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A REVIEW OF THE ATTRIBUTES OF TRANSFORMATIONAL CHANGE IN THE ENERGY AND PUBLIC HEALTH SECTORS

APPROACH PAPER

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A review of the attributes of transformational change in the energy and public health sectors

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ABBREVIATIONS

3IE	International Initiative for Impact Evaluation
ATT	Average treatment effect on treated
C4ED	Center for Evaluation and Development
CAIT	Climate Access Indicators Tool
CIF	Climate Investment Fund
CO2	Carbon dioxide
COP21	Conference of the Parties
DID	Difference-in-differences approach
EGM	Evidence gap map
EPPI Centre	Evidence for Policy and Practice Information and Co-ordination Center
F-gases	Fluorinated gases
GCF	Green Climate Fund
GHG	Greenhouse gas
GRADE	Grading of Recommendation, Assessment, Development and Evaluation
HIV	Human immunodeficiency viruses
ICTs	Internet and information and communications technologies
IPCC	Intergovernmental Panel on Climate Change
IV	Instrumental variable
LATE	Local average treatment effect
LMICs	Low- and middle-income countries
NAPA	National Adaptation Program of Action
ORS	Oral rehydration solution
PICOS model	Population, intervention, comparison, outcome and study design model
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSM	Propensity score matching
RCT	Randomized controlled trial
RDD	Regression discontinuity design
SURE ranking	Supporting the Use of Research Evidence
ToC	Theory of Change
TWh	Terawatt hour
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water, sanitation and hygiene
WHO	World Health Organization
WRI	World Recourses Institute

A. BACKGROUND

1. DESCRIPTION OF THE PROBLEM

a. The need for transformational change in climate change mitigation and adaptation

The Intergovernmental Panel on Climate Change (IPCC) estimates that if greenhouse gas (GHG) emissions maintain their rise at the current rate ("business-as-usual"), then by the end of the 21st century, the average temperature will increase by 2.6 to 4.8 degrees Celsius and sea levels will rise by 0.45 to 0.82 meters (Intergovernmental Panel on Climate Change, 2018).

The international community is responding to climate change adaptation and mitigation, such as through the Paris Agreement and National Adaptation Programmes of Action. Mitigation measures cover efforts to reduce GHG emissions, such as through a transition to clean energy sources, and the absorption of gases already emitted. Adaptation, on the other hand, refers to actions needed to better cope with the impact of climate change (Pachuari and Meyer, 2014; Watts et al., 2018).

Ongoing global efforts are, however, not sufficient to meet the goals of the Paris Agreement. Although climate finance has risen considerably over the past years, it is still deemed too low compared to the level required to achieve a 1.5 degrees Celsius global-warming scenario (Climate Policy Initiative, 2019). As one example, investments into low-carbon technologies fall short of what is required to meet the mitigation target, according to a report by the International Energy Agency (2019). The same applies to insufficient adaptation finance (Global Commission on Adaptation, 2019), which does not meet the needs expressed in the nationally determined contributions (Neufeldt et al., 2018).

To meet needed targets, climate investments would have to substantially increased and their impacts per dollar spent need to be considerably higher. Furthermore, the longer current mitigation and adaptation measures fall short, the higher must be the overall impact that is required by future interventions. It is therefore imperative to usher in interventions that have (1) a large impact that (2) is sustained over time and at (3) a large scale. We follow Puri (2019) to consider such changes in outcomes as being transformational. To achieve transformational change, the behavior of many people or even entire systems have to change.

According to Puri (2019), these three elements are common in how major multinational agencies operationalize transformational change.[1] For these organizations, working closely with national and subnational governments, as well as national policy makers, learning about the drivers of transformational change is of vital importance.

The Climate Investment Funds (2019) has also published on transformational change from climate finance and identified the dimensions of relevance, scale, systemic change and sustainability as key to achieving such change. Their work posits that all four dimensions must be in place (to a greater or lesser extent) for transformational change to be considered both real and lasting.

[1] For a growing literature on substantive definitions of, as well as the theoretic mechanisms behind, transformational change see Feola (2015), Few et al. (2017) and Kates et al. (2012). While these mechanisms enter neither our definition nor our analysis of the evidence for transformational change, they do inform the selection of interventions and thereby the types of studies included in our review.

b. Searching for evidence on drivers of transformational change in the energy and public health sectors

As Puri (2019) suggests, transformational change has become the holy grail in climate change and development assistance. While there is much anecdotal evidence in brochures and examples of highly successful interventions in the academic literature, many interventions do not replicate when scaled up, or work well in one context, but fail elsewhere (Banerjee et al., 2017; Deaton, 2010; Madrian, 2014; Muralidharan and Niehaus, 2017). The lack of systematic high-quality evidence may be particularly severe in the field of climate change interventions, as rigorous evidence has only recently started to grow (Prowse and Snilstveit, 2010).

Our review is meant as a step towards finding the holy grail of transformational change. We do so by searching for robust and causal evidence of transformational change and its drivers. On the one hand, we approach this directly by systematically reviewing the experimental and quasi-experimental literature with the *potential* to document transformational change across a broad set of interventions and outcomes. We hereby focus on the energy sector in low and middle income countries (LMICs) because of its key role for future climate change mitigation measures. We also approach this learning exercise indirectly by reviewing the evidence on behavioral change in the sector of public health, without restricting the focus to climate change. The public health literature has the longest tradition of long-term causal studies on behavioral change and thereby how to overcome the "last-mile problem", which so often stands in the way of realizing transformational change (Puri, 2019). The goal behind our study is to assess how lessons about transformational change in energy and behavioral change in public health (in terms of interventions that led to large and sustained change at scale) may inform broader mitigation and adaptation investment. This review therefore combines, in a novel way, two different reviews into one learning exercise on transformational change.

The primary research question guiding this review is: What are the attributes, determinants and contributors of transformational change in the energy and public health sectors? The effort is to map and systematically meta-analyze multi-sector evidence.

