IEU LEARNING PAPER

11/2020

GOING THE LAST MILE: BEHAVIOURAL SCIENCE AND INVESTMENTS IN CLIMATE CHANGE MITIGATION AND ADAPTATION

Cornelius Krüger, Jyotsna Puri

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Going the last mile: Behavioural science and investments in climate change mitigation and adaptation

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11/2020

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About this IEU Learning Paper

This paper makes the case for behavioural science analysis and interventions in project design. Current approaches to behaviour change in the GCF portfolio are likely to ignore several psychological barriers. We base our analysis and recommendations on both portfolio-level data as well as case studies of 11 purposively-chosen projects from a random sample of 20 projects in the GCF portfolio.

About the author(s)

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ABSTRACT

Climate investments and projects usually include awareness-raising and training to deliver impacts. We argue these are not themselves sufficient to ensure climate-related behaviour or action. Several psychological barriers limit individual pro-climate action on the ground. To overcome these barriers, we discuss the use of behavioural science tools and specifically "nudges" and "boosts". This study examines the potential for including behavioural science interventions in Green Climate Fund investments/funded proposals that aim overall to increase adaptive behaviour among target communities (adaptation action) and/or mitigate greenhouse gas emissions (mitigation action). We identify "last mile gaps" in these investments, that is, gaps between the knowledge provision and skills creation that are usually included in investments, and changes in practices and behaviour on the ground.

We find that 82 per cent of GCF investments potentially have this last mile gap in their overall causal pathways. We also find that very few investments recognize and acknowledge this gap or attempt to reduce it. We conclude that employing behavioural science approaches to close this last mile gap requires deep context-specific analyses, creating mental models to understand possible barriers and enablers, and designing appropriate behavioural science interventions that need to be tested before they are used and scaled-up. Incorporating such approaches can help us understand much better what works in climate projects, for whom and why. We recommend a set of practical steps that indicate how tools from behavioural science may be developed to increase the effectiveness and impact of climate investments.

Keywords: Nudges, Boosts, Behaviour Change, Green Climate Fund, Behavioural Science, Evaluation, Climate, Investments, Design, Strategy.

ABBREVIATIONS

CCT	Conditional cash transfer
EBRD	European Bank for Reconstruction and Development
FP	Funding (funded) proposal
GCF	Green Climate Fund
MSMEs	Micro, small and medium size enterprises
OECD	Organisation for Economic Co-operation and Development
REDD+	Reducing emissions from deforestation and forest degradation
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

A. INTRODUCTION

The Green Climate Fund (GCF) is a financial mechanism of the United Nations Framework Convention on Climate Change (UNFCCC), and its main mandate is to support developing countries in meeting their climate change commitments by contributing to low-emission climate-resilient development pathways. Since the first investment decisions in 2015, the GCF (the Fund) has committed USD 5.6 billion for 124 projects/funding proposals in developing countries.[1] Through its activities, the Fund aims to contribute to a paradigm shift in developing countries towards low-emission, climate-resilient development pathways.[2] With its focus on catalysing low-emission climate-resilient pathways, the Fund expects beneficiaries and communities to change their behaviour as a consequence of its climate investments. Put another way, it means that GCF projects and investments are expected to catalyse processes that go beyond *supplying* investments: The Fund expects that a *change* in practices and behaviour will occur. We argue, that by making this assumption, most climate investments/projects ignore this "last mile" in their causal pathways. The last mile is the *gap* between *supplying* infrastructure, services, knowledge, awareness and training on the one hand, and, *realized* changes in practices and behaviour on the other. Ignoring last mile gaps can mean large investments may ultimately fail because they have been unable to cause changes in practices (process, behaviours) on the ground.

The purpose of this paper is to showcase how tools from behavioural science, such as nudges and boosts, can increase the effectiveness and impact of climate investments by closing the last mile gap. Since the ground-breaking book Nudge by Thaler and Sunstein (2009), insights from behavioural science have been applied frequently in public policy to increase its effectiveness (OECD, 2017). Nudges, a category of psychology-based interventions, can be a cost-effective tool for supporting individual decision-making. There is now a growing literature on how nudges have been applied to foster pro-environmental behaviour (Cinner, 2018; Schubert, 2017). In this study, we first analyse the GCF funding proposal investment portfolio[3] to understand where last mile gaps are potentially present. Then we illustrate how these last mile gaps may be reduced by examining 11 purposively-chosen projects from a random sample of 20 GCF investments, to help us draw some initial conclusions on process and best practices for designing better climate investments. To the best of our knowledge, this is the first examination of the use of behavioural science for climate investments.

The learning paper is structured as follows: section B discusses possible psychological barriers against climate action, and discusses potential tools that may be included in investments. The GCF portfolio and the potential for applying behavioural science are discussed in section C. We discuss our eleven case studies in section D. The results of these analyses are presented in section E. The generalizability of the findings is discussed in section F. Section G provides recommendations for improving climate investment designs and section 0 concludes.

B. PSYCHOLOGY OF CLIMATE (IN-)ACTION

Despite strong scientific evidence on anthropogenic climate change (IPCC, 2014), climate action has been ineffective or relatively absent on the ground (UNFCCC, 2016). This section summarizes the potential psychological dynamics behind this phenomenon while acknowledging there may be

[1] As of January 2020. Available at *https://www.greenclimate.fund/what-we-do/portfolio-dashboard.*
[2] Governing Instrument of the GCF.
[3] We use the terms funding proposals, funded proposals, GCF investments and GCF projects interchangeably. They all refer to commitments GCF has made by way of loans, grants, guarantees and other financial instruments, to mitigation and adaptation efforts in developing countries.

many other reasons for inaction. It also discusses potential tools from behavioural science that may help overcome these barriers.

1. PSYCHOLOGICAL BARRIERS

The literature identifies a complex set of interrelated psychological factors that hinder climate awareness and action (Gifford, Kormos, and McIntyre, 2011; Stoknes, 2014; van der Linden, Maibach, and Leiserowitz, 2015). Following Stoknes (2014), the present discussion focuses on three such barriers: perceived distance, framing, and cognitive dissonance.

Perceived distance: The human brain relies on experiences, rather than abstract statistics, for decision-making. This means that changes in climate, which happen over years and decades, do not easily translate into changes of attitude. Climate change is an event taking place in the distant future (e.g. temperature increases by 2100) or in distant areas (e.g. melting of the Arctic). This makes it difficult for individuals to relate their actions and experiences to the bigger phenomenon (Stoknes 2014; Spence and Pidgeon, 2010). Additionally, the complex nature of climate change and its description in statistical and scientific terms hinders emotional responses (van der Linden, Maibach, and Leiserowitz, 2015). On the other hand, extreme weather events lead to specific memories and are thus much more likely to change attitudes and behaviours (van der Linden, Maibach, and Leiserowitz, 2015). Egan and Mullin (2012) find perceptions of climate change are highly correlated with the weather from the previous week.

Framing: Emotional and motivational responses to climate information depend a lot on how that information is presented (framed). Framing affects the perception of risks. Presenting a decision in terms of losses often elicits a different reaction to when the same decision is presented in terms of gains (Kahneman and Tversky, 1984). Current framings in the public debate on climate change focus on its disastrous (future) effects and the huge costs of reducing emissions (Stoknes, 2014). Pidgeon (2012) argues that the constant use of extremes in communicating climate change can make people numb. On the other hand, presenting the costs of mitigation as foregone gains have been found to increase support for emission cuts (Hurlstone et al., 2014). Highlighting the gains of mitigation efforts has similar effects (Spence and Pidgeon, 2010).

Cognitive dissonance: Meaningful emission reductions can only be achieved through combined public and private efforts. However, if this is perceived as being costly, it may discourage individuals from acting since they may doubt their individual contribution can make a difference. Accordingly, a change in climate-friendly *attitudes* will not make a difference if individual *action* is perceived as not being efficacious. This misalignment between perceived need and own ability or action is called “cognitive dissonance”. To resolve this discomfort, people tend to adjust their beliefs or ignore the issue instead of changing their behaviour and actions. People’s awareness of climate change therefore reduces (Stoknes, 2014). In addition, cognitive dissonance plays an important role when climate action conflicts with other, more imminent needs. For example, increased public spending on emission reductions requires budget cuts in other areas. To support this shift, especially during times of low employment, people reduce their support for mitigation measures (Scruggs and Benegal, 2012).

Distance effects, framing and cognitive dissonance are important, but not the only psychological barriers to climate action. They all show, however, that awareness creation alone is not enough to generate societal change. Climate change investments that ignore these factors are thus less likely to achieve the expected results. Similarly, economic solutions that assume people are rational and care only about the monetary costs of efforts are less likely to present us with full solutions to the last mile problem.

2. INTERVENTIONS BASED ON BEHAVIOURAL INSIGHTS

When behavioural economists had successfully argued that human beings did not always act rationally (Kahneman and Tversky, 1984), they developed policy tools to counter these behavioural biases. This subsection introduces and discusses nudges and boosts. Of these, nudges are probably better known, although boosts can be quite promising, too.

a. Nudges

The concept of nudging became famous when Thaler and Sunstein (2009) published their seminal book Nudge. In 2017, nudges received further attention when Thaler was awarded the Nobel memorial prize in economics. The authors define nudges as "any aspect of the **choice architecture** that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler and Sunstein, 2009, p.6). In other words, nudges work because people react differently depending on the way a decision is presented. *Framing* is one example of a nudge (Kahneman and Tversky, 1984). Setting the *default* option is another important nudge. Countries with opt-out rules for organ donations have substantially higher rates of donations than countries where people have to actively register as an organ donor (Johnson and Goldstein, 2003). Further types of nudges are, inter alia, *reminders* and the use of *social norms* (Sunstein, 2014). All nudges have one thing in common, in that they are irrelevant to a purely rational decision maker, the "homo economicus" (Thaler and Sunstein, 2009, p. 8).

Sociologists have criticized the narrow definition of the decision-making environment in terms of cognitive factors alone. They have argued that the pre-dominant definition of nudging ignores the importance of the sociocultural context in terms of, for example, gender, class and ethnicity for motivating individual behaviour (Brown, 2012). Thus, for example, nudges to reduce energy consumption have been found especially effective for individuals with pro-environmental attitudes, and less effective for conservatives (Costa and Kahn, 2013). This underlines the importance of tailoring nudges to the social context of the target group.[4]

Schubert (2017) presents a framework for assessing the ethical quality of non-paternalist nudges. In some cases, nudging for pro-environmental behaviour may not increase individual well-being. For example, nudging against excessive heating can reduce the short-term comfort of individuals. Pro-environmental or green nudges are legitimate when they increase social welfare by protecting a common pool resource (Schubert, 2017). Overall this requires that nudges have a realistic prospect of success. Nudges are effective because following them requires less mental effort than deliberative thinking. On the other hand, Schubert warns against relying overly on nudging for public policy. When individuals get used to being nudged in the "right" direction, this undermines their habits for reflection and deliberative action. However, it is true that nudging may cause people to gain new experiences which they could not have imagined before (Banerjee and Duflo, 2011, chapter 3.3). A targeted nudge intervention can make people update their mental models,[5] which empowers rational decision-making. Schubert (2017) also urges special caution when nudging low-income individuals in developing countries: Seeing as their daily decisions impose a heavier cognitive load on them,

[4] Thaler and Sunstein (2003) legitimize the use of nudging by their moral philosophy called "libertarian paternalism": Individuals exhibit systematic biases in their decision-making through the effects of the decision-making environment. As the existence of a decision-making environment cannot be avoided, policy makers should intentionally alter these to improve the outcomes for individuals. The authors claim that this concept reconciles both paternalists and libertarians by influencing behaviour while preserving freedom of choice. However, not every nudge is automatically consistent with libertarian paternalism: supermarkets optimize the placement of their products, thus setting the decision-making environment, in order to maximize profits. But even well-intended nudges can be criticized as they reduce people's autonomy, that is, the control individuals have over their own choices (Hausman and Welch, 2010). There is some evidence that default effects may persist even when their use and intention are fully disclosed (Loewenstein et al., 2015).

