hypotheses on the timing of referrals. First, that smallholder farmers usually wait until right before planting to buy seeds. Referrals should, therefore, be targeted to arrive just before the rains, to be salient when the majority makes their input choices. Second, that referral messages increase both knowledge and salience of the products but that this salience dissipates over time so referral messages are most effective exactly when customers are in a position to purchase. For example, in Zambia conversions were highest on Mondays which is often a market day in rural areas. And third, that farmers' ability to engage with the message varies throughout the day. The best times to engage farmers are when they are working on the farm, or, even better, on the way to purchase inputs.

Busara also hypothesised that the characteristics of the customer sending the referral were important. First, the conversion rate was much higher when referrals came from a customer who had bought more than 15kgs of maize seed. This suggests either that smallholders are more likely to trust recommendations from a well-heeled friend, or that these customers have wealthier friends who are in a better position to purchase the seed. Second, the most valuable referrals were to contacts in the same district but not in the same village or group of villages. The average distance from the customer to the recipient who received the recommendation and bought the product was around 75km in both countries (which have very different population densities). This is a very interesting finding that deserves further investigation.

Based on this data, Busara offered a range of suggestions to Pula in five areas. The first suggestion was based on the incentive structure; specifically, to use the rule of reciprocity to reward the most active agents in a referral programme. Since the data revealed that farmers making the largest purchases made the highest conversion referrals, Pula could provide a greater incentive, but could also implement a system in which the referral incentive was split between the (probably wealthier) farmer making the referral and the (possibly less wealthy) farmer they were referring. The pressures of time constraints could also be harnessed by encouraging the recipient of the recommendation to respond within a limited timeframe.

A key method for behavioural scientists to change behaviour is using non-monetary incentives because they are less expensive to implement. A typical way to do this is with social recognition. Especially in domains where trust is critical, such as insurance, potential new customers can become sceptical. Busara suggested that Pula could use non-monetary incentives to increase referrals by increasing public recognition of high-value referrers that could boost their reputation within the community. A further suggestion was a simple SMS to high-quality referrers to acknowledge their contribution, focusing on how much safer they have made their community.

Busara also made suggestions on situational targeting, which encouraged referrals at the point-of-sale as this drives salience of the product. The suggestions included sending messages to recent customers at the time of the delivery of their seed bags, when extension workers or input sales people visited their farms, or when new customers were registering their insurance products, to precipitate a referral.

Decision aids can also help improve conversion rates, especially those that keep referrals salient in the minds of customers, and goal setting can also yield more high-quality referrals. Busara's suggestions noted that at the point-of-sale or seed collection point, Pula could ask referrers to set goals and make a commitment to them. Another version of this nudge that was suggested by Busara was to encourage customers to think about why the insurance is valuable and to use these values to frame the referral message. For example, a purchaser with children might make a very effective referral by including messaging about protecting income that would help pay schooling fees. A third suggestion was an action-oriented message, providing information on seed pick up locations and times to encourage conversion.

The final area where Busara offered suggestions focused on the premise that group norms and conversations on insured seeds could improve demand, new information could address biases and false expectations on seed insurance, and people tended to share information that validated their purchases or perspectives. Two suggestions: 1) Pula could convey information on the insurance product to customers in a manner that would prompt them to share within their social networks; 2) A more elaborate suggestion was to include recent news articles on an insurance claim or climate risk that could encourage engaged sharing. Overall, the key suggestions that Busara made to Pula aimed to target particular market days, try a split-incentive referral system, leverage large-scale buyers and create awareness among the top customers who were making referrals.

For Pula, the first step for any of these suggestions would be to identify whether psychological mechanisms operated in this context as assumed. The second step would be to test interventions against each other. A third step would be to fully investigate underlying mechanisms in this context. For researchers, understanding mechanisms is often interesting and allows more confident intervention design, but it is also more expensive and often regarded as a luxury (if other research on this mechanism has already been done in that intellectual realm and/or specific context). Making this judgement is difficult and is best conducted as a structured discussion between the organization implementing the intervention and the organization(s) designing, monitoring and evaluating the intervention(s). We now turn to the examples from GCF projects on how project developers and implementors can utilise the insights of behavioural science within their project interventions.