Transformational change, as such, is difficult to find directly for two reasons: First, since transformational change consists of several elements and still lacks an established definition, it is not the outcome measured in empirical studies. Instead, evidence for transformational change may be found across a wide range of possible outcomes. Second, restricting our search to studies that document transformational change, i.e. large effects, at scale and sustained over time, risks finding statistical outliers rather than an unbiased reflection of the available evidence. We therefore search for evidence across a wide range of interventions and outcomes in studies that have the *potential* to document transformational change – regardless of whether the individual study indeed found large effects over time. In the subsequent step, we synthesize the evidence across studies to identify those interventions that can produce transformational change. Our approach is laid out in more detail in the methods section.

c. Drivers of climate change

In the following paragraphs, we describe why studying the energy sector in LMICs is key to future climate change mitigation efforts and also highlight that the energy sector itself is in need of adapting to climate change.

Carbon dioxide, methane, nitrous dioxide and fluorinated gases (F-gases) are the key greenhouse gases emitted by human activities, with 76% of these constituted by carbon dioxide (CO_2) emissions alone. Of the overall carbon emissions, fossil fuels and industrial processes account for 86% of

GHG emissions.[2] In terms of economic sectors, energy is the largest offender in terms of contribution to GHG emissions. It accounts for around 35% of GHG emissions, including emissions that occur in the middle stages of energy production, e.g. fuel extraction, refining, processing and transportation (Pachuari and Meyer, 2014). Global warming is a consequence of the lagged, cumulative effect of greenhouse gas emissions. Such gases stay in the atmosphere for up to a century, such that on a *per capita*, historical basis, industrialised countries (that is, Annex 1 countries who are party to the UNFCCC) bear the majority of the responsibility for such pollutants.

That said, nearly all of the growth in energy demand, and consequently fossil-fuel use and GHG emissions, is predicted to come from LMICs (Wolfram et al., 2012). Part of this increase may in itself be driven by climate change. With rising temperatures, LMICs, for example, are expected to increasingly use air conditioners, with the demand for residential air conditioning projected to rise from 500 TWh in 2000 to around 4000 TWh in 2050 (World Energy Council, 2015). The reliance of LMICs on fossil fuels for energy production means the projected increase in energy demand will, without strong counter-measures, result in even higher greenhouse gas emissions (Ebinger and Vergara, 2011a). For the period of 1994 and 2014, Falconí et al. (2019) already found considerably higher growth rates of per capita CO_2 emissions in middle-income compared to high-income countries (HICs), with -0.2% for the latter compared to 2.8% for upper and 1.4% for lower middle income countries. Similarly, upper and lower middle income countries have nearly 24 times (for upper) and 9 times (for lower) per-capita energy-use growth rate of HICs. The contrast between the responsibility of Annex 1 countries for historical emissions and the responsibility of non-Annex 1 countries for future emissions is why climate change is such an intractable problem. It also shows why the energy sector in LMICs plays such a key role for climate change mitigation measures.

At the same time, the energy sector itself is vulnerable to climate change. Changing precipitation and weather patterns directly affect renewable energy plants, which are dependent on natural activities – hydropower plants can suffer from drying rivers, wind power plants would produce less energy if there is a windless drought and solar panels suffer from higher precipitation and cloud cover (Ebinger and Vergara, 2011a). Since LMICs are predicted to be the main victims of climate change, because of their weaker capacity to adapt than HICs (Cole, 2008), adaptation measures in the energy sector are therefore particularly important for these countries.

Despite their vulnerability to climate change, LMICs also have opportunities to implement effective adaptation and mitigation strategies. For example, according to an analysis of the International Energy Agency (IEA) in their World Energy Outlook 2019, sub-Saharan Africa could achieve significant industrialisation and economic growth while keeping emissions relatively low by increasing the share of renewable energy in the energy mix. To achieve this, the IEA calls for investments on grid expansion, reinforcement and maintenance as well as on renewable-energy generating capacity, in particular solar PV. As outlined in a report by the GCA (2019), investments in climate change adaptation could generate high rates of return and pay out a "triple dividend" of avoided losses, economic benefits (e.g. through reduced climate risk) as well as social and environmental co-benefits. Through our review, we will study which interventions indeed show robust and causal evidence – across individual studies – of transformational change in energy and public health sectors.

2. CATEGORIZATION OF INTERVENTIONS AND OUTCOMES

The interventions and outcomes that are covered in this review are categorized within two broad theories of change (see Appendix Appendix 1) for each sector. These theories of change (ToCs)

[2] Other gases are less dominant, however, still heavily present – 16% of emissions are methane, 6% - nitrous dioxide and the remaining 2% consist of F-gases.

simultaneously structure and define the scope of this study, which is important in light of our goal to broadly search for interventions that could produce transformational change.

For the energy sector, we cover a broad set of interventions that either target or could have effects for climate change mitigation and adaptation. These take place either at the level of institutional and market systems, through incentives and standards, through "soft" interventions (nudges), or in form of investments into infrastructure. Outcomes under the purview of this review capture either climate change mitigation, adaptation (resilience of energy systems), or labor-market co-benefits of investments or transition into renewable energy. They are described in more detail in the next section.

For the public health sector, we include interventions targeting behavioral change in five broad areas – nutritional (dietary) habits, physical activity, substance abuse, hygiene practices and utilization of health care service.[3] The current scope of the targeted areas for the interventions in the health sector are as shown in the inclusion and exclusion criteria (Appendix 3).

These are to be redefined in order to align them with the preferred scope of the study. These interventions will then be coded following the behavioral change framework provided by Michie et al. (2011). The behavioral change framework outlines the intersection between the two sectors, to enable the comparison and cross-sectoral learning on behavioral change. Therefore, within this section, the ToCs will be presented with the public health sector preceeding the energy sector, to facilitate the understanding of intervention categorization within the latter.