[5] Mental models are paradigms within which individuals think and encompass culture, values and perceptions related to effective action and agency.

there is less capacity for opting-out of being nudged. In addition, limited health and education levels can also play a role here. Since this then restricts freedom of choice, one way to prevent unfairly limiting choices in these contexts is to undertake stakeholder consultations which can help ensure that nudges are aligned with the needs, values and mental models of nudgees (people to be nudged).

b. Boosts

Another category of interventions is called "boosting". Unlike nudges, boosts foster the competencies of individuals instead of inducing a specific behaviour (Hertwig and Grüne-Yanoff, 2017). Using a boost assumes that individuals are motivated to engage in the desired behaviour but lack the means to achieve it. Alternatively, boosts can improve individual decisions independently of a target behaviour.

The most basic form of boosting is presenting information in an easily **understandable format**. For example, presenting information in absolute frequencies instead of percentages was found to improve statistical reasoning when assessing risks (Grüne-Yanoff and Hertwig, 2016).[6] Other types of boosts are teaching simple but **effective heuristics** and problem-solving skills (Hertwig and Grüne-Yanoff, 2017). Heuristics are often considered to be at the cause of cognitive biases. Yet rules of thumb can improve decision-making with low cognitive load. Lastly, boosts can be implemented by writing **reflexive essays**: Writing about values and goals shifts attention from limiting beliefs towards enabling aspects of one's identity. The effects of these exercises can persist over years (Cohen and Sherman, 2014).[7] As boosts aim at improving deliberative thinking, they require additional cognitive resources to be successful. Some believe (see for example Hertwig, 2017) that if target individuals lack either motivation or cognitive resources, nudges can be more effective than boosts in achieving a specific behaviour change (Hertwig, 2017).

C. Elements of behaviour change in the GCF portfolio

This section analyses the GCF portfolio to showcase areas where behaviour change has been targeted in GCF investments, and how this has been done.

1. Key drivers of behaviour

To analyse the potential for mitigating last mile challenges that GCF investments might face, we use the COM-B framework. This framework provides a useful lens for categorizing behavioural phenomena and behaviour change interventions. According to the framework, individual behaviour depends on three interrelated factors: capabilities, opportunity, and motivation (Michie, van Stralen, and West, 2011 (see Figure 1)).[8]

In the framework, *motivation* refers to incentives and values. This category includes cognitive biases, emotional responses and habits related to decision-making. Nudges are included in this domain and are expected to help overcome cognitive biases. *Capability* encompasses all individual attributes that *enable* a certain behaviour. This includes knowledge and skills, but also mental models. Boosts are included here since they increase capability by teaching problem-solving skills, and they are capable of fostering enabling actions. Finally, *opportunity* contains conditions for behavioural change that are set by the environment. This refers to infrastructure, processes, as well as social norms and hierarchies that may otherwise conflict with a change in behaviour.

[6] Simplifying information is also seen as a subcategory of nudges (Sunstein, 2014).
[7] Educating people does not count as boosting as it aims at transferring knowledge but not at fostering competencies (Hertwig and Grüne-Yanoff, 2017).
[8] Note that the framework is not intended as a testable theory but is supposed to provide guidance for practitioners.

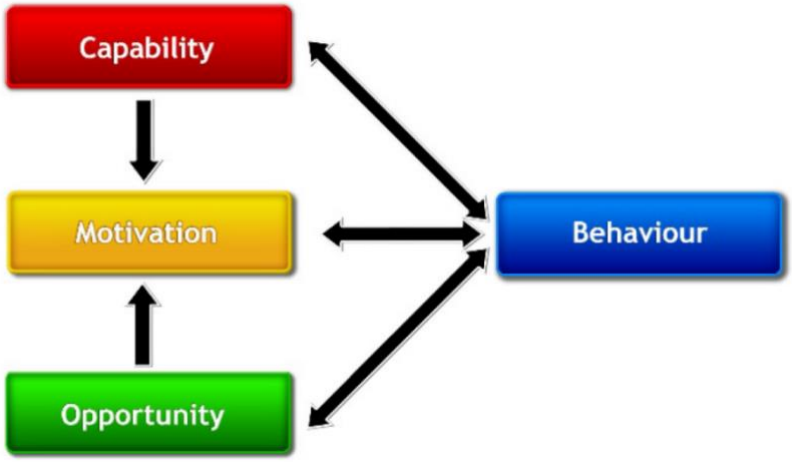

Figure 1. The COM-B framework for understanding behaviour
Source: Michie, van Stralen, and West, 2011

This framework leads to an alternative definition of the last mile: *a last mile gap is said to exist if there is a lack in capability, motivation or opportunity that prevents individuals and groups from changing behaviour which is otherwise (privately or publicly) beneficial*. Identifying and diagnosing the last mile in climate investments and projects means taking stock of existing gaps in capabilities, motivations or opportunities that are likely to prevent intended behaviour from occurring, and diagnosing this with possible behavioural science-related interventions to improve their effectiveness. We consider behavioural science to be important in two aspects for closing the last mile: First, methods and frameworks from behavioural science can help *identify* barriers and enablers for behaviour change. This has the potential to improve the effectiveness of interventions and investments. Second, tools from behavioural science (nudges and boosts in this paper) can help *close these gaps* by addressing cognitive biases, and subsequently enhance the effectiveness of projects and investments.

2. THE DATASET

To understand the use of behaviour change interventions in the GCF portfolio, we created a data set consisting of all 128 GCF investments (or funding proposals) made up until November 2019. From these we omitted projects that were approved but had lapsed due to legal reasons (five projects). We also omitted four projects related to results-based payments for REDD+.[9] Of the remaining 119 projects that we extracted data from, almost half focus on climate adaptation, one quarter on mitigation, and the remaining are cross-cutting projects that focus on both areas simultaneously. Second, we constructed a protocol of questions that extracted information on how last mile questions were being addressed in funding proposals. These questions were informed by the COM-B framework and were related to the overall results that GCF investments are expected to achieve, address or inform. We then extracted information from GCF-approved funding proposals using this protocol (see protocol in Appendix 1).

Information in funding proposals is provided by entities or organizations that are submitting proposals to the GCF for investment. These proposals give a description of planned activities and outputs. Data was extracted in two stages. First, we applied the initial protocol to 10 per cent of the proposals as our "trial dataset", and explored these to examine if relevant behaviour change interventions could be captured by the variables in our protocol. The protocol was refined and

[9] REDD+ refers to reducing emissions from deforestation and forest degradation. The mechanism was developed by Parties to the UNFCCC.

finalized using information from this trial dataset, and applied to the rest of the dataset (see Table 1 for final data extraction protocol).

Table 1. Relation between COM-B framework and the GCF project dataset: The data extraction protocol used to extract data from GCF funding proposals

FRAMEWORK VARIABLE	QUESTIONS IN DATA EXTRACTION PROTOCOL
Behaviour	• Is there a need for behaviour change? (Yes/No)
Capability	• Is the project targeting training? (Yes/No) • Is there consideration of boosting related interventions? (Yes/No)
Opportunity	• Are there awareness campaigns as part of the programme plan? (Yes/No)
Motivation	• Is the investment targeting any of the following interventions for increased motivation (Yes/No): – Conditional cash transfers – Incentives – Change groups – Nudges – Others...?

Our final set of variables (see Appendix 1) contains five categories of variables that we extracted data on. The first category of variables captures the context.[10] The remaining four categories relate to the elements of the COM-B framework (Table 1): As can be seen in Table 1, first we identify the kind of behaviour change that may be needed in the last mile.[11] This information is taken from the description of the project baseline or the theory of change. We infer that there is a "need for behaviour change" if the funding proposal identifies lack of awareness, attitudes, knowledge, skills or practices among individuals or members of institutions as an obstacle. Table 1, row 2 focuses on the fact that the most common approach to increase capabilities is through trainings that transfer knowledge and technical skills. Boosts also fall into this category because they foster soft skills and teach decision-making tools. Many activities within development and climate projects aim to increase opportunities for behaviour change: For example, adaptation interventions that diversify income can be made easier by improving access to markets and credit. In this study, we focus only on psychological factors. Table 1, row 3 shows that we include a variable indicating whether the project plans to undertake any awareness campaigns. Being aware of a situation or problem is a necessary condition for the opportunity to change behaviour. In row 4 of Table 1, we list other variables that we collected project-level information on, that target the motivation of individuals. We ask whether the project targeted motivation through conditional cash transfers (CCTs) or other incentives or plans to establish "change groups". Change groups are support groups with a specific purpose that can be led by a facilitator (e.g. savings groups). The mutual support and social dynamics increase motivation and persistence of changes. The "motivation" category further refers to unconscious decision-making processes, such as cognitive biases. Therefore, we checked whether the funding proposals mention any type of nudging. Appendix 1 shows all the variables that we extracted data on and those that we adduced from the information contained in the funding proposal templates.

[10] This refers to the result areas that the project focuses on, the output category and the name of the accredited entity.
[11] We collected information from the sectors in which a need for behaviour change was identified by the project (e.g. agriculture, governance, gender).

3. WHERE IS BEHAVIOUR CHANGE NEEDED AND INCORPORATED INTO GCF FUNDING PROPOSALS?

This section presents the results of our dataset, starting with the "behaviour" aspect of the COM-B framework. Figure 2 shows the share of projects we identified that had *any* need for individual behaviour change. We see that 62 per cent of overall funding proposals require some form of individual behaviour change. Most funded projects that are adaptation related or both mitigation and adaptation (i.e. are 'cross-cutting' projects) seem to require behaviour change (i.e. related to ecosystem management, gender or early warning systems). Examples of individual behaviour change in climate change projects are behaviours that require households to adopt new farming technologies or efficient cookstoves.