2. CASE STUDY TWO: THRIVE AND ALLUVIAL AGRICULTURE

The third applied example we offer here applies behavioural insights in the domain of adopting climate resilient agriculture technologies among smallholder farmers, focusing on agriculture platforms such as Thrive Agric[6] and Alluvial Agriculture[7]. Thrive and Alluvial are agricultural platforms that provide access to affordable, high-quality fertiliser as a risk mitigating strategy as fertiliser helps farmers manage erosion if they apply it several times throughout the crop cultivation life cycle. Busara, in partnership with Acumen, posed a number of questions including: how did you get to know about these platforms, what attracted you to Thrive/Alluvial - to uncover the enablers

[6] Thrive Agric is an agricultural technology startup connecting Farmers with Access to Finance, Premium Markets and Data.

[7] Alluvial is an integrated farm business based in Nigeria that uses the best of modern technology and traditional methods, to deliver environmentally and socially sustainable farming that enriches the environment and uplifts our Communities.

and barriers to platform take up and use. With the responses, Busara identified a number of structural and behavioural enablers and barriers that hinder take up of climate resilience products.

Busara conducted a total of 36 in-depth interviews, focus group discussions and cognitive mapping exercises with users and potential users of Thrive and Alluvial. This formative qualitative research helped to explore the enablers and barriers that farmers experience along each step of their customer journey on both structural and behavioural factors. It helped to gauge farmers' baseline knowledge of climate change, and how they make climate-related decisions.

Busara identified some of the structural enablers and barriers such as infrastructure and platform offerings in which farmers have no direct control; whereas behavioural enablers and barriers include farmers' beliefs, perceptions and biases.

Using these insights, Busara distilled a farmer's experience with a platform such as Thrive/Alluvial into four distinct steps. The first step is "attract." This step encompasses how farmers learn of the platform, and why they initially found the platform to be either appealing or unappealing. The main behavioural enabler here was leveraging social networks to disseminate knowledge/awareness on the platform. However, a primary barrier is a widespread mistrust in agribusiness; thus, platforms should directly address the concerns that fuel this mistrust. The second step is "take up," which identifies how and why farmers sign up for the platform and their opinions/perceptions of the onboarding process. Both users and non-users agreed that the registration process has to be simple, quick and easy. The presence of any minor inconveniences can trigger procrastination or lead farmers to not follow through the registration process.

One of the major barriers here is perceived affordability when compared to other offerings. When asked to compare the cost of Thrive/Alluvial, farmers found it relatively inexpensive but as a standalone product, they believe that the registration fees can be prohibitive for many. The third step is "use," examining both the use of the platform as a whole and the individual products and services offered by the platform. There are several pain points in the platforms' offerings and operating models that pose barriers to usage. In general, people tend to prefer known risks and outcomes over the unknown, that is, farmers will accept some degree of risk, provided the risks are well-established. Thus, platforms should be mindful in providing training and demonstrations to encourage new technology adoption, allowing farmers to learn how the technology works as well as the potential risks involved in usage. The platform should also be easy to use to reduce any cognitive burden on people. The fourth and final step is "continued use;" whereby farmers choose whether to continue using the platform over extended periods of time.

The study further recommends that farmers highly value fertilisers and irrigation systems, and platforms should provide access to these two essential inputs to enable platform take up, use and continued use. As Busara uncovered during the cognitive mapping exercises, farmers frequently experience irregular rainfall and soil erosion, and they manage these challenges using irrigation and fertiliser, respectively. Therefore, irrigation systems and fertilisers are core components of farmers' current state climate change mitigation strategies, and they will likely seek out and use platforms that provide them with reliable, affordable access to these two inputs. Additionally, throughout the crop cultivation life cycle, farmers repeatedly water their crops and apply fertiliser, which may encourage continued use of the platforms' offerings over extended periods of time. To maximize both uptake and impact, platforms should promote the two products among their user base so their farmers are aware that these offerings are available. They should also offer training on proper usage, particularly for fertilisers, as misuse can exacerbate the effects of climate change by polluting water sources.

To stimulate demand for new services and technologies, platforms should educate farmers on climate change, which could increase not only the amount of time and money they are willing to

invest in solutions, but also the amount of risk they are willing to accept. Our focus group discussions and in-depth interviews revealed that farmers do not typically use some of the more innovative products and services that platforms offer, such as crop insurance and soil testing services. Moreover, in the current state, farmers implement a wide variety of mitigation strategies, but when explaining these strategies, there was a noticeable lack of discussion on most platform offerings, aside from fertiliser and drought-resistant seeds.