The ToCs also include the moderators they function through and the assumptions which influence the overall relation between the interventions and their potential outcomes. Therefore, the existing institutions, the political and ideological framework, the economic structures, the available resources, the environmental and technological constraints, and finally the characteristics of the intervention population are all important variables that might moderate the effect or the nature of an intervention. These are therefore included within both ToCs. Specific assumptions on which the causal chain between interventions and long-term goals rest are:

- Individuals are responsive, receive the intervention as envisioned, and comply with the treatment
- Interventions are relevant for the context or have been contextualized appropriately
- Institutions at all levels support the implementation of the interventions

Finally, the ToCs map out the consequent outcomes and long-term goals that are targeted by the type of interventions listed above. The sector-specific ToCs are described below.

a. Public Health

The Public Health sector has the longest tradition of using causal methods to investigate the interventions that may produce large and sustained behavioral change. Within this review, we use this tradition to highlight the key interventions that may elicit sustained behavior change in individuals, within the five areas of *nutritional (and dietary) habits*, *physical activity*, *substance abuse, hygiene practices* and *utilization of health care services.*

Each intervention is categorized under the behavioral framework from Michie et al. (2011). Michie et al. (2011) rely on expert consultation as well as a review of a range of other behavioral frameworks to define a framework categorizing intervention and policies that encompass all previous frameworks. This framework, which they call the "behavior change wheel", groups

[3] These five broad areas are not final and are subject to change based on the final search results as well as their appropriateness to the objective of the review.

interventions along nine *intervention functions*.[4] Behind these functions lie three essential sources of behavior change: capability, opportunity and motivation, or the *COM-B system*. These source functions are effectively the drivers of behavior change, without one (or more) of these being targeted, behavior change is not possible. Each of these sources are further broken into two additional categories. Within capability, there exists *psychological* and *physical* capacity, to allow the individual to engage in the activity promoted/inhibited by the intervention. Similarly, without *social* and *physical* opportunity, which lies outside of the control of the individual, behavior change might not be possible. Both capability and opportunity also provide the necessary stimulus to the brain processes that motivate behavior change, either by *reflection* or *automatively*. All these sources inform the design of the intervention, as depicted within the causal chain. There are nine categories of intervention functions that are included within the behavioral change wheel and are meant to contribute towards long term change in health behaviors:

First are interventions under the category of *education*, such as awareness and knowledge campaigns, used to increase knowledge or understanding, not only to inspire a particular behavior but also to provide knowledge about competing behaviors.

The second category of interventions falls under *persuasion*, whereby through various methods of communication, such as reminders or warnings via phone or other ICTs, positive or negative feelings are induced to stimulate action.

Incentivization in the form of monetary and in-kind rewards is the third category of interventions, meant to create reward expectations for following a particular behavior or abstaining from it.

Fourth category of interventions is *coercion*, which is opposed to incentivization, and creates an expectation of punishment, such as by raising prices or increasing taxes.

The fifth type of intervention is *training*, where individuals are imparted skills to encourage behavior of activity being trained.

Restriction, which prohibits engagement in target behavior with the use of rules such as bans or regulated uses, is the sixth category of interventions. By discouraging competing behaviors, these can also be used to encourage a particular behavior.

Another set of interventions falls under the category of *environmental restructuring*, where by modifying the *physical* context around an individual, such as improving infrastructure or technologies related to the targeted behavior, behavior change can be encouraged or discouraged. Another subset of interventions under this category captures the modification of the *social* context around the targeted behavior, such as prompts that guide the behavior change.

The penultimate category of interventions is *modelling*, where behavioral change is stimulated by depicting what the model behavior should be. This is the method of leading by example, by showcasing the model behavior.

Finally, under the category *enablement*, any type of support that increases the means, reduces the barriers, or increase the capability to act on targeted behavior (such as surgeries or prosthetics to increase physical activity) will be included.

Within our review, we further divide the intervention function of environmental restructuring into its two categories, physical restructuring and social restructuring, giving us ten intervention functions in total.

[4] They also categorize seven policy categories (communication/marketing, guidelines, fiscal, regulation, lesgistaion, environmental/social planning and service provision) but these are not included in our theoretical causal chain of results.

Each intervention function affects one or more source function, and thereby leads to the required modification of health behaviors, attitudes and practices, as depicted as the *concrete outcomes* in our theory of change.

These interventions aim at changing behavior in the outcome categories, which also define the scope of this sector. For the purpose of this review, we are not per se interested in all possible health outcomes, but rather in what we can learn from these health behaviors for behaviors related to climate change mitigation and adaptation. We therefore propose to define the scope of the health outcomes along the following dimensions: *action / health-seeking behaviors* and *purchasing / consumption behavior*. These two dimensions can have a private benefit (quitting smoking), or might alternatively also affect health outcomes for other individuals (because of less exposure to passive smoke).

Overall, these outcomes (and interventions) will lead us to observe sustained improvements in health behavior, infrastructure and practices.

b. Energy

A large amount of the interventions targeted at climate mitigation can be found in the energy sector. Due to the implementation of the Paris Agreement, 197 countries are required to have national GHG-emission reduction policies and plans for their post-2020 agenda (World Resources Institute, 2018). Fostering low-carbon technologies is therefore projected to be a major issue for governments (Bouye et al., 2018). The long term goal of the ToC in the energy sector is that energy production and consumption is sustainable, resilient and does not contribute to climate change. Moreover, an increase in energy supply and demand also aims to contribute to higher employment, which is on the one hand a social co-benefit of energy investments but on the other hand a potential conflict with the goal of climate change mitigation. In this sector, we base the ToC mainly on different assessment reports and systematic reviews concerning climate change mitigation and adaptation to it, especially the IPCC's Synthesis report on climate change (Pachuari and Meyer, 2014), the 3IE scoping report by Robalino et al. (2014), frameworks and reports by the World Bank Group, the International Energy Agency and the European Union Energy Initiative Partnership Dialogue Facility (Ebinger and Vergara, 2011b), as well as on extensive discussions with the Climate Investment Fund's Evaluation and Learning Initiative and the Green Climate Fund's Independent Evaluation Unit.