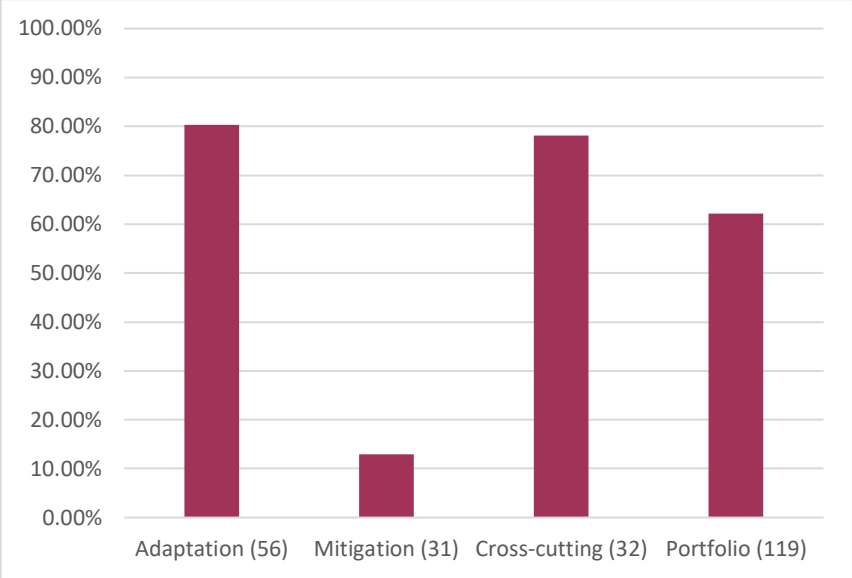

Figure 2. Need for individual-level behaviour change

Notes: * This figure shows the 'Need for individual behaviour change' as extracted from section C.2 of the funding proposal (see Appendix 1, variable 6.3 for further information).
* Total number of projects within categories are shown in parenthesis.

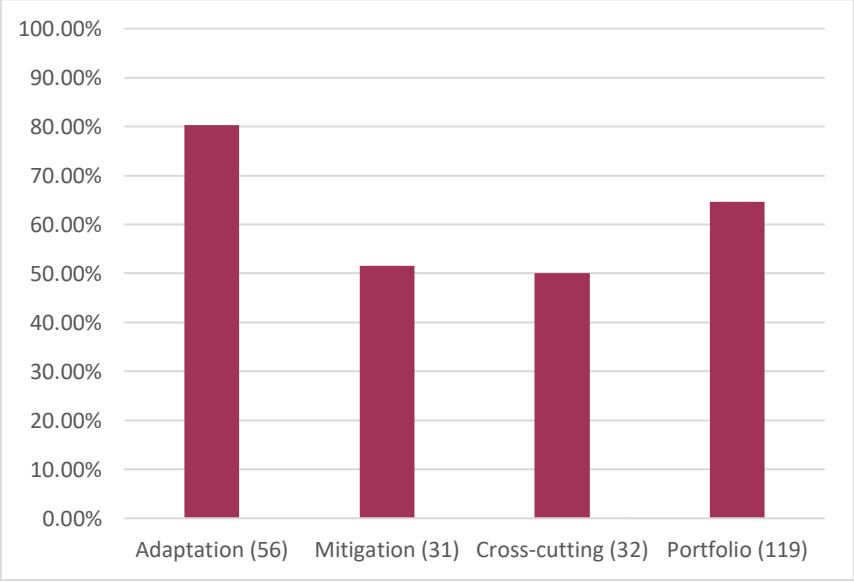

Figure 3. Need for behaviour change in governance entities

Note: Total number of projects within categories are shown in parenthesis. The responses are extracted from section C.2 of the funding proposal (see Appendix 1, variable 6.2.10 for further information).

The need for behaviour change at the governance level is self-reported as often as it is on the individual-level (Figure 3). We distinguish between behaviours on the individual and governance levels, because members of governance entities are bound in their decisions by intra-organizational targets, regulations and social dynamics, in addition to individual-level factors. Governance entities include central and regional governments as well as community-level organizations, such as water committees. Partner financial institutions are also classified as "governance organizations" because these make disbursements of GCF funds to last mile investors. We code required behaviour change as 1 = required, and 0 = otherwise, using the following logic: Change in "behaviour" at the governance level is required if members of these institutions lack awareness, knowledge, skills or practices in dealing with the climate challenges in their area of responsibility, *and* this is identified as a barrier within the funding proposal. "Need for behaviour change in governance institutions" excludes lack of regulation or frameworks. For example, the spread of decentralized solar plants poses new challenges for regulators compared to central fossil power plants. This is not behaviour change. However, operators need to learn how to manage the new patterns of grid load effectively. This is behaviour change. At the local-level, new irrigation technologies potentially improve adaptive capacities but require effective water committees for the fair distribution of water. Another example are banks. Banks may lack experience on debt financing for adaptation investments and knowledge of what good bankable projects are.

Mitigation projects generally require behaviour change more often on the governance level than among the final beneficiaries (individual-level, Figure 2 and Figure 3). For the example of a solar power project, an end user of electricity does not recognize whether it was produced from renewable or fossil fuel sources. Operators, however, need to adjust their behaviours (see above). Moreover, more than half of all GCF mitigation projects provide incentives for private investment through special credit lines. Those projects aim to change investment patterns which are outside the realm of behaviour change. Only the final investor can assess to what degree the investment requires changes in behaviours by the end users. Therefore, there is less scope for GCF mitigation projects and investments to target individual behaviour change.

Overall, we find that 82 per cent of GCF projects require some sort of behaviour change, either on the individual-level or within governance entities. This means that a very large share of the portfolio potentially faces a last mile gap within the causal pathways of the theories of change.

Figure 4, Figure 5 and Figure 6 show how GCF projects deal with the identified needs for behaviour change. Figure 4 and Figure 5 show that almost all projects that have behaviour change incorporated into their planned activities, are directed at awareness-raising or training. These interventions are now standard tools for behaviour change. This frequent use of trainings implies that the capability aspect of behaviour change is well targeted within the GCF portfolio. Note that funding proposals identify needs for change in multiple areas, for example, in agriculture and climate information. The figures do not imply anything about the extent or quality of trainings and awareness campaigns.

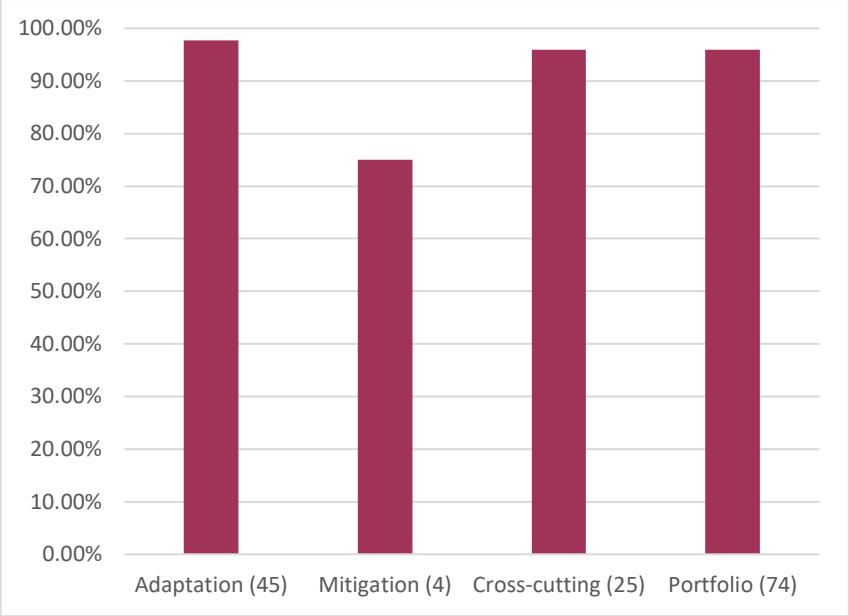

Figure 4. Are the trainings planned for in funding proposals, conditional on a need for individual behaviour change in funding proposals?

Note: Number of projects which identify need for individual-level behaviour change are in parentheses. The bars show the number of proposals that indicated that training is included in the funding proposal CONDITIONAL ON individual behaviour change being identified as a need. The training data is extracted from section C.3 of the FP. The need for individual behavior change is identified in section C.2 of the Funding Proposal (see Appendix 1, variables 8.2.3 and 8.4 for further details).

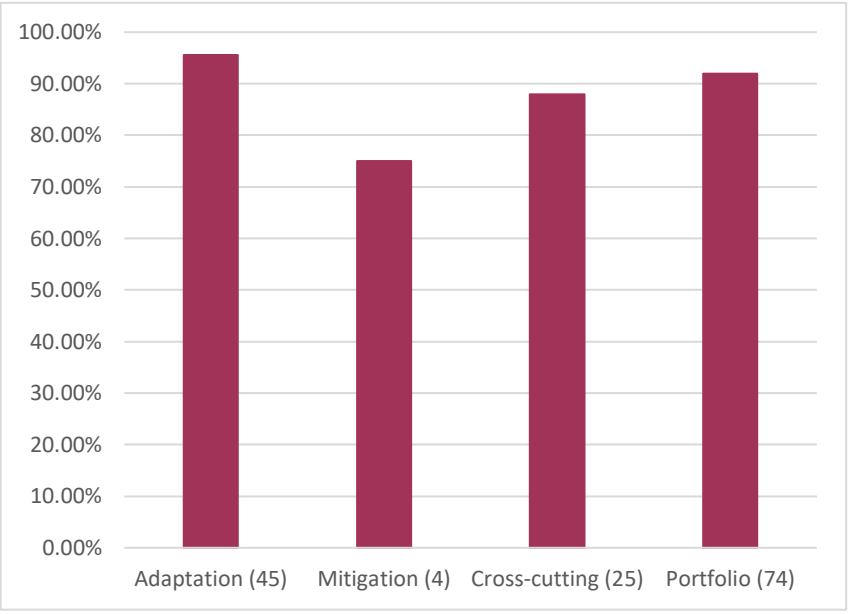

Figure 5. Use of awareness campaigns given need for individual behaviour change

Note: Number of projects which identify need for individual-level behaviour change are in parentheses. The bars show the number of Proposals that included 'awareness raising' in section C.3 of the proposal IF (conditional on) individual behaviour change being identified as a need in section C.2 of the proposal (see Appendix 1, variable 7.2 for further information).

Other elements of behaviour change are planned for to a much lesser extent in GCF projects (see Figure 7). One third of the adaptation projects and half of the cross-cutting projects that have identified a need for behaviour change (45 adaptation projects and 25 cross-cutting), contain at least one behaviour change intervention other than awareness campaigns and trainings (see Figure 6).