Farmers may not take up and use innovative platform offerings to manage climate change due to their limited understanding of climate change, and their mental models regarding how they make climate-related decisions are based on several inaccurate assumptions. For example, most farmers in our sample associate the term "climate change" with normal, seasonal weather changes, not climate shocks or atypical weather patterns, and they believe that the amount of vegetation in a given area causes irregular rainfall. If they gain a better understanding of the permanence and potential severity of climate change, they may overcome their ambiguity aversion and increase their willingness to invest in new, innovative solutions.

To educate farmers on climate change, platforms should leverage social networks to prevent potential issues caused by mistrust, which was cited by many farmers as a barrier to platform take up and use. The farmers in our sample were apprehensive of platforms with operating models similar to Thrive and Alluvial, as scammers have posed as field agents in the past and have stolen money from farmers. Therefore, farmers may not believe that the information coming directly from the platforms and field agents is real. Their most trusted sources of information are their friends and families, and thus, platforms should develop education and communication strategies centred on these close, personal connections.

Lastly, platforms must develop systems to guarantee on-time delivery, as late delivery of consumable inputs negatively impacts yields. Busara's findings on the farming life cycles show that farmers apply inputs such as fertilisers and herbicides multiple times and at key points during crop cultivation. Farmers depend on platforms for these inputs. If the seasons change, and platforms do not deliver these inputs between planting and harvest, farmers carry on with their activities without fertilisers or herbicides, which negatively impacts their yields. When their yields suffer, farmers drop-off the platforms, and even their neighbours choose not to join.

E. Discussion

Humans are an essential part of climate projects. The GCF work is no exception. Every stage, from conceptualisation to operationalisation, depends on human decisions and every stage is susceptible to different biases. Thus, various behavioural science insights and strategies that can account for such barriers can be considered by GCF projects. This conclusion discusses some key suggestions across the different stages of a project's life cycle. Some of these strategies are more applicable when projects are being planned, whereas others are more suitable for later stages.

1. Planning and conception of projects

For any project to be successful, it will need to be planned and conceptualised keeping in mind the various context-specific factors that may affect key outcomes. The aforementioned projects either require target populations to take up a climate resilient product or service, apply learnings from training and adhere to adaptive practices over time. For these changes to be applied effectively, it will be helpful to explore attitudes, perceptions and motivations of key stakeholders. This will ensure that the project goals resonate with the target population and foster cooperation over the duration of the project.

Formative research also provides an opportunity to understand potential beneficiaries. This includes how they might react to a new product or service, barriers to utilising an offered service, prevailing social norms around similar products, preconceived notions, and how challenging they believe switching from an existing service will be. These questions are important to understand the mechanisms which might persuade an individual from adhering to a product or service. This will, in turn, determine the effectiveness and impact of the intervention.

Ideally, GCF projects would include formative research at the concept note or proposal stage to tailor their programme to context-specific insights. Recommending or requiring formative research on pertinent behavioural patterns of target populations during or immediately after the concept note and then during the proposal stage would serve as a powerful way to incorporate this into GCF project proposals.

2. DEVELOPMENT OF PROJECTS

Formative research can provide a strong foundation for the development of projects by examining risk perceptions, information delivery, beliefs and other patterns in the target population. This knowledge will help inform accredited entities on ways to best deliver the intervention, product or service. For example, an important aspect of training is to identify the most appropriate trainer for the given audience. As demonstrated by the messenger effect, the person delivering the training is as important as the content of the training. If community members are being trained by a local NGO they are unfamiliar with, there might be very little to no impact, regardless of the value of the content. Other aspects of project development to consider include selecting the best methods of communicating risk while considering limited mental capacity and factoring self-efficacy and beliefs into how interventions will be developed and deployed. It will also be vital to utilise formative research and pilot testing to determine the optimal way to measure outcomes. Considering how to feasibly and accurately record impact can be challenging. An understanding of how beneficiary populations behave will inform the calibration of outcome measures and orient them towards revealed preferences rather than stated preferences. Piloting these outcome measures before or during the start of the project implementation will ensure that the most reliable impact measures are being used.