We group interventions into four broad categories, which, according to the ToC, will jointly contribute to achieving the long term goals.

The first category is *institutional and market systems*, i.e., interventions that change the institutional structure of energy systems or markets. The sub-categories are public-administration reforms, industry coordination and industry self-regulation, privatization, liberalization and introduction of market-based mechanisms as well as de-privatization and de-liberalization.

The second category is *incentives and standards*. This category consists of three sub-categories that directly link to the behavioral framework from Michie et al. (2011), as described in the public health sector above: incentivization (such as transfers), coercion (such as taxes and fees) and restrictions (such as bans and limits).

The third category is *"soft" interventions*, which do not change incentives. The sub-categories therein are again taken from Michie et al. (2011): education, persuasion, training, environmental restructuring (such as social norms), modelling (such as presenting model behavior in TV shows) and enablement (such as defaults).

Lastly, *investments into energy infrastructure, equipment and technologies* is the fourth category. Sub-categories are investments into energy transmission, distribution and storage of electric energy systems as well as investments into renewable energy generating equipment.

These interventions may lead to outcomes grouped into seven categories. First, mainly through investments into energy infrastructure, such as grid-extension, *access to energy and the supply of (renewable) energy* may increase.

Second, *energy market development* may be spurred through institutional and market-systems interventions (International Finance Corporation, 2019).

Third, *energy consumption and demand* (differentiated between renewable, non-renewable and on-grid electricity) and fourth, *adoption of more energy-efficient technologies (including the transition to renewables)*, may change due to targeted interventions in all intervention categories.

Fifth, the *resilience of energy systems* to climate change may increase due to investments into energy systems, such as smart grids and energy storage capacities (Ebinger and Vergara, 2011a; Stuart and Escudero, 2017).

Sixth, as a result of incentives and standards (such as energy-efficiency standards), as well as cleaner energy supply and demand and adoption of more energy-efficient technologies (such as improved cookstoves), *GHG emissions and indoor air pollution* may decrease.

Lastly, as a *labour market co-benefit* from investments into renewable energy, formal employment may increase.

In order to facilitate cross-sector learnings from the Public Health sector, all behavioral outcomes within these seven outcomes will be coded in terms of whether they are *action behaviors* or *purchasing/consumption behaviors*.

3. WHY IS IT IMPORTANT TO DO THIS REVIEW?

To our knowledge, there appears to be an absence of systematic evidence on the causal drivers of transformational change in general, and in particular in relation to climate change mitigation and adaptation as well as on behavioral change in public health. The study that is closest to our review is Lee et al. (2013), who systematically review the literature on organizational transformation, mainly in health care. Their definition of transformational change is, however, focused on organizational practices, whereas we look at a broad range of outcomes. Furthermore, most included studies in their review are qualitative and thereby not able to show causal drivers of transformational change. This review will reduce this gap within the literature in order to inform governments, donors and other policy makers on the available evidence on a broad set of interventions and their effects on climate change mitigation and adaptation outcomes in the energy sector.

We contribute to the literature on the drivers of transformational change in the following ways:

- We discuss attributes of transformational change by offering a precise definition of transformational change (see next section), which will form the basis of this review.
- In order to learn about causal evidence on transformational change, we select only quantitative studies with an experimental or quasi-experimental study design. Furthermore, our inclusion criteria are based on a precise definition of transformational change. More specifically, we only include studies that have the potential to document transformational change according to these criteria. For instance, we intend to only include studies where data-collection was done at least one year after the intervention. Whether transformational change indeed happened is the empirical question to be answered through our meta-analysis.
- While our review is broad in scope, we have a precise but extensive list of interventions and outcomes within each sector, within clearly structured categories. This allows us to search for evidence for transformational change across fields of studies while at the same time keeping the scope of the review manageable.

- We combine two reviews, in two different sectors, public health and energy, into one learning exercise about transformational change and how the lessons learned may inform climate change mitigation and adaptation investment.
- As a first step we provide a framework of reviewed evidence in the form of an evidence gap map (EGM) of interventions in the specified sectors. EGMs are a convenient and simple-to-use tool for policymakers to quickly inform themselves about existing evidence. This exercise will highlight where research is comprehensive and where there appears to be a lack of evidence. Moreover, it enables policymakers and practitioners to make informed decisions about project prioritization and further research activities.
- We then conduct meta-analyses with the data extracted from the selected quantitative studies for sufficiently populated cells of the EGMs (i.e. at least 10 studies for the same intervention and outcome combination). This is another exercise that has not been found to be common in the literature on transformational change.
- The results of the meta-analysis are important to determine where robust evidence exists, i.e. across individual studies and contexts, for transformational change. Doing so will minimize the risk that large effects of interventions are simply statistical outliers. By using the results from this meta-analysis, we intend to produce "transformational change maps" (TCMs), i.e., infographics that only show those intervention and outcome combinations where evidence for large effects at scale and over time exists. The TCMs will show the determinants of transformational change.
- In order to identify contributors of transformational change, we will search for common characteristics between populated cells in the TCMs, i.e. those intervention and outcome combinations where we find evidence for transformational change. We will also run, where applicable, meta-regressions across these cells in the TCMs and across sectors in order to explain heterogeneity in study results. This way we might learn which characteristics of interventions contribute to transformational change.

B. OBJECTIVE OF THE REVIEW

This systematic review focuses on the evidence from LMICs in order to learn about the attributes, determinants and contributors of transformational change in the energy and public health sectors.

For the purpose of our review, we have to operationalize transformational change into clearly measurable criteria. We do so with the following three criteria:

1) A large **depth** of change: Transformational change requires a sizeable change. For the purpose of this review, this can be measured in the terms of a large effect size an intervention produced on the outcomes.