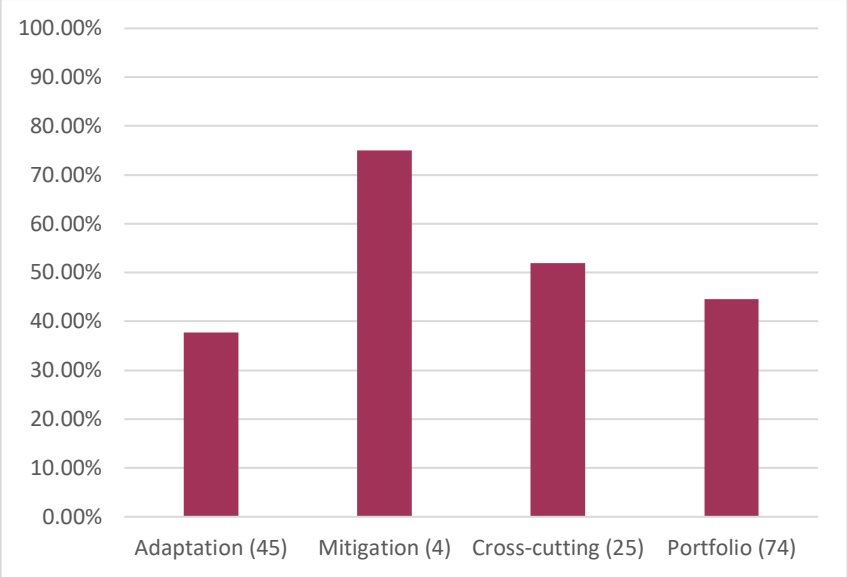

Figure 6. Use of alternative behaviour change interventions in funded proposals

Note: Number of projects which identify need for individual-level behaviour change are in parentheses. The bars represent the number of proposals that identified 'use of other behaviour change interventions' (in section C.3 of the proposal) IF individual behaviour change is identified as a need (See Appendix 1, variables 8.2.* for further information).

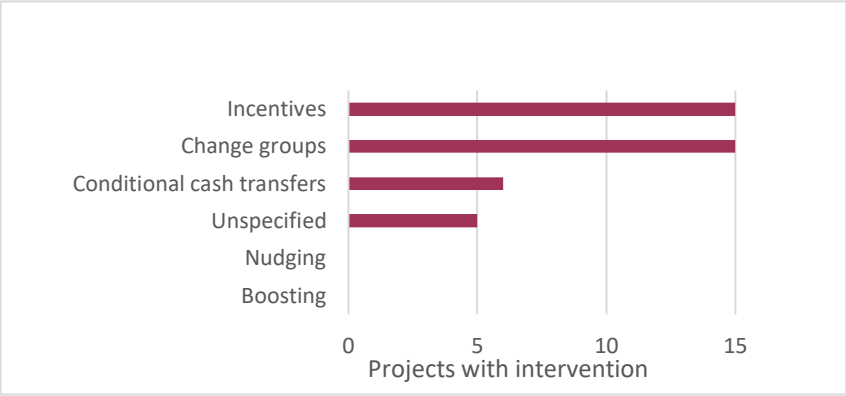

Figure 7. Types of alternative behaviour change interventions included in funding proposals when behaviour change is identified as a need

Figure 7 shows that incentives and change groups are the most common alternative elements of behaviour change, yet they are used much less frequently than awareness campaigns and trainings. (Note that one project can contain more than one type of intervention.) Five funded proposals stated that a behaviour change campaign is planned, without further specifying the activities. Unsurprisingly, neither nudging nor boosting were mentioned in the funding proposals. One reason is that the application of behavioural science in development is a relatively new field. On the other hand, it is possible that nudges are seen as too minor to be mentioned in a GCF funding proposal.[12] Overall, our portfolio-wide results show that few GCF projects recognize or aim to shift mental models, or to overcome cognitive biases or really examine the overall changes on the ground the projects require, in terms of behaviour.

[12] Moreover, communication materials that are used in awareness campaigns may use techniques that are similar to nudging (framing, simplifying information, making key information salient). Yet multiple factors, including cognitive biases, can prevent individuals from deriving intentions from awareness and, in turn, create an intention-behaviour gap.

In the next section, we provide some examples of how nudges and boosts may be applied in climate projects, given how critical they are to meeting last mile objectives.

D. APPLICATION OF BEHAVIOURAL SCIENCE TO GCF PROJECTS

To illustrate the potential for applying nudges and boosts to a selection of GCF projects, we selected a set of projects as case studies for which we examined the potential for incorporating nudges and boosts that may help the project close the last mile gap, that is, increase the likelihood that people's *behaviour* will change. We conducted case studies of 11 purposively-chosen projects from a random sample of 20 projects from the GCF portfolio. In the remaining projects there was limited information in the proposals about context, and it was not possible for us to build thoughtful and useful illustrations of behavioural interventions. For most of the projects selected for analysis, types of boosts and nudges were found in the literature that could be adapted to the project context. In others, we discuss new concepts for interventions that are based on well-established psychological/behavioural science literature. For this section we used information available on the projects and their social contexts as written in funding proposals submitted to the GCF (and accepted by the GCF) by accredited organizations. We think this is reasonable since appraisal of GCF proposals at the GCF, is mostly desk-based and relies on the proposals themselves. It is of course clear that different and additional behavioural science interventions may be developed with better and field-based information on the social and cultural contexts of the projects. We choose the set of 11 investments as cases studies to illustrate the potential for applying behavioural insights.

1. IDENTIFICATION OF BEHAVIOURAL INSIGHTS

As shown in section C, most GCF projects require individual behaviour change.[13] All our illustrations are examples and have not been tested yet. Our aim with these illustrations is to encourage project implementers to incorporate behavioural science interventions into their designs and to use them as a way to increase project effectiveness. It is clear that if project proposers incorporate these ideas, the behavioural science-related intervention (nudges and boosts in this paper) will need to be *tested* in the specific context of the projects and, more importantly, adjusted to the mental models of the target population (World Bank, 2015; Zoratto, Calvo-González, and Balch, 2017). This is especially true as most cited studies and examples that we use, are a result of studies conducted in North America or Europe and are not necessarily applicable to developing countries that are eligible for GCF projects. We believe there is strong potential for the GCF to be a trailblazer in understanding what works, for whom and under what circumstances, for both developing-country contexts and for climate change investments, by identifying and testing behavioural science interventions that are well suited to developing-country contexts.

2. SELECTION OF CASE STUDIES

Eleven projects were purposively selected to analyse social bottlenecks for long-term impact as well as possible behavioural interventions. The selected projects are listed in Table 2. GCF projects are indexed by their respective funding proposal (FP) number. The focus of GCF projects is either on adaptation to climate damages, the reduction of greenhouse gas emissions (mitigation) or both (cross-cutting). While mitigation projects rarely identify a need for behaviour change on the individual-level, we assess whether they could still be suitable for behavioural interventions. Behavioural interventions could be useful within governance entities, as more than half of all

[13] In our view, these behavioural science interventions for ensuring last mile delivery/effectiveness and change, should be explicitly stated in the theory of change or in the project design. So for example, in a reforestation project this would mean that people not go back to clearing or damaging forests.

mitigation projects and almost two thirds of the overall portfolio identified the need for change in this area.

Table 2. Overview of case study projects

PROJECT NO.	COUNTRY	PROJECT NAME	FOCUS	GCF FUNDING SIZE (USD M)
FP015	Tuvalu	Coastal Adaptation	Adaptation	38.9
FP020	Eastern Caribbean	Sustainable Energy Facility	Mitigation	190.5
FP025	Various	Sustainable Energy Financing Facilities	Cross-cutting	1,538.5
FP029	South Africa	SCF Capital Solutions	Cross-cutting	34.1
FP040	Tajikistan	Hydropower Sector Climate Resilience	Cross-cutting	133
FP058	Ethiopia	Building Gender-responsive Resilience	Adaptation	50
FP061	Eastern Caribbean	Physical adaptation and community resilience	Adaptation	20
FP062	Paraguay	Poverty, Reforestation, Energy and Climate Change	Cross-cutting	118.6
FP084	India	Climate resilience of India's coastal communities	Cross-cutting	130
FP091	Kiribati	Water supply adaptation	Cross-cutting	58.1
FP093	Burkina Faso	Yeleen Rural Electrification Project	Mitigation	59.2

Source: Authors' summary of GCF FPs

Table 3 presents summary statistics on the sample of projects for which we developed case studies, and its comparison to the GCF portfolio.[14] This allows us to judge whether the sample projects are still representative of the portfolio.[15] On average, in this sample and in the overall portfolio, GCF adaptation projects are smaller compared to mitigation projects or even cross-cutting projects. Compared to the overall portfolio, in this sample, adaptation projects are underrepresented and cross-cutting projects overrepresented. (See also Appendix 2 for a detailed listing of projects and their key attributes, including funding amounts, country, implementer, key objective(s) and primary activities.). Overall, our 11 cases that contained the most relevant information are not representative of the 119 project proposals from which a random sample of 20 projects was drawn.[16] Nevertheless, the case studies still contain very valuable lessons that the GCF and other climate agencies can learn from.

[14] Information on approved GCF projects is available at *https://www.greenclimate.fund/what-we-do/projects-programmes*. Our small sample size of 11 cases precludes the use of statistical tests to assess whether the sub-group differences are due to chance.
[15] The "total investments" variable contains investments by the GCF and co-financing by other organizations. This makes projects more comparable as the co-financing ratio varies between projects.
[16] Examples of the types of projects where we couldn't find relevant information include FP052, which constructs a new sustainable port in Nauru, and FP048, a risk-sharing facility for climate-smart agricultural investments.

Table 3. Comparison between sample projects and GCF portfolio (as of November 2019)

	Adaptation	Mitigation	Cross-cutting	Total
Sample (n=11)				
Number of projects	3	2	6	11
Number as a percentage of sample (%)	27.3	18.2	54.5	100
Total investments (USD million)*	108.9	249.7	2,012.3	2,370.9
Average (USD million)*	36.3	124.85	335.38	215.5
Portfolio (n=119)				
Number of projects	56	31	32	119
Number as a percentage of portfolio (%)	47.0	26.1	26.9	100
Total dollar investment (USD million)*	3,135.4	7,852.4	8,154.6	19,142.4
Average amount (USD million)*	55.9	253.3	254.8	160.8

Source: IEU projects dataset, as of November 2019.
Note: * indicates investments that include co-financing by other organizations.

E. Results of the case studies

We examined the potential for behavioural interventions in 11 GCF investments.[17] For these 11 projects we group investments to illustrate three categories of behavioural science interventions. The first category uses nudges, the second discusses the use of interventions based on social norms and social influence, and the third category illustrates boosts. Please note that the suggestions within the case studies are not exhaustive of potential types of interventions that can be applied using a behavioural science lens (and readers are encouraged to explore a broader landscape of nudges and boosts).

1. Nudging by refocusing attention

Nudges are a broad category that encompass a variety of behavioural interventions (Sunstein, 2014). We illustrate them with the following four projects where framing, reminders and priming are used to potentially increase the effectiveness of GCF investments.

Using the right framing for information campaigns

Project FP020 finances the construction of geothermal plants on small island developing States in the Eastern Caribbean, to reduce the carbon footprint of their energy sectors. It plans to provide training and technical assistance to implementing public authorities. Since geothermal technology is new in the Caribbean, it is expected that there will be public resistance, especially because geothermal plants produce waste and can pollute the air and nearby water systems. With the right mitigation measures, though, these dangers can be controlled (Manzella et al., 2018).