3. IMPLEMENTATION OF PROJECTS

All projects have some technical capacity building components within them, which are extremely important to disseminate information. However, conducting effective training is a difficult task and thus, the following insights from behavioural science can be considered. First, people have limited mental capacity and can only process and retain a finite amount of information. Trainings that inundate beneficiaries with technical details will cause disengagement. Ill-suited training may also hinder behaviour change. Only a few beneficiaries will be able to apply the new knowledge if it is complex and hard to apply. Second, in creating the training content, it is important to consider framing. The way messages are framed tends to greatly influence people and their decision to act. Framing is not simply messaging: it is a conceptual exercise that involves tying ideas into a comprehensive picture that makes it easier for people to organize information and gauge its relevance to their lives (Pickering et al., 2017). A simple way to ensure the relevance and applicability of training is to collect feedback and conduct follow-ups with participants.

To sustain the momentum of the training, projects should incentivise people to apply what they have learned to their lives. This could be as simple as identifying a group of people who could champion a cause in their community to providing financial reward to those who apply this knowledge and change their behaviour. Overcoming the intention-action gap is critical to a successful intervention.

It is essential to target people's intrinsic motivation as it is independent of any external forces and will last after the external motivation is taken away.

F. CONCLUSION

Climate change adaptation and mitigation requires our long-term commitment. Projects want people to engage with the new knowledge and products they have received long after the project team concludes their work and departs. To generate sustainable outcomes, projects should identify and leverage the power of community norms and pledges. Social norms can serve as a powerful tool to enforce positive change in attitudes, behaviours and mindset. Each of these projects should identify community leaders who are reliable, trustworthy and can champion a cause as big as this one. These leaders will rally their communities to adapt to climate smart technologies, seek climate smart investments and foster a culture of innovation.

To close, many challenges threatening environmental sustainability are rooted in human behaviour. To effectively usher in change, large-scale projects must first understand what motivates people and drives their behaviour and use that to shape project interventions and impacts. When it comes to advocacy and capacity building, projects can start by removing assumptions and preconceived notions about culture and context. It is important to recognise that people's perception of risks are highly influenced by their values and beliefs. As a result, the way in which climate risks are framed and the response they elicit can greatly influence the decision to act.

However, increasing the likelihood of success from GCF projects involves more than understanding the behaviour of beneficiaries. It also requires an understanding of the configuration of actors implementing the projects as well as the context that each of these actors are embedded in. As detailed above, project teams have many experts from different sectors with different skillsets and experiences often from very different countries. These teams need to understand how to work well together and to limit the role of biases and errors of judgement, to close representation gaps and encourage a willingness among team members to learn so that they're motivated to better understand each other and ensure more successful GCF projects.

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APPENDICES

Appendix 1. Illustrative areas where behavioural science can be incorporated within four GCF projects

FP118: Building a resilient Churia region in Nepal

A key part of the Building a Resilient Churia Region in Nepal is the development of training programmes for farmers. These training programmes not only teach farmers climate resilient practices, but also livestock rearing and adoption of agroforestry. Developing farmer schools to disseminate this information is a powerful way to close the last mile gap and make the training accessible. However, there are some fundamental assumptions in the notion that training will lead to the adoption of more resilient practices. This project assumes that farmers have the time and interest to attend, the financial means and willingness to adopt these practices, and that the measures are effective against shocks. These barriers may inhibit a well-designed training programme from achieving its objectives. These assumptions include both structural barriers of constrained resources and behavioural barriers of determination, status quo bias and availability. Tackling these problems may not be straightforward, given the time and resources that may need to be spent to pilot how a training session is received. As a result, it makes sense to consider these assumptions before the training is developed and disseminated. Methods of accounting for these assumptions include offering subsidies or compensation for attending, providing financial and technical support for those who adopt desired practices, and ensuring security for those willing to experiment.

Coupling the training with hands-on activities to apply the lessons learned or creating a system of assisting participants after the training may go a long way to translate the intention to adopt climate resilient practices to action. Providing loans to communities or subsidising the cost of adoption can also have a positive impact on adoption. It may be helpful from the project point of view to contact previous participants to see how they have been able to apply the training to their work and non-participants to understand why they did not attend the training programme.

Regarding the content of the training sessions themselves, there should be an emphasis on applicability. As the first and third components of the project rely on the successful delivery of training, it is important to collect feedback at every stage to improve the training. Ideally, this would take the form of short interviews with participants a few months after the training to understand how much they have retained, what they have been able to apply, support they might need, and the challenges they have faced. This will provide valuable insight to constantly improve training and the development of modules on climate resilient practices, ultimately achieving the higher objectives of the project.