   To define what a large impact is, we rely on previous literature that has attempted to standardize these definitions. Sawilowsky (2009) defines rule of thumb effect sizes for Cohen's d as large if d = .8 (and very large if d= 1.2 and huge for a d= 2), based on a review of literature and contextualization of the effect sizes defined by Cohen in 1988 (Cohen, 1988). For relative risk, common in the medical literature, the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) uses a scale separating relative risks of at least 2 as large (and those greater than 5 as very large, Guyatt et al., 2011). We will use these two definitions to define large impacts based on effect sizes in outcomes.

2) A large **scale** of change: Even with a large effect size, an intervention only becomes an important contributor of transformational change if it has sufficiently large scale, i.e., targeting many beneficiaries or covering large areas.

Given the variety of interventions within the two sectors, we consider interventions as large scale if there are at least 1000 individual beneficiaries (effect being measured here is the treatment effect on the treated - ToT) or if they target an entire administrative area larger than a village (e.g. district, region, state).

3) **Sustained** change: For a change to be transformational, it has to persist over time. The definition of sustained is found to vary considerably over the literature we reviewed (between 6 months and several years). In order to maintain coherence across the results, we consider an effect sustained if it persists at least one year after first full implementation of the intervention.

The report will discuss these thresholds for depth of change, scale of change and sustained change in light of the available evidence that we found.

C. METHODS

1. CRITERIA FOR INCLUSION AND EXCLUSION OF STUDIES IN THE SYSTEMATIC REVIEW

To preview the precise inclusion criteria of individual studies described through the PICOS model (population, intervention, comparison, outcome and study design model), we only look at studies that

1) measure effect sizes (allowing us to search for interventions that produce a large **depth** of change)
2) are sufficiently large in their scope or coverage (reflecting the possibility for a large **scale** of change) and
3) collect data over a prolonged period in time (reflecting the possibility for showing **sustained** change)

Note that these three criteria are closely linked to the definition of transformational change. However, the criteria only help finding studies that have the *potential* to document transformational change.

Crucially, individual studies will also be selected for inclusion into the review if the evaluated intervention did not lead to large effects over time. If we only included studies with large effects over time, we would run a strong risk of picking statistical outliers instead of finding an unbiased picture of the available evidence. Study results will only become a selection criterion after meta-analysis and therefore always at the level of a group of closely related studies (with the same intervention and outcome combination). We will describe in the analysis subsection how the *fulfillment* of the three criteria of transformational change are reflected in the analysis that leads to the TCMs.

Following Petticrew and Roberts (2006), we use the PICOS model to precisely describe the inclusion and exclusion criteria. The tables including the summary of the inclusion and exclusion criteria for both sectors can be found in Appendix 3 Pilot screening may lead to adjustments in these tables to make sure that the categorization and coding of studies is sufficiently clear.

a. Population

We include interventions rolled out in LMICs, as defined by the current World Bank categorization (financial year 2020). Thus, we exclude studies of interventions in high-income countries or that include LMICs but do not separately report results for those. In the energy sector, we exclude interventions targeted at children (below the age of 12) because generally they are not main agents of climate change mitigation and adaptation. In the health sector, interventions that target behavioral

change of adolescents or children (below the age of 18) are excluded because we study long-lasting behavioral change, about which we may learn more general lessons from adults, who have more solidified personalities than adolescents. While it would be interesting to compare adults and adolescents, this would be beyond the scope of this review.

b. Interventions

The types of interventions we study are informed by the sector-specific theories of change described in the background section and enclosed in Appendix 1.

We focus on studies which seek to evaluate the causal effect of an intervention that was purposefully implemented. We focus only on interventions that are sufficiently large in scale in order to draw meaningful conclusions. Results need to be representative of a large-scale intervention through two ways, following (Muralidharan and Niehaus, 2017). First, the scale of the intervention: There need to be at least 1000 treated beneficiaries (automatically fulfilled if there are more than 1000 treated individuals in the study sample). If the number of beneficiaries are not given or in case the intervention is disseminated through radio and other media, it needs to target an entire administrative area larger than a village (e.g. district, region, state). Second, the scale of the population represented: the sample of treated individuals must be representative of a sampling frame of at least 1000 treated individuals or of an administrative area larger than a village. While truly large-scale (to reduce the familiar upward "bias" of small-scale interventions and studies) would mean a higher threshold than a 1000 beneficiaries, it is purposefully set low initially in order not to risk the exclusion of too many studies. Depending on the number of studies passing this threshold, it might therefore still be raised later.

c. Comparison

We consider only quantitative studies that aim to evaluate the causal effect of an intervention on the outcome, i.e., experimental or quasi-experimental studies further defined later. We include studies that have a clearly defined comparison group for evaluation of the treatment effect. The nature of the comparison group depends on the type of research design used in the study and can include both active and passive comparison groups.

d. Outcomes

Since our major outcome, transformational change, cannot be directly measured, we look at a range of outcomes and measure change therein, which could reflect transformative processes in the two sectors. Our list of outcomes is based on the ToCs described in the background section and provided in the Appendix 1.

In order to see whether the effects are long lasting, the outcomes of the studies must have been measured at least one year after the full delivery of the intervention. When baseline values are used for identifying treatment effect, then time between baseline and endline needs to be at least one year. While collecting data one year after the intervention is in many cases not sufficiently long to be certain of a sustained change, e.g. by enduring over changes in political or administrative leadership, a higher threshold may lead to the exclusion of too many studies. This threshold may be adjusted depending on the number of studies we find, possibly differentiating between types of outcomes. As an example, the one-year threshold is likely to be too short for key behavioral outcomes in Public Health, such as smoking and alcohol consumption.

e. Study design

Based on the research design, we categorize the studies into two major groups:

a) Experimental designs

This type of study specifically uses random assignment of intervention to the treatment group and evaluates the effect by comparing the outcome with the control group and by using an appropriate methodology.

b) Non-experimental designs

In cases when the assignment of treatment is not random, various quasi-random designs are used to evaluate the treatment effects. These methods include and will be restricted to regression discontinuity design (RDD), instrumental variable (IV), difference-in-differences (DID) and propensity score matching (PSM). For the health sector, in addition to these aforementioned methods, we will also use interrupted time series (ITS) and controlled before after (CBA), given their relevance in the health literature.