An information campaign could reduce public concerns by raising public knowledge about the project and its measures to reduce environmental damages. Framing the project outcomes as *improvement* compared to the reduction in current carbon emissions and pollution by fossil fuel

[17] Overall, we selected 20 projects randomly but for our case studies, ended up focusing on 11 of these. In the remaining projects there was limited information in the proposals about context, and it was not possible for us to build thoughtful and useful illustrations of behavioural interventions.

plants is also likely to increase acceptance (Kahneman and Tversky, 1984). If used, it will be important to time interventions related to information and framing, early, to prevent public fear and anger which subsequently could bias perception and judgment (Blanchette and Richards, 2010).

Reminders to increase loan repayment

In project FP029, the Development Bank of Southern Africa plans to set up a fund to finance green investments by micro, small and medium sized enterprises (MSMEs). However, micro-entrepreneurs may lack the financial management skills to repay the loans on time. For these inexperienced loan-takers, reminders by text message have been found to be more effective than financial incentives for punctual repayments (Cadena and Schoar, 2011). Case study evidence from the Republic of Kenya suggests that these reminders are more effective when sent in the evening (OECD, 2017, p.178).

Nudging honesty by changing form layouts

In project FP029 above, GCF did not finance specific projects but provided funding to a local climate fund. The administrative structure of project FP025 is even more complex: GCF provides loans to the European Bank for Reconstruction and Development (EBRD) which in turn funds local climate finance institutions in project countries. Even though EBRD has much experience in monitoring subfunds, implementation due diligence is dependent to a large extent on local operators. A nudge could increase honesty in reporting by changing the layout of templates. It has been shown in lab and field experiments that signing a declaration of honesty at the top of the document makes ethics salient. This has been shown to increase the accuracy of self-reported information compared to cases where the declaration of honesty was put at the bottom of the document (Shu et al., 2012). It is still unclear whether this effect will persist over time. In spite of these uncertainties, if those nudges test successfully even for the short run, low implementation costs are likely to ensure that the efforts are worthwhile.

Priming social identity and motivation

Some nudges target behaviour only indirectly through motivation and identity. On the island state of Tuvalu, GCF project FP015 finances coastal protection works against increased wave activities and flooding. Yet the funding proposal states that high labour turnover among public officials remains a risk for project success. Domestic financial resources are insufficient for keeping personnel by raising wages. Thus, a stylized but simple poster is presented in Figure 8 to nudge identity and motivation in public officials.[18] The intention is to link work identity to national identity in order to strengthen the former. There is some evidence that strong identification with the workplace reduces turnover intentions (Avanzi et al., 2014). Furthermore, pride is as powerful as guilt in motivating pro-environmental behaviour (Onwezen, Bartels, and Antonides, 2014).

Figure 8. Stylized poster for case study FP015

2. SOCIAL NORMS AND SOCIAL INFLUENCE

Humans are subject to social influence. Social norms are defined by in-group expectations about what is usual and desirable behaviour (Bicchieri and McNally, 2018). These two categories need not overlap. Giving feedback that a majority is doing a desirable behaviour exerts social pressure on

[18] This is a prototype to showcase behavioural mechanisms. Before any application it had to be revised and pre-tested.

others to do the same. This application of social norms is a subcategory of nudges. Telling students the average alcohol consumption of their peers corrects misperceptions and has been shown to reduce excessive drinking (Lewis and Neighbors, 2006). Similarly, stating on electricity bills that energy consumption was higher than usual for comparable households, tends to reduce consumption in the following months (Costa and Kahn, 2013).

Increasing cooperativeness through social feedback

Social norms work at different levels and depend on the respective social group (Hogg and Reid, 2006). Social norms feedback can be used to increase cooperativeness between groups. The GCF project FP040 finances an overhaul and repowering of hydropower in the Republic of Tajikistan, to make it more adaptive to the effects of climate change. The long-term success of the project depends crucially on training hydropower administration officials in long-term maintenance. This requires cooperation between groups of trainers and trainees. Feedback has been used successfully to increase cooperativeness in a Google management team.[19] In a quarterly survey, team members rated each other's cooperativeness on a two-item scale. Each person was given his position in the overall ranking. This anonymous feedback could improve project effectiveness in two ways: First, by facilitating learning between trainers and trainees and second, by increasing knowledge-sharing among administration personnel. Furthermore, giving feedback anonymously blurs any potential biases between the groups of trainers and trainees.

Dynamic social norms for conservation

The last intervention assumed that cooperation was a desirable behaviour. However, it is possible that prevalent social norms are not necessarily aligned with project purposes. The GCF project FP084 promotes ecosystem-based adaptation through conservation and restoration in addition to the diversification of economic activities. The sustainability of the project depends crucially on how local communities treat their environment once the project activities are finished. Giving feedback on existing lack of conservation behaviour may be counter productive when a change in social norms is intended (Cialdini et al., 2006). In such a setting the desired effect can be achieved by telling people that overall behaviour is shifting (Mortensen et al., 2019; Sparkman and Walton, 2017). This can be implemented in the GCF project by putting up a sign outside the forest saying, "More and more people are stepping up to prevent the destruction of our forests. What can you do?" This encourages individuals to deviate from current habits. By adding a list of practical conservation behaviours, it further overcomes a possible lack of knowledge in the targeted population.

Positive deviance campaign

The Republic of Kiribati relies on underground water reserves for its fresh water supply, which are threatened by increased wave activity. The project FP091 finances the construction of a desalination plant and an extension of the water supply network. Simultaneously, a behaviour change campaign is undertaken regarding water use and sanitation. It is suggested that this campaign use the positive deviance approach for increased effectiveness. Positive deviance assumes that the solutions to a problem already exist within a society but are applied only by a few individuals. It thus aims at identifying these persons to spread their approach throughout the communities. Positive deviance has proven successful in the fields of nutrition and health (Lapping et al., 2002). Its advantage compared to expert-driven programmes is that it uses community members as role models and advocates of behaviour change, which increases credibility (Dolan et al., 2012).

[19] Available at *https://www.livemint.com/Leisure/GsHx7pV97Dotr2jj92hRjL/Five-smart-nudges-for-your-workplace.html*.

3. BOOSTING COMPETENCIES

This subsection shows how boosting can be applied to climate projects.

Plan-making exercise

The Republic of Paraguay is one of the countries with the highest forest loss worldwide (Hansen et al., 2013). The GCF project FP055 aims to empower rural communities to set up sustainable agroforestry businesses. Most poor people in these areas depend on welfare for their income, which will be topped up by the project during the start-up phase of the new businesses. However, being accustomed to tight budgets may limit long-term thinking. Thus, transferring cash may result in more short-term oriented spending than desired (Banerjee and Duflo, 2011). A change in mental models is the target of plan-making exercises, as already implemented by the World Bank in the Republic of Madagascar (World Bank, 2018). Within groups, recipients of transfers discuss possible goals to spend the money on, and identify goals and steps of implementation. By making plans, they create a new narrative about what they can achieve in the future. Motivating action, in turn, is one of the key functions of narratives (Akerlof and Snower, 2016).

Value affirmation exercise

Climate change is already heavily affecting the Federal Democratic Republic of Ethiopia through an increase in droughts (Regassa et al., 2010). Due to unequal gender roles, women are more likely to suffer from malnutrition in food-insecure households (Hadley et al., 2008). The GCF project FP058 invests in adaptive farming technologies for rural communities. Gender inequalities are addressed by a variety of project elements that are targeted at women, including trainings. However, the prevalence of traditional gender roles may inhibit the success of trainings. They shape the self-understanding of women about what they are able and allowed to do, and thus limit their achievements (Hoff and Walsh, 2017). Value-affirmation exercises can be used to empower these women by reframing their identity. An intervention usually consists of the participant writing a 15-30 minute essay about what they value most in life. Shifting attention from personal limitation towards one's core values frees mental resources and creates a healthy sense of self. These interventions have helped to counter gender or race gaps in education, induce healthy behaviour or objective communication in conflicts (Cohen and Sherman, 2014). The World Bank used value-affirmation interventions in a project in Madagascar to accompany a plan-making exercise (World Bank, 2018).

Personal initiative training

In Burkina Faso, less than 3 per cent of the rural population have access to electricity.[20] Project FP093 finances the set up of solar-powered mini-grids throughout the country. In addition, productive use equipment will be given out to support economic development and ensure the repayment of the investments. Community-based organizations or non-governmental organizations are thought to assume the role of a business incubator. However, technical knowledge is unlikely to be sufficient for business success. In their survey on the psychology of entrepreneurship, Frese and Gielnik (2014) showed the importance of personal traits and soft skills. To put these insights into practice, Solomon et al. (2013) developed a personal initiative course for small business owners. It focuses on improving competencies in creativity, proactive goal setting and planning, time management and overcoming barriers. A large scale study in the Togolese Republic found personal initiative training increases sales and profits even two years after the intervention. On the other hand, a standard business course did not have any significant effect on business outcomes (Campos

[20] World Development Indicators. Available at *https://datacatalog.worldbank.org/dataset/world-development-indicators.*

et al., 2017). The effectiveness of the personal initiative training had previously been shown in studies conducted in the Republic of South Africa (Solomon et al., 2013) and the Republic of Uganda (Glaub et al., 2014). Personal initiative training offers a powerful tool for projects that depend on the business successes of micro or small entrepreneurs.

Insurance games

The island states in the Eastern Caribbean are heavily affected by hurricanes. The project FP061 aims to increase governments' capacities to plan and implement adaptation policies in Antigua and Barbuda, the Commonwealth of Dominica, and Grenada. In addition, funding will be provided to finance adaptation projects by the private sector and civil society. As these projects still must be identified, their social context and purpose is unclear. Here, we outline a scenario project in which behavioural interventions are applied: It is assumed that GCF finance will be used by a microinsurance firm to expand its operations into the project area. There are already index-based disaster risk insurance products targeted at the poor in Central America.[21] Studies on the promotion of health insurance raise caution that information campaigns may not be sufficient to elicit subscription to insurance products (Bocoum et al., 2019). A promising approach could be to discuss how the product functions by playing insurance games with stakeholders. These games simulate the incomes and insurance fees for randomly drawn weather events. In a study in China, this intervention increased subscription rates by 48 per cent (Cai and Song, 2013). It was shown that this was due to the novel experience. Similar results have been found in the context of Ethiopia (Norton et al., 2012) and the Republic of Malawi (Patt et al., 2009).

F. WHERE DO BEHAVIOURAL INTERVENTIONS FIT BEST?

The previous section presented case studies for 11 projects out of a sample of 20 randomly drawn projects. Desk research limits the quality of information on the social context of projects. This means that field research may have led to the identification of more interventions. Thus, there is no guarantee that these concepts of behavioural interventions will prove effective in practice. Still, some important observations can be made when comparing the case study projects (for which we developed an intervention) to the rest of the sample (without intervention).