In addition to making the application of training easier, it is important for farmers to adhere to resilient and alternate income-generating practices over a longer period. If they do not see immediate effects, there may be insufficient incentive to continue with the resilient method. While this is beyond the control of the farmers or trainers, the expected timeline for results can be made transparent to the participants of the training. It may also be helpful for communities or small groups to come together and pledge to change their practices from traditional to resilient modes. This will not only create a social norm of what type of practices and activities to follow within that community, but may be effective in getting farmers to adhere over several seasons. Community pledges have proven to be effective in some contexts, such as overfishing in the Philippines, Indonesia, Mozambique and Brazil (Rare, 2018). However, as mentioned in earlier sections, it is important to use formative research to understand the exact mechanisms that will motivate participants. Before doing so, one cannot be certain that their interventions will have the intended effect.

Many of the aforementioned concerns also apply to training community-based organizations (CBOs). This is further complicated by the fact that incentives and priorities may be different between project staff and community-based organisations. Leadership changes, willingness of households to work with CBOs, and success in other activities by CBOs may dissuade CBOs from focusing on climate resilience and other income-generating activities. As discussed in the case of farmer training, it is important to ensure the alignment of incentives and the smooth adoption of training practices.

FP076: CLIMATE FRIENDLY AGRIBUSINESS VALUE CHAINS SECTOR PROJECT

The Climate Friendly Agribusiness Value Chains Sector Project aims to reduce climate change vulnerability and enhance climate resilience of target crops to increase agricultural competitiveness and household incomes in the project areas of Cambodia. One of the main components of the project is to invest in climate-proof infrastructure such as biodigesters, compost huts and solar energy. The project states that this will be conducted by including local norms and practices designed to ensure uptake. This kind of formative research is important to understand some of the uptake challenges that may potentially arise. In addition, it may be important to conduct a pilot study among a subset of the target population to understand the actual behaviour due to the potential gap that may exist between what people say in surveys and what they actually do in reality (Blake, 1999; Ungar, 1994; Kollmuss, Agyeman, 2002); thus, gaining a better sense of how social norms, perceptions about the products, cost, and availability of human resources in the household to use products may improve the uptake of these products.

Moreover, this project intends to rely heavily on agricultural cooperatives at the community level to integrate climate-proof infrastructures in promoting climate smart agricultural value chains. The metric suggested in the proposal to choose these cooperatives is “strong willingness and readiness to integrate climate resilient and low carbon technology.” As suggested in the above paragraph, willingness may not always translate into real action. It is important to think through other metrics to measure the credibility of these cooperatives in achieving the mentioned objectives. Evaluation of the cooperatives should be based on metrics that are measurable and tangible such as: What percentage of farmers in this cooperative have received a loan to purchase hybrid seeds? What services are available to those farmers who wish to buy crop and livestock insurance? Has the cooperative tried to introduce some innovative services and products for farmers to help them cope with climate change?

Finally, the project also aims to strengthen awareness of climate threats among local community members. Again, it is important to consider how this newly acquired knowledge translates into people changing their behaviour to achieve the project's overall aim and objective. It might be worthwhile to think through some of the incentives that would encourage people to apply what these capacity building sessions would teach them. Depending on the project budget, incentives could range from providing financial incentives to identifying a group of people who could champion this cause in their community. Projects want to avoid status quo bias with beneficiaries going back to their old methods and habits after the training because it is cognitively, socially and perhaps, physically easier to do so.

SAP008: EXTENDED COMMUNITY CLIMATE CHANGE PROJECT-FLOOD

One of the main objectives of the ECCCP-Flood project is to build capacity of local institutions, community groups and individual beneficiaries to help them better understand climate change and

its impact. Social scientists have shown that capacity building programmes that focus on people's psychological adaptation is much needed as the threat of climate change becomes urgent (Lazarus, Cohen, 1977; Holahan, Wandersman, 1987). Thus, these training sessions should have components on disaster preparedness, response and recovery to help people cope with these imminent threats at individual and community levels.

Likewise, to ensure that learning from the training is sustained and implemented, the project intends to identify local champions who will disseminate knowledge on a regular basis (typically fortnightly or monthly) to local individuals. However, there is no guarantee that this knowledge will translate into concrete actions - a classic example of intention-action gap as people face a barrage of barriers rooted within institutional, social and cultural contexts. Thus, to make these information sessions even more effective the project can incorporate creative behaviour-change strategies by taking local context into account. For example, they can promote pro-environmental behaviour by using community-based social marketing either as an alternative to information-intensive campaigns or as an extension to the monthly meetings which could overcome these obstacles (McKenzie-Mohr, 2000).