Of both these design types, the finalized studies would be critically appraised in order to identify their strength and weaknesses. We will explore the possibility of using the software RobotReviewer for a (semi-)automated risk of bias assessment.

f. Exclusion criteria

We will exclude studies that are conducted outside the time frame of 1990–2020 and before 2000 in the public health sector or not including a separate sample from LMICs. We also exclude studies that do not attempt to evaluate causal effects of the intervention on the outcome, in particular, that do not follow the methods explained in the study design. As mentioned above, we will exclude studies that are not sufficiently large-scale or long-term (as defined before). In addition, all studies that are not included within our interventions, even if they measure relevant outcomes, or *vice versa*, measure relevant outcomes but are not capturing relevant interventions will also be excluded.

2. SEARCH METHOD FOR IDENTIFICATION OF STUDIES

a. Search steps

The search strategy aims to find both published and unpublished studies. A three-stage search strategy will be utilized in this review.

In the first stage, studies will be searched using text in the title, abstract, and the keywords. For searching the databases, we decided on search terms for each sector as described in the following subsection on combinations of search terms.[5]

In addition to these databases, the Cochrane, Campbell Collaboration, Collaboration for Environmental Evidence, and 3ie libraries will be searched for impact evaluation studies and systematic reviews in the area of the above sectors. Further searches for grey literature in the energy sector will be conducted on institutional websites. In case there are less than 12,000 search results in the public health sector, a further search in Epistemonikos database will be conducted for impact evaluation studies and systematic reviews in the public health area. A record will be maintained describing the databases searched, the keywords used, and search results from each search engine.

As the final (optional) step, in case there are less than 50 studies (in any of the sectors) selected for data extraction from the full text screening, we will do backward snowballing of the studies that have been selected from the full text screening, as a follow up on the initial search.[6]

[5] The search terms for the health sector are preliminary and are to be finalized based on the benchmark studies, and the number of final papers to be screened.
[6] Backward snowballing is the process of identifying articles from reference lists of studies found in database searches and included into review as studies satisfying all inclusion criteria.

b. Databases, repositories and individual journals

The choice of databases was guided by relevance and comprehensiveness of their coverage of the sectoral literature. We are planning to run searches on the most appropriate databases for published literature, and websites of agencies and research institutes for grey literature.

Energy sector:

- Databases:
  - Academic Search Complete (via EBSCO)
  - CAB Abstracts (via EBSCO)
  - EconLit (via EBSCO)
  - GreenFILE (via EBSCO)
  - Web of Science (Social Sciences Citation Index, Science Citation Index Expanded, Emerging Sources Citation Index)
  - World Bank eLibrary (via EBSCO) [7]
- Websites of agencies and research institutes:
  - African Development Bank (AfDB) *https://www.afdb.org/en*
  - Asian Development Bank *https://www.adb.org/*
  - Campbell Collaboration *https://campbellcollaboration.org/*
  - Collaboration for Environmental Evidence *https://www.environmentalevidence.org/*
  - International Initiative for Impact Evaluation: 3ie Development Evidence Portal *https://developmentevidence.3ieimpact.org/*
  - National Bureau of Economic Research *https://www.nber.org/*
  - Swedish International Development Cooperation Agency (SIDA)[8] *https://www.sida.se/English/*
- Key journals:
  - Energy Economics
  - Energy Journal
  - Energy Policy

Given the scope of the review in terms of the range of topics as well as the time period covered, we will not perform hand search of key journals. Instead, we will run a database search in the Web of Science platform with the simplified set of search terms in the three relevant energy journals with the highest impact factors[9].

Public health sector:

- Databases:

[7] We will conduct the search in Ideas RePEc and World Bank eLibrary databases assuming that the technical problem on the EBSCO database will be solved by EBSCO. We are in contact with the EBSCO technical support service on this matter.

[8] We included SIDA as a bilateral agency website because during preliminary searches we identified it as having potentially relevant impact evaluation studies. We excluded websites of other shortlisted bilateral agencies due to a lack of relevant studies.

[9] The highest impact journals relevant for this review were selected from the list available at Scimago Journal & Country Rank for energy. These more relaxed restrictions (in terms of outcomes, and long-term or large-scale) will ensure that only three of the six categories below (countries, methodology and interventions) are combined using the AND operator with the following Publication Name terms string:
SO=("energy" OR "energy economics" OR "energy journal" OR "energy policy").

  - EconLit (via EBSCO)
  - Global Health (CAB- Ovid)
  - Medline (Ovid)
  - Web of Science (Social Sciences Citation Index)
- Websites of agencies and research institutes:
  - Campbell Collaboration *https://campbellcollaboration.org/*
  - Cochrane
    + Central Registry of Controlled Trials
    + Cochrane Database of Systematic Reviews *https://www.cochranelibrary.com/cdsr/*
  - Collaboration for Environmental Evidence *https://www.environmentalevidence.org/*
  - International Initiative for Impact Evaluation: 3ie Development Evidence Portal *https://developmentevidence.3ieimpact.org/*

We will not hand search specific journals in public health, as the relevant studies for LMICs are dispersed across a large number of journals, and we expect to capture a large number of studies already through the database searches.

c. Search terms

The search terms are organized in six different categories that reflect the inclusion criteria and the sector-specific theories of change. The search terms within each category are combined with the OR operator, whereas the AND operator is used to combine the different categories of search terms.