As is intuitively clear, most projects can incorporate behavioural insight interventions.[22] In our small sample of projects, we could not think of behavioural insights for investments that targeted "low-emission transport". This does not mean that the entire result area offers few opportunities for behavioural interventions. For example, nudges can play a big role in increasing the acceptance and use of public transport (Kormos, Gifford, and Brown, 2015). In Table 4, we examine where we were able to think of behavioural insight-related interventions, organized by GCF result areas. The table shows what is intuitively clear – there is no specific result area that is more, or, less likely to be able to incorporate behavioural insights compared to other areas.

The first half of Table 4 groups the sample projects into purely adaptation, purely mitigation and cross-cutting projects. Cross-cutting projects seem to be more suitable for behavioural interventions than those aimed at adaptation or mitigation alone. One reason behind this could be project complexity. As behavioural interventions target only one specific change in behaviour, complex projects offer more potential areas for application.

[21] Available at *https://www.microrisk.org/our-approach/*.
[22] The table in Appendix 3 groups the initial selection of sample projects by GCF result area. Case study projects fell in all result areas with the exception of "Low-emission transport". Investments in mitigation and adaptation can fall in up to four result areas each. Cross-cutting projects need to cover at least one result area from both mitigation and adaptation.

Table 4. Applicability of behavioural interventions to sample of 11 projects

	WITH INTERVENTION	WITHOUT INTERVENTION	SHARE
Focus area			
Adaptation	FP015, FP058, FP061	FP012, FP054	3 of 5
Mitigation	FP020, FP093	FP027, FP038, FP064, FP090	2 of 6
Cross-cutting	FP025, FP029, FP040, FP062, FP084, FP091	FP048, FP098, FP052	6 of 9
Output category			
Infrastructure	FP015, FP020, FP040, FP61, FP091, FP093	FP012, FP052, FP054, FP090	6 of 10
- Public Infrastructure	FP015, FP020, FP040, FP061, FP093	FP052, FP054, FP090	5 of 8
- User Infrastructure	FP091	FP012	1 of 2
Financial intermediaries	FP025, FP029	FP027, FP038, FP048, FP064, FP098	2 of 7
Empowerment	FP058, FP062, FP084	None	3 of 3
Total	11	9	10

Source: Authors' summary of case studies

The remainder of Table 5 below shows sample projects grouped according to outcomes. These mutually exclusive[23] categories were created for the purpose of this study and are not related to current practices at the GCF. The infrastructure category refers to the construction or modernization of any infrastructure, independent of the specific GCF result area. The feasibility of behavioural interventions for infrastructure projects depends on the degree to which they interfere with individual actions. Target stakeholders can be the officials responsible for operation, maintenance and administration (FP015, FP040), users of new electricity or water supplies (FP091, FP093) as well as neighbouring communities of new power plants (FP020). Modernizing transport (FP052, FP054) or energy (FP090) infrastructure alone does not require behaviour change of the public. Infrastructure projects make up half of the sample and half of these were found suitable for behavioural interventions.[24]

The second category concerns projects in which the GCF provides funding to specialized financial intermediaries. These offer special loan programmes for green investments and take on the responsibility to select and monitor specific investments. This makes it nearly impossible for the GCF to identify final stakeholders, their social setting and the feasibility of behavioural interventions. Accordingly, the case studies under this category target the processes within the financial institution. One calls for a nudge to increase honesty in reporting (FP025). The other aims at increasing the punctuality of repayment by unexperienced microentrepreneurs (FP029).

[23] Green Climate Fund projects can be very complex. The output category was chosen according to the main activities of the project. For example, an empowerment project in agriculture can still improve road quality for market access.
[24] This indicates that infrastructure projects are often embedded within a social context that is fertile for applying behavioural interventions. We then split this category further: "public infrastructure" refers to all energy and transport infrastructure, public buildings and dams/sea walls. These are all publicly administered projects which are assumed to require less individual behaviour change. The "user infrastructure" category takes up all other infrastructure projects such as irrigation or early warning systems. The success of these projects depends heavily on the actions of end users. Within both subcategories, half of the sample projects were found suitable for behavioural interventions. Yet there are too few observations to make any structural comparisons as only two projects fall into the "user infrastructure" category.

Furthermore, two projects (FP025, FP098) explicitly mention the need to raise awareness about investment opportunities in mitigation. Overall, the scope for specific interventions by the GCF is small. Still, the financial institutions could provide personal initiative training (Campos et al., 2017) to micro and small entrepreneurs (e.g. for project FP048) to reduce default rates on their loans.

The last category concerns projects that empower individuals to improve their livelihoods by reducing emissions and increasing their adaptive capacity. These projects combine financial support to change business models with relevant trainings and awareness campaigns. As the key stakeholders, target behaviours and social settings are clear in this category, it is especially suited for behavioural interventions. The case studies cover social norm nudges for conservation (FP084), value-affirmation (FP058) and plan-making exercises (FP062). The latter case studies illustrate a key difference between the roles of boosting and training for projects: training concerns the transfer of knowledge and hard skills which are necessary for project success. Boosting, on the other hand, complements these activities by fostering important soft skills.

The qualitative analyses of sample projects suggest that empowerment projects have the highest potential for behavioural interventions, followed by infrastructure projects and, lastly, support through financial intermediaries.

Table 5. GCF projects by output category

	Public infrastructure	User infrastructure	Financial intermediaries	Empowerment
Portfolio	27	23	28	41
Adaptation	10	17	4	26
Mitigation	11	0	17	3
Cross-cutting	6	6	7	12
Share of projects with change needed				
Individual	22.22%	95.65%	32.14%	90.24%
Institutional	66.67%	65.22%	46.43%	75.61%
Case study projects with interventions				
	4 of 8	1 of 2	2 of 7	3 of 3

Source: Authors' categorization of projects and case studies.

More evidence is needed on what behavioural intervention works best in which context. The most promising area for further exploration on the individual-level are adaptation projects focusing on empowerment and user infrastructure.

G. PRACTICAL STEPS FOR INCORPORATING BEHAVIOURAL SCIENCE INTERVENTIONS INTO DESIGNS OF CLIMATE INVESTMENTS

There is still little specific evidence on the application of behavioural science in the GCF context. Contrasting the case studies with portfolio data reveals that changes in livelihoods and interactions between individuals and infrastructure are the most promising areas for further exploration.

To understand and incorporate these sorts of behavioural insights into project designs, we strongly recommend planners and project designers to use the following basic steps (see Box 1).[25] The starting point for behavioural analysis and intervention design is the theory of change. The formulation of the project logic is crucial for identifying the "last mile", that is, where demand side changes or behaviour changes are a critical assumption and are likely to affect project impact. The last mile can be linked to the barriers to and enablers of desired behaviour, which should also appear in the theory of change. Ask and examine: What is stopping a certain behaviour or what is leading to it? This analysis needs to reflect the project context and the "mental models" of the people who are expected to change their behaviours. Different tools for investigation should be used, such as focus group discussions, interviews, ethnographic examination and anthropological study. A follow-up survey shows the general distribution of different behaviours, perceptions and mental models in the population of interest.

This deep understanding of the project beneficiaries allows us to meaningfully design behavioural interventions. Individual assumptions underlying these interventions can be tested through lab experiments. These interventions should be field tested before rolling them out on a large-scale. Field trials require clearly defined ex-ante hypotheses and empirical identification methods (usually randomization), and need to follow predefined protocols for implementation. Only then can the effectiveness of the intervention be proven by empirical analyses.

We highly recommend the continual testing of the interventions during implementation in projects. Behavioural science is very context-dependent, and what works in one place need not hold in another. Thus, replication and up-scaling both require, as a bare minimum, consultations with local communities to see whether the underlying assumptions of the intervention still hold.

[25] See Appendix 4 for a collection of practical resources for the design, implementation and evaluation of behavioural science interventions.

Box 1. Some practical steps for incorporating behavioural science into project designs.

Step 1: Build a *theory of change* and identify the *last mile*.

(This last mile – the place where the demand side changes or behaviour changes are required – is a critical assumption and is likely to affect project impact.)

Step 2: In the last mile of the project's theory of change, *identify* barriers to and enablers of desired behaviour.

(Ask and examine: What is stopping a certain behaviour or leading to it?)

Step 3: *Map* these *barriers and enablers* and create "mental models" that are customized to the project context.

(Here different tools for investigation and understanding the local context should be used, such as focus group discussions, interviews, ethnographic examination and anthropological study.)

Step 4: Build a *distribution* of these behaviours, and determine the incidence of different behaviours, perceptions and mental models, and their dominant characteristics in the population of interest.

(This step typically uses survey instruments.)

Step 5: Design possible behavioural science interventions and test their *efficacy*.

(This step typically requires randomized trials in the laboratory (lab experiments) on small sub-samples while engaging closely with project implementers.)

Step 6: Test the *uptake* of efficacious interventions in experimental settings: These usually have the following components:

- What is the *ex-ante hypothesis* that we want to test? (Why? Work closely with project designers/implementers during this stage and discuss how this will help *them*);
- Employ identification methods (usually randomization) and identify how *causality* will be established;
- Build protocols for implementing experiments;
- Use econometrics and data methods (including data-collection, timing and specifications of econometric models); and
- Analyse the data and discuss findings with project implementers and designers.

Step 7: Implement tested behavioural interventions in the field and *test them further*:

(These are usually field experiments.)

Step 8: Work closely with project designers and implementers to use and scale-up tested and successful interventions (Also see if these nudges and boosts work in real-world situations as planned.)

Step 9: Report and dissseeminate as much as you can, externally so the world learns too.

Source: Authors.

H. CONCLUSION

Climate projects do not operate in a vacuum but are embedded within social, economic and ecological systems. Purely technocratic solutions to climate action are thus likely to face serious challenges. The striking discrepancy between scientific findings and climate policy globally, is a straightforward example of an intention-action gap.

This study illustrates the use and opportunity of behavioural science interventions in climate investments. We examine the design of climate investments as supported by the GCF and examine them using the lens of behavioural science. On the portfolio-level, behaviour change by final beneficiaries is essential for most adaptation and cross-cutting projects. We illustrate potential applications of behavioural science utilizing 11 GCF projects as case studies. Our results show that nudges and boosts are broadly applicable to climate projects.

Behavioural public policy is already a well-established field in developed countries using a variety of interventions far beyond what we can illustrate in this article. Within developing countries, the field is still in its infancy. Our stylized interventions showcase that behavioural science can be an important tool for increasing the effectiveness of climate and development projects. We encourage project developers and researchers to develop interventions and create an evidence base. Any project aiming to change livelihoods or introduce a new technology to end users is well-suited in this regard.

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Appendix 1. VARIABLES IN THE BEHAVIOUR CHANGE DATASET

Variables 1-4 were taken directly from the relevant fields in FPs. All other variables were extracted according to the definitions in the right-hand column.