On the other hand, the project aims to increase resilience of the health and well-being of communities by increasing the number of food-secure households in areas that are at risk of flood. In order to achieve this objective, the households should be willing to accept and practice adaptation technologies in the flood vulnerable areas. However, this willingness depends on each individual's personality - their risk tolerance, their perception of benefits and costs associated with these new tools, their motivation, values, beliefs and general preferences - of those making the decision (Sok et al., 2018). Thus, the project should conduct formative research to gather information on these social, cognitive and dispositional behavioural factors that affect people's decision-making process.

Moreover, the project intends to install 500 tube wells and 2810 sanitary latrines to increase access to safe water and sanitation. While the construction of toilets is the first step, it can't be the only one. Formative research is extremely crucial before installation as it will focus on engaging the social and economic factors that will lead to toilet adoption. Existing research suggests that poor communities may already know about good hygiene behaviours but lack the means and incentives to build or use the facilities (Robinson, 2006; Joshi, Fawcett, Mannan, 2011; O'Reilly and Louis, 2014). Scholars have highlighted the importance of providing the right kind of toilet designs (Devine, 2009), community involvement (Chambers and Kar, 2008), finding locally specific solutions (Waterkeyn and Cairncross, 2005) and understanding people's ideas and social values around sanitation (Rheinländer et al., 2010; Drangert, Nawab, 2011). Thus, it is important to consider the local context of the project areas in Bangladesh before rolling out this project.

SAP011: Climate-resilient food security for women and men smallholders in Mozambique through integrated risk management

The climate-resilient food security for women and men smallholders project has the advantage of working at the community level to implement training programmes tailored to the needs of different communities. As more individuals in a community participate in climate-resilient activities, it will result in social proofing and strengthen the norm of income generation through sustainable means, leading to a long term impact on the economic and social health of the community. While this arrangement will pave the way for the project activities to become community-led through the system of clubs with lead and follower farmers, it will also be important to ensure effective uptake

and adherence to climate-resilient practices. This question touches upon the intention-action gap and incentives.

The project goes to great lengths to ensure that farmers are supported in their learning and transition to climate-resilient modes of livelihood generation. These individuals are also incentivized to continue with the practices due to advantages such as access to financial markets and savings groups. However, for those who are facing success with their current cultivation practices or are resistant to change, the lessons from the training may never be applied. In addition to conducting effective and actionable training sessions, it will be vital to track the activities of the community over time and ensure participation in these activities. One of the key barriers to adoption may be the friction costs associated with changing the method of cultivation or livestock management. For the first few months, it may be necessary to support farmers to change their practices by playing a more active role and making salient the benefits of such a transition. Creating community champions or showcasing successful farmer clubs may create an appetite for success across all farmer clubs.

Individuals are prone to availability heuristics and distorted thinking during times of uncertainty and risk. If deviations from their traditional method of cultivation results in failure, there is a high chance that individuals will return to the status quo. It can be helpful to create disaster mitigation plans or support individuals in case of losses to align expectations of how the change from one mode of livelihood generation to the other will take place. Having last step measures in place will also remove the annual risk and stress faced by individuals and allow them to take more risks as they have something to fall back on.

This project also relies on the improvement of community resources through watershed rehabilitation and enhancement. For this phase of the project to be successful, communities and individuals must feel ownership and responsibility for the maintenance of related assets. The question of collective action has been explored in different contexts through psychosocial games in laboratories and laboratories in the field (Cardenas and Ostrom, 2004; Carpenter and Cardenas, 2011; Finkbeiner et al., 2017; Carpenter and Seki., 2005) to demonstrate how a number of factors, including one’s perception of their community, wealth and social status of an individual, and their sense of reciprocity, can lead to a change in outcomes for community resources. While conducting a similar investigation may not be possible, it would still be valuable to understand the community dynamics through formative research and unravel what keeps individuals motivated to collaborate on such ventures. This knowledge can enrich the uptake and adherence of communities to climate-resilient practices. See more in the part three of the paper which illustrates three case studies where behavioural insights have been applied in climate-related projects.