1) Long-term or large-scale: This category encompasses terms used to describe studies carried out over a longer time span or at a large scale
2) Methodology: These terms capture the experimental and quasi-experimental methods (for more details see the inclusion / exclusion tables in Appendix3)
3) Countries: All lower- and middle-income countries as well as general terms describing LMICs are listed here
4) Interventions: Terms are based on sector-specific ToCs
5) Outcomes: Terms are based on sector-specific ToCs
6) Sector-specifying terms: This category contains terms used to describe the respective sectors.

d. Combinations of search terms

The following combinations of categories are used:

- Energy: The five categories (2-6 above) are combined through the AND operator. In case the total number of studies to be screened exceeds 7,500, the long-term or large scale terms (category 1 above) will be applied with the AND operator.
- Public Health: The four categories (2-5 above) are combined with the AND operator. In case the total number of studies to be screened exceeds 15,000, the long-term or large scale terms (category 1 above) will be applied with the AND operator.

The search strategies are tested against a set of benchmark studies in each sector. If more than two thirds of the benchmark papers can be retrieved through the database searches, the search strategy is deemed satisfactory. This threshold has already been passed in the energy sector with the total number of studies within the target of 7,500 (for the list of benchmark papers, see Appendix

Appendix 7).[10] In public health, the list of benchmark papers has already been determined (see AppendixAppendix 8, while the search strategy is being finalized by testing over two databases: PubMed and WoS. Currently, 68-90% of the benchmark studies for health (9 out of 10 in the WoS database and 11 out of 16 in the PubMed database) were part of the search results. The number of studies found for screening in these two databases stands at 30,120 papers (12,448 in the WoS database and 17,672 in the PubMed database). Given this is much larger than the targeted 15,000 papers, our current strategy is to streamline the search so as to not lose benchmark papers but remove most of the non-relevant papers within the search results. Several iterations, requiring various permutations and combinations of the search categories, are required. The current list of search terms (in Boolean format) are provided in Appendix 5.

SUBJECT AREA	COVERAGE[11]		
	PubMed	WoS	PubMed AND WoS
Utilization of health care services	5	4	4
Nutrition	7	2	2
Substance Abuse	5	2	2
Hygiene Practices	6	5	5
Physical Acitivity	4	3	3
Total number of subject areas	**27**	**16**	**16**
Number of benchmark studies	**16**	**10**	**10**

3. DATA COLLECTION AND ANALYSIS FOR THE SYSTEMATIC REVIEW

a. Screening of studies

The screening process of the two populations of studies, which we found through the literature searches described in the previous section, will be carried out in several steps. Note that these steps will be done for each sector such that there are two separate screening processes. First, pilot screening will make sure that the coding tools are well understood or revised. Two independent screeners will each screen 200 studies. The results of pilot screening is considered satisfactory when the overlap between the inclusion decisions of both screeners after reconciliation is above 80%.[12] Second, titles, abstracts and keywords will be screened to exclude any irrelevant studies. In order to save time given the wide scope of the literature search, this stage will be assisted by the machine-learning algorithm embedded in EPPI Reviewer 4. We propose the following procedures to achieve both speed and quality of screening. The machine learning algorithm will be fed the results of the pilot screening of 200 studies. The software will then sort the entire population of studies by prioritizing them according to relevance. The first 50% of studies, sorted by relevance, will be screened by two independent screeners. The next 25% of studies will be screened only by a single

[10] Benchmark studies are studies that, according to their titles and abstracts, are clearly relevant for our review. As the search strategy relies on searching in title, abstract, and keyword fields, finding these studies is a good measure of the quality of the search strategy. The large majority of benchmark studies also satisfy all of our inclusion criteria (as specified in the inclusion and exclusion tables in Appendix3) and would therefore also pass the full-text screening stage.
[11] The coverage represents the number of subject areas covered by benchmark studies that are present in Web of Science and PubMed databases. As there are studies that cover multiple subjects areas, the total number of subject areas covered is not equal to the number of benchmark studies.
[12] The results of pilot screening in the energy sector are provided in Appendix 9.

screener and the last 25% directly excluded from the review. The screening process will stop earlier in case 100 continuous studies, sorted by priority, are all excluded. Third, we will apply the specified inclusion/exclusion criteria to the full text and determine whether the study should be included for analysis. We will record all search results, including the reasons for exclusion at the full-text screening stage. These results will be presented in the PRISMA diagram. At least 20% of studies will be double-screened by a second reviewer. Disagreement will be resolved through discussion and third-member involvement.

Systematic reviews will be screened on the basis of their inclusion criteria. If the inclusion criteria of a systematic review meet all of our inclusion criteria, it passes on to data-extraction to be shown in our own EGMs.

b. Data extraction and management

Depending on the number of studies found, either one or two people working independently will extract information from each study included in the review. In this step, data will be extracted and summarized using a pre-piloted extraction form (see Appendix4) by two people. Disagreements in coding will be resolved through discussion and third-member involvement.

c. Analysis

The goal of the analysis is to document evidence for transformational change.. The analysis will proceed in several steps for each sector, described below with technical details following in later paragraphs.

1) We will use simple EGMs, with interventions listed along the Y-axis and outcomes along the X-axis, to document evidence and gaps within the scope of each sector.
2) We will then concentrate on the sufficiently populated cells (at least 10 individual studies) within the map to run meta-analyses on the available evidence and estimate average effect sizes.
3) We will then map only those combinations of interventions and outcomes where evidence of transformational change is found. That is to say, we will only show those combinations of interventions and outcomes where there is a large effect size at least one year after the intervention, following the thresholds defined before. It is this step where the results of the studies, i.e., depth of change and sustained change, are used as selection criteria. However, selection is not done at the level of the individual study but rather at the level of intervention-outcome combinations (cells in the EGM). Based on the simulation results of our meta-analysis expert (Frank Renkewitz), 10 studies are a lower bound to test for heterogeneity and therefore to assess the generalizability of the results. The results of this exercise will be shown in “transformational change maps” (TCMs) and discussed.
4) In order to identify contributors of transformational change, we will search for common characteristics between populated cells in the TCMs, i.e. those intervention and outcome combinations where we find evidence for transformational change. We will also run, where applicable, meta-regressions across these cells in the TCMs and across sectors in order to explain heterogeneity in study results. This way we might learn which characteristics of interventions contribute to transformational change.

d. Evidence and Gap Maps (EGMs)

In order to draw the EGMs, the following procedure would be applied:

- **Categorization of studies:** We intend to follow Rankin et al. (2016) to determine the categorization of studies in the EGMs. In case several different interventions were grouped

together, each intervention would be coded separately in order to be able to show all available evidence related to a particular intervention. For example, a study may look at the effects of a program that includes a cash transfer intervention and an awareness intervention on two different outcomes. In this case, the two associated outcomes would be coded separately for each intervention. In some studies, it might be that only some elements of the program or evaluation were relevant to this EGM (e.g. specific intervention or outcome) and only these aspects would then be extracted and coded. Systematic reviews will be coded based on the PICOS of the review. If a systematic review covers more than one intervention and outcome, it will appear in each cell that applies.