Table A - 1. Variable definitions, coding and sources for the funded proposal portfolio dataset

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
1. FP Ref.	The Project No. of the funding proposal to whose Secretariat's review the point belongs.	> FP### > SAP###	Cover page of the funding proposal.
2. Accredited entity	Name of the accredited entity.		Section A.1.5 of the FP.
3. Mitigation/adaptation/cross-cutting focus	The focus of the project in terms of adaptation, mitigation or cross-cutting.	> Mitigation > Adaptation > Cross-cutting	Section A.1.8 of the FP. For earlier projects, this variable is taken from the project summary on the GCF website.
4. Result areas			
4.1 Energy access and power generation	The official GCF result areas that the project belongs to.	> 1: The project belongs to the result area > 0: The project does not belong to the result area.	Taken from section A.1.11 of the FP (section A.5 for Simplified Approval Process (SAP) template). For earlier projects, this variable is taken from the project description on the GCF website.
4.2 Low-emission transport			
4.3 Buildings, cities and industries and appliances			
4.4 Forestry and land use			
4.5 Most vulnerable people and communities			
4.6 Health and well-being, and food and water security			
4.7 Infrastructure and built environment			

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
4.8 Ecosystem and ecosystem services			
5. Project output category	Alternative classification of FPs according to project activities, based on working paper on behavioural insights. The category refers to the core activity of the project (e.g. the fortification of roads does not make it an infrastructure project when they are to support the training of farmers).	> Public infrastructure: energy, transport, public buildings, dams, seawalls > User infrastructure: any other infrastructure (e.g. sanitation, irrigation, meteorological equipment, water tanks) > Financial intermediaries: GCF provides funding to other financial institutions which further select the final projects to be financed > Empowerment: strengthening of individuals to change their business model > Other	Based on the project activities in section C.3 of the FP (B.2 for SAPs).
6. Need for behaviour change			
6.1 Any change needed	Binary indicator for whether the FP identifies lack of awareness, knowledge, skills, practices or behaviour among project beneficiaries or national institutions as a key barrier to project success. This excludes lack of regulation or frameworks.	> 1: Yes > 0: No	Taken from the theory of change or FP sections C.1 and C.2. (sections A.15 and B.1 for SAPs). As some FPs may mention these barriers in other sections, a keyword search for “awareness”, “lack”, “knowledge”, “skills”, “practice” and “behaviour” is further conducted in section C.3 (B.2 for SAPs).
6.2 Change needed - topic			
6.2.1 Climate change/extreme weather	Binary indicator for whether the lack of awareness/knowledge/skills/ practices/behaviour in variable 6.1 relates to the specific topic that may help either adapt to or mitigate climate change. 6.2.1: General understanding of climate change/weather events is lacking.	> 1: The FP mentions a lack of awareness about the specific topic > 0: The FP does not 6.2.11b: > [Category]	Source of variable 6.1
6.2.2 Renewable energy			
6.2.3 Investment opportunities			
6.2.4 Energy efficiency			

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
6.2.5 Agriculture/forestry	6.2.3: Uptake and awareness of "funding programmes, only for financial intermediaries" projects (3.). 6.2.6: Related to household water consumption, and not irrigation. 6.2.10: Individuals in governments, public administration, public services, financial intermediaries. Not related to policies/frameworks/laws. 6.2.11b: Ad hoc category specifying what the "other" lack of awareness/knowledge/skills/ practice/behaviour in 6.2.10 is about..	> NA: No "other change needed" mentioned in 6.2.11	
6.2.6 Water/sanitation/hygiene			
6.2.7 Climate information/early warning systems			
6.2.8 Ecosystems			
6.2.9 Gender			
6.2.10 Governance entities			
6.2.11a Other			
6.2.11b Other - category			
6.3 Any individual change needed	Binary indicator for whether any change is needed in any of the categories 6.2.1, 6.2.5-6.2.9, 6.2.11. These categories relate to individual behaviour change. Variables 6.2.2-6.2.4 referred predominantly to investment decisions while 6.2.10 refers to governance entities.	> 1: Yes > 0: No.	Own calculation.
7. Awareness-raising			
7.1 Awareness-raising mentioned	Binary variable indicating whether awareness-raising is among the project activities.	> 1: Awareness-raising is mentioned > 0: It is not mentioned.	Section C.3 of the FP (section B.2 for SAPs), and/or section H.1.2 (section D for SAPs) "Activities".
7.2 Awareness-raising by sector			
7.2.1 Climate change/extreme weather.	Binary variable indicating whether the specific topic is addressed by an awareness-raising activity:	> 1: The specific topic is addressed > 0: The topic is not addressed	Section C.3 of the FP (section B.2 for SAPs), and/or section H.1.2 (section D) "Activities".

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
7.2.2 Renewable energy	7.2.1: General information on climate change and its effects. 7.2.2: Includes solar-powered appliances. 7.2.3: Information on funding programmes, for "financial intermediaries" projects (variable 5.) only. 7.2.4: Information on energy-efficient and wasteful practices. 7.2.5: Information on climate-smart agriculture and forestry. 7.2.6: Adaptation and mitigation behaviours in WASH, not irrigation. 7.2.7: Availability and use of climate information. 7.2.8: Functioning and importance of ecosystems. 7.2.9: Availability and functioning of insurance. 7.2.10: Importance of gender aspects in adaptation and mitigation. 7.2.11b: Ad hoc category specifying the "other" topic of awareness-raising in 7.2.10.	7.2.11b: > [Category] > NA: No "other awareness-raising" mentioned in 7.2.11	
7.2.3 Investment opportunities			
7.2.4 Energy efficiency			
7.2.5 Agriculture/forestry			
7.2.6 Water/sanitation/hygiene (WASH)			
7.2.7 Climate information/early warning systems			
7.2.8 Ecosystems			
7.2.9 Insurance			
7.2.10 Gender			
7.2.11a Other			
7.2.11b Other - category			
8. Behaviour change			
8.1 Any intervention	Binary variable indicating whether the section C.3 – Project description of the FP contains any behaviour change intervention from the list in variable 8.2.	> 1: Behaviour change interventions are among the project activities > 0: They are not	Section C.3 of the FP (section B.2 for SAPs), and/or section H.1.2 (section D) "Activities". All listed activities in the section were checked as to whether they belong to any of the listed categories.
8.2 Type of behaviour change intervention			
8.2.1 CCTs			

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
8.2.2 Change agents/change groups	Binary variable indicating whether the following type of behaviour change intervention is among the project activities. 8.2.1: Cash transfers that are given only if the specific behaviour is observed. 8.2.2: Support groups led by a facilitator. 8.2.3: Any kind of training. 8.2.4: Training in soft skills, psychosocial support. 8.2.5: Interventions related to the choice architecture, e.g. reminders, framing, default options, simplified and targeted information, stating majority behaviour. 8.2.6: Desired behaviour is made cheaper or rewarded.	> 1: The specific behaviour change intervention is planned > 0: The specific intervention is not planned.	Section C.3 of the FP (section B.2 for SAPs), and/or section H.1.2 (section D) "Activities".
8.2.3 Technical skills transfer			
8.2.4 Boosting			
8.2.5 Nudging			
8.2.6 Incentives (not CCT)			
8.2.8 Unspecified/other behaviour change intervention			
8.3 Intervention – quote	Quotation from the FP containing the method used, and target behaviour of the behaviour change intervention with the exception of trainings.	> [Quotation] > Capacity-building.	Source of variable 8.2.
8.4 Trainings by sector			
8.4.1 Agriculture/forestry.	Binary variable indicating whether the training activities in section C.3 of the FP relate to: 8.4.1: Climate-smart agriculture/forestry practices. 8.4.2: Interpretation and application of climate information. 8.4.3: Conservation/maintenance of ecosystems. 8.4.4: Professional training for alternative income-generating activities.	> 1: The specific topic is targeted by a training activity > 0: It is not targeted 8.4.7b: > [Category] > NA: no "other training" mentioned in 8.4.7.	Section C.3 of the FP (section B.2 for SAPs), and/or section H.1.2 (section D) "Activities".
8.4.2 Climate information			

VARIABLE NAME	VARIABLE DESCRIPTION	VARIABLE CODING	SOURCE
8.4.3 Ecosystems	8.4.5: Avoiding discrimination and facilitating empowerment of women. 8.4.6: Ability to execute and administer adaptation/mitigation. 8.4.7b: Ad hoc category specifying the "other" topic of trainings in variable 8.4.6.		
8.4.4 Alternative livelihoods			
8.4.5 Gender			
8.4.6 Governance entities			
8.4.7a Other training			
8.4.7b Other training – category			
8.5 Change expectation mentioned	Binary variable indicating that a behaviour change is mentioned as an expected project result.	> 1: Behaviour change expectations are mentioned > 0: They are not mentioned.	Keyword search for "behaviour change" in the funding proposal, supplemented by reading sections C.1-C.3, D, E.2-E.3 of the funding proposal.
8.6 Change expectation – quote	Quotation from the funding proposal stating how the behaviour change in 8.5 is expected to be achieved.	> [Quotation]	Source of variable 8.5.
8.7 Change from awareness	Binary variable indicating that the behaviour change in 8.5 is expected from increased awareness.	> 1: Behaviour change is expected ... > 0: It is not expected > NA: No change expectation is mentioned in 8.5	Source of variable 8.5.

Appendix 2. BACKGROUND INFORMATION OF CASE STUDY PROJECTS

The project summaries are adapted from their descriptions on the GCF website (add the relevant project number to the end of the following address: *www.greenclimate.fund/project/fpXXX*). The behaviour change objectives and activities are taken from the logic framework in the funding proposals.

FP015 – Tuvalu Coastal Adaptation Project

Country:	Tuvalu
Accredited entity:	United Nations Development Programme (UNDP)
Project funding:	USD 38.9 million (USD 36.0 million from GCF, USD 2.9 million co-financing)
Project summary:	The project will build coastal resilience in three of the nine inhabited islands of Tuvalu, managing coastal inundation risks. Some 2,780m of high-value vulnerable coastline will be protected, reducing the impact of increasingly intensive wave action on key infrastructure. The investments will build upon existing initiatives, using a range of measures for coastal protection including eco-system initiatives, beach nourishment, concrete and rock revetments, and sea walls. National capacity for resilient coastal management will also be developed, and the project will help to catalyze additional coastal adaptation finance from other donors.
Behaviour change objective:	Strengthening of institutions, human resources, awareness and knowledge for resilient coastal management.
Behaviour change activities:	Institutional strengthening, including trainings, for resilient coastal management.

FP020 – Sustainable Energy Facility for the Eastern Caribbean

Countries:	Dominica, Grenada, Saint Kitts & Nevis, Saint Lucia, and Saint Vincent & Grenadines
Accredited entity:	Inter-American Development Bank
Project funding:	USD 192.4 million (USD 80 million GCF, USD 112.4 million co-financing)
Project summary:	The five East Caribbean states have small and isolated electricity markets that depend heavily on imported liquid fossil fuels for electricity generation. Geothermal energy (GE) presents the largest available renewable energy resource, with the potential to provide low cost, reliable electricity generation. The main barriers to GE development are the high investment cost, high uncertainty during early development stages, lack of access to capital and ability to finance through public debt, inadequate regulatory and policy frameworks, and other factors such as lack of technical skills and economies of scale. The project will address these barriers by

providing institutional strengthening and capacity building, and provide a financing package to mitigate exploration and other underlying risks, and unlock investments in GE by the private sector that are critical to developing GE projects in the region.