Appendix 2. CASE STUDY THREE: PULA IN NIGERIA

The second applied example we offer here also applies behavioural insights in the domain of agricultural insurance. The Bill & Melinda Gates Foundation, along with Pula advisors and Busara, seeks to increase access to financial services that enable investment in productivity-enhancing technologies whilst building resilience and ultimately improving the income gains of Smallholder Farmers households. The goal of the project was to improve access to risk mitigating products and services.

Busara played the role of a learning partner to better understand the behaviours and perceptions of insurance among smallholder farmers in Nigeria with the goal of enabling greater adoption and uptake of micro-insurance. The research was designed to explore some of the behavioural and cognitive dimensions that may influence farmers' mental models that drive their decision-making around risk mitigation and ultimately, around agricultural insurance. It sought to understand the perceptions and practicalities of an input-bundled insurance model from the perspective of farmers, agro dealers and agents. Even though the research primarily focused on an input-bundled model of insurance, the cognitive mechanisms explored here are relevant to insurance more broadly as well.

Busara used a series of semi-structured interviews to explore the following areas - everyday farming practices and the risks that farmers face; measures taken to mitigate risks and attitudes towards risk and mitigation; awareness, understanding and perceptions of agricultural insurance; the process by which Pula bundled insurance is offered to farmers through agro dealerships and agents; the barriers that agents and agro dealers currently face in onboarding farmers. The formative research answered some of the important questions on farmers' perceptions about insurance; for example, farmers were more likely to speak positively about insurance if they had either benefited from a policy or knew someone who had benefited. Even those who had no interaction with insurance products were more likely to have positive perceptions than those who had a negative experience with an insurance product in the past. Farmers are reluctant to use insurance products that have unnecessary protocols and lack of transparency. They highlighted that the personal marketing of the insurance product should focus on explaining the product. The insurance policies should be transparent and easy to understand. The research showed that one of the best ways to disseminate knowledge on insurance was by creating awareness through community meetings, community leaders, associations and agro dealers.

On the other hand, Busara also verbally presented farmers with the risks involved in farming, their origins and potential solutions. They were asked to choose between a fertiliser without insurance or a slightly more expensive fertiliser with insurance. It is important to note that farmers were asked to pick a fertiliser they were interested in buying but in case they were not ready, they would pick what they were interested in buying when they needed it. Moreover, farmers were also asked binary lottery choice questions generally used to assess risk tolerance. They had to choose between fictitious fertilisers that offered 1) a low chance of high reward or 2) a high chance of low reward. Their responses on these questions can be used to categorise farmers as either Risk Averse or Risk Neutral or Risk Seeking. Most farmers displayed risk averseness, meaning they are less likely to take risks when it comes to decision-making.

Through a series of quantitative and qualitative research, this study shed light on trust, risk perception, messenger and framing effects, locus of control and time preference, particularly in reference to insurance uptake among SHF farmers in Nigeria. Thus, while marketing and communicating these insurance products, companies can do the following: prime a farmer's sense of control - emphasizing that they may not be able to avert climate shocks but having control over its impact on their lives may motivate them to invest in insurance; frame climate shocks as a medium sized risk - framing the chance of crop failure due to climate as a real but not excessive risk may

encourage farmers to insure against them; frame insurance to appeal to different risk profiles - identify the farmers and their appetite for risks before framing insurance as either a protection or a gamble as it may appeal differently to risk averse and risk seeking farmers.

Finally, there is a difference between rewards and costs now versus in the future, known as time preference, since insurance involved a small upfront cost for potential larger benefits later. Therefore, it was important to know the level of present bias among farmers in Nigeria. Farmers were again presented with a series of binary decisions regarding money, one option represented an amount of money now and the other, a slightly larger amount of money in the future. By increasing the future reward with each subsequent question, one can calculate the point at which they switch to favoring the future reward. This gives a discount rate for each farmer – the amount of the future reward that would make it "worth the wait." The research suggests that farmers have a very high discount rate, meaning they are heavily present biased. In this case, insurance would not naturally appeal to the farmers. However, some of the potential ways to address this bias is to spread the costs by requiring farmers to pay the insurance at the end of the harvest or spread out the premium payment so that the initial present-cost is significantly smaller; reframe insurance benefits as immediate costs or future benefits as current benefits, or even future potential costs of bad harvest as a current cost today; identify the groups of future-oriented farmers who are more likely to be attracted to insurance and focus insurance products specifically to this group.

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