Behaviour change objective: Institutional strengthening and capacity building for geothermal energy.

Behaviour change activities: Technical assistance to develop regulatory frameworks and training on project development and management for government representatives.

FP025 – EBRD sustainable energy financing facilities

Countries: Republic of Armenia, Arab Republic of Egypt, Georgia, Hashemite Kingdom of Jordan, Mongolia, the Kingdom of Morocco, Republic of Moldova, Republic of Serbia, Tajikistan, Republic of Tunisia

Accredited entity: European Bank for Reconstruction and Development (EBRD)

Programme funding: USD 1,385 million USD (USD 378 million GCF, USD 1007 million co-financing)

Programme summary: This programme will deliver climate finance at scale via partner financial institutions (PFIs) in developing countries, which will fund over 20,000 sub-projects across industrial, commercial, residential, transport and agricultural sectors. The programme will provide credit lines to PFIs with the aim to create self-sustaining markets in the areas of energy efficiency, renewable energy and climate resilience. The PFIs in the programme will on-lend the funds to borrowers such as MSMEs, special purpose companies and households for energy efficiency, renewable energy and climate resilience projects. Financing activities will be complemented by the provision of technical assistance (TA), both to the local PFIs and to the borrowers. This component will include capacity building of local PFIs and MSMEs, project assessment and monitoring, and gender mainstreaming activities.

Behaviour change objectives: Awareness about climate financing opportunities; strengthened partner financial institutions.

Behaviour change activities: Trainings to members of partner financial institutions; marketing campaign to promote climate finance credit lines.

FP029 – SCF Capital Solutions

Country: South Africa

Accredited entity: Development Bank of Southern Africa

Project funding: USD 34.1 million (USD 12.2 million GCF, USD 21.9 million co-financing)

Project summary: Micro, small and medium-sized enterprises can contribute significantly to the climate change objectives of South Africa, as they occupy a large part of the national economy. This programme

was created as a direct result of the needs of MSME start-ups in the Green Fund incubation programme of South Africa. Despite engaging in climate activities which the country so greatly needs, MSMEs have been unable to access financing from traditional financial institutions. SCF Capital Solutions allows start-ups in renewable energy and energy-efficient sectors to transition from incubation to securing contracts with large buyers, accelerating both their own activities and the transition of South Africa to a low-carbon economy.

Behaviour change objectives: Only changes in investment decisions mentioned.

Behaviour change activities: Not mentioned.

FP040 – Scaling Up Hydropower Sector Climate Resilience

Country: Tajikistan

Accredited entity: EBRD

Project funding: USD 128.9 million (USD 50 million, USD 78.9 million co-financing)

Project summary: The energy system in Tajikistan is dominated by hydropower and is therefore highly exposed to climate change risks. Hydropower is of fundamental importance for economic development and living standards in Tajikistan, and climate change is a hugely important risk amplifier in this already precarious and challenging context. Strengthened institutions and governance are necessary to improve the climate resilience of hydropower systems. Additionally, the climate vulnerability of energy systems in Tajikistan also has important social and gender dimensions.

In response to these severe challenges, the proposed project aims to scale up the adoption of climate resilience practices and technologies in the Tajik hydropower sector. Enhanced institutional capacities, modern climate resilience technologies and adequate technical skills are urgently needed in Tajikistan to address the risks associated with climate change in the fragile and highly climate-vulnerable hydropower system. The proposed project will support the transfer of the knowledge and technologies needed to achieve these targets, which are vital for the strategically important hydropower sector of Tajikistan.

Behaviour change objectives: Improved climate risk management in the hydropower sector.

Behaviour change activities: Technical assistance and training for hydropower operators.

FP058 – Responding to the increasing risk of drought: Building gender-responsive resilience of the most vulnerable communities

Country: Ethiopia

Accredited entity: Ministry of Finance and Economic Cooperation, Ethiopia

Project funding: USD 50 million (USD 45 million GCF, USD 5 million co-financing)

Project summary:	Ethiopia is projected to experience drought conditions worsened by climate change. In 2015 to 2016, Ethiopia experienced one of its worst droughts in decades. Climate change impacts are likely to increase temperatures, create greater rainfall variability with more frequent extremes, and change the nature of seasonal rainfalls. Introducing improved water supply and management systems will increase local communities' productive capacities as well as the water ecosystem's carrying capacity. The three main activities will be introducing solar-powered water pumping and small-scale irrigation; the rehabilitation and management of degraded lands around the water sources; and creating an enabling environment by raising awareness and improving local capacity. Over 50 per cent of the beneficiaries will be women, with 30 per cent of households being female-headed.
Behaviour change objectives:	Farmers adopt climate-resilient farming, water and land management practices.
Behaviour change activities:	Trainings on water management, land management and farming practices.

FP061 – Integrated physical adaptation and community resilience through an enhanced direct access pilot in the public, private, and civil society sectors of three Eastern Caribbean small island developing States

Countries:	Antigua and Barbuda, Dominica, Grenada
Accredited entity:	Department of Environment, Ministry of Health and Environment, Government of Antigua and Barbuda
Project funding:	USD 22.6 million (USD 20 million GCF, USD 2.6 million co-financing)
Project summary:	Antigua and Barbuda, Dominica, and Grenada are three small island developing States facing challenges in adapting to climate change-related threats such as more intense hurricanes, higher temperatures and lower overall rainfall. Small grants for community organizations, together with revolving loans for households and businesses, will improve the resilience of infrastructure to withstand category 5 hurricanes. A funding mechanism for public infrastructure (including drainage and irrigation) and ecosystems will also reduce disruptions in the water system and improve soil and water conservation, which are all threatened by the results of climate change.
Behaviour change objectives:	Enhanced capacity for climate adaptation planning, implementation, and monitoring and evaluation via direct access.
Behaviour change activities:	Training on adaptation strategies and measures for officials.

FP062 – Poverty, Reforestation, Energy and Climate Change Project (PROEZA)

Country:	Republic of Paraguay
Accredited entity:	Food and Agriculture Organization of the United Nations
Project funding:	USD 90.3 million (USD 25.1 million GCF, USD 65.2 million co-financing)
Project summary:	Municipal districts in eastern Paraguay are highly vulnerable to the impacts of climate change. In addition, certain municipal districts have extremely high climate and social vulnerability. Deforestation and forest degradation increases the vulnerability of populations dependent on family farming for agricultural production and livelihood. Environmental conditional cash transfers (E-CCT) will be provided in exchange for community-based climate-sensitive agroforestry. This will serve as a bridge until new farming models are financially sustainable. Credit will be made available to establish productive forest plantations for bioenergy, timber and silvo-pastoral production (combining forestry with livestock grazing). Capacity building will support good governance and law enforcement.
Behaviour change objective:	Improved management of land or forest areas contributing to emissions reductions.
Behaviour change activities:	Technical assistance for sustainable agroforestry, environmental conditional cash transfers.

FP084 – Enhancing climate resilience of India's coastal communities

Country:	Republic of India
Accredited entity:	UNDP
Project funding:	USD 130.3 million (USD 43.4 million GCF, USD 86.9 million co-financing)
Project summary:	The coastline of India is expected to be among the coastlines most affected by climate change in the world. Climate change impacts such as extreme weather events and sea level rise are exacerbated by urbanization, overfishing and poorly planned coastal development. This project will strengthen the climate resilience of coastal communities in India by protecting and restoring natural ecosystems such as mangroves and seagrass, which are essential for buffering against storm surges. The project will also support climate-adaptive livelihoods and value chains to increase the climate resilience of these coastal communities.
Behaviour change objectives:	Use by participating households of support on climate-adaptive livelihoods and value chains.
Behaviour change activities:	Trainings on coastal ecosystem management and climate-resilient livelihoods, in addition to a media campaign around climate change.

FP091 – South Tarawa Water Supply Project

Country:	Kiribati
Accredited entity:	Asian Development Bank
Project funding:	USD 58.1 million (USD 28.6 million GCF, USD 29.5 million co-financing)
Project summary:	Kiribati is one of the most remote and least developed countries in the world. It faces significant challenges due to its vulnerability to climate change. The water supply of South Tarawa is almost entirely dependent on underground freshwater lenses, the quality and quantity of which are seriously threatened by climate change-induced inundations and prolonged drought. This project aims to reduce the climate vulnerability of the entire population of South Tarawa through increased water security, by providing them with a reliable, safe and climate-resilient water supply. This will be done through the construction of a desalination plant and a photovoltaic system to provide low-emission power for the plant and the water supply network. With this project, the residents of South Tarawa will no longer need to boil drinking water, thereby reducing emissions from burning fuel and firewood.
Behaviour change objective:	Strengthened awareness of climate threats and risk-reduction processes.
Behaviour change activities:	Community outreach programme and visitor education centre at desalination plant.

FP093 – Yeleen Rural Electrification Project in Burkina Faso

Country:	Burkina Faso
Accredited entity:	African Development Bank
Project funding:	USD 62.9 million (USD 28.8 million GCF, USD 34.1 million co-financing)
Project summary:	Burkina Faso is a landlocked least developed country where electricity generation is 80 per cent reliant on fossil fuels. While 70 per cent of the country's population lives in rural areas, only 3 per cent of these people have access to electricity. The Government of Burkina Faso currently subsidises diesel generation in remote areas, a situation which is unsustainable from both climate-change and economic standpoints. This project aims to create a paradigm shift towards low-emission electricity access by using a public sector intervention to provide an enabling environment for the private sector, which will operate solar mini-grids. The project will include the installation of 100 mini-grids in Burkina Faso using result-based payments to private sector operators, and it aims to improve the regulatory framework to mobilize private sector capital in renewable energy-based rural electrification investments. Micro-finance institutions will be encouraged to provide loans to

	productive users in the areas where solar mini-grids will be installed.
Behaviour change objective:	Commercial use of electricity access by rural communities.
Behaviour change activities:	Provision of results-based capital grants and training on productive use equipment.

Appendix 3. MAPPING OF SAMPLE PROJECTS BY GCF RESULT AREAS

Table A - 2. Mapping of sample projects by GCF result areas

RESULT AREA	SHARE OF PROJECTS WITH INTERVENTION
Mitigation	
Energy access and power generation	5 / 10
Low-emission transport	0 / 2
Buildings, cities and industries and appliances	3 / 6
Forestry and land use	2 / 3
Adaptation	
Most vulnerable people and communities	8 / 11
Health and well-being, and food and water security	5 / 8
Infrastructure and built environment	5 / 8
Ecosystem and ecosystem services	4 / 5

Source: Authors' summary of case studies.

Appendix 4. ADDITIONAL RESOURCES FOR INTERVENTION DESIGN

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