- **Generate categories based on the outcomes related to each sector:** Within an EGM, the outcomes are presented on the x axis of the map (every column) and indicate a cluster of multiple studies. These categories would be generated on the basis of the outcomes as described in the sector-specific theories of change.
- **Generate categories for the interventions and outcomes related to each sector:** the y axis (each row) of the EGM lists all the specific interventions that were found as part of the review. These would be listed under the nature of the intervention, where, if the aim is to reduce CO_2 emissions via carbon taxation, then incentivization would be the category for that particular row. All impact evaluations/systematic reviews that use carbon taxation as an intervention would be included within that row.
- **Ranking the systematic reviews on the basis of their quality:** following the categorization of each systematic review, we would sort it according to the confidence with which one can attribute the particular outcomes to the given intervention. This ranking code can be based on the SURE (2011) ranking, which was used in the Snilsveit et al. (2013) paper. The checklist ranks studies on the basis of methods that were used to identify, include and critically appraise studies in the systematic review, as well as the methods used to analyze the findings.

Possible evidence and gap frameworks to categorize each systematic review and impact evaluation finalized within each sector can be found in Appendix2.[13]

e. Methods for handling dependent effect sizes

We will attempt to do a meta-analysis for the studies with comparable variables and coefficients. We will make the studies comparable by calculating the same standardized effect sizes across the studies. We will also attempt to detect publication bias and subsequently run sensitivity analyses of the distribution of the effects, after comparing outcomes of different correction methods. We exclude studies that do not provide sufficient information to do this or which are not exclusively based on experimental or quasi-experimental methods.

f. Data synthesis

Synthesis of the evidence from the included studies will be presented through narrative and statistical analysis of comparable effect sizes using meta-analysis. Meta-analysis is useful in synthesizing quantitative evidence as it takes into account the statistical power of the estimated effect. Calculations of standardized mean difference, or the risk ratios are appropriate for similar type of treatment effects, hence they can be widely used for studies that apply randomized control

[13] The public health sector EGM currently contains the basic framework were all five intervention areas are pooled together. However, this illustrative version can be cut in multiple ways, depending on the sectoral combinations. It can therefore serve to illustrate one table with each of the ten interventions nested within the larger intervention areas (containing 50 rows) or several tables with two or more intervention areas combined (for instance by combining substance abuse, physical activity as well as nutritional and dietary habits under one umbrella and utilization of health services and hygiene practices under another, we derive 30- rows and 20-rows tables, respectively).

trials. However, in case of quasi-experimental studies, the treatment effects may not be strictly comparable. For instance, studies that use a regression discontinuity design or instrumental variable method typically estimate local average treatment effect (LATE), while those using propensity score matching would estimate the average treatment effect on treated (ATT). Therefore, we shall conduct meta-analysis where it is possible to convert the treatment effects into comparable measures (Duvendack et al., 2012). Specifically, we shall carry out meta-analysis if the following conditions are met:

a) the interventions are sufficiently similar to be comparable
b) the effect sizes can be computed for comparison
c) the outcome measures are sufficiently similar
d) there are at least 10 different studies available that meet these criteria for the same intervention and outcome combination

These results will be presented using conventional methods such as forest plots. In terms of software, we will use Stata or R for this purpose. In case there are less than 25 studies that enter meta-analysis in each sector, we will at that point explore the possibilities of combining intervention (sub-)categories (combining cells), re-arranging cells so as to conduct further meta-analysis or alternative evidence aggregation methods that can provide suggestive evidence on transformational change.

g. Assessment of heterogeneity and contributors to transformational change

When meta-analysis is possible (see above), we shall test for heterogeneity across studies and assess the amount of heterogeneity by the tau statistic as well as the I-squared statistic. Tau denotes the standard error of true effect sizes in the original units whereas I-squared measures the percentage of variability across studies that is not due to sampling error but rather to differences in study population, intervention and implementation. Thus, tau indicates the stability of an average true effect size across studies, while the I-squared allows for a rough categorization of heterogeneity (Borenstein et al., 2011). We will follow the corresponding rule of thumb that if the I-squared statistic hits the threshold of 75 percent then there is high heterogeneity, with 50 percent there is moderate heterogeneity and with 25 percent the extent of heterogeneity is low. We can also use the Q-statistic to test for statistical heterogeneity in the outcome variables.

If high heterogeneity is present, we shall investigate what factors explain it by conducting moderator analysis, including sub-group meta-analysis and meta-regression, if possible. For sufficient statistical power in meta-regressions, we follow Borenstein et al. (2011), who recommend that each covariate (the coding of studies) contains at least ten studies. Where studies are sufficiently similar to be comparable, we will run meta-regressions across sufficiently populated cells in both EGMs. This method will enable us to examine which factors contribute to transformational change.

To check if the results are sensitive to the quality of data and approaches to analysis, we shall report at sub-group based results levels, assuming at least 10 studies per sub-group, particularly based on study design. We shall use funnel plots and corresponding regression methods (Stanley and Doucouliagos, 2014) and sub-group analysis comparing published versus unpublished studies to assess potential publication bias.

h. Discussion of cross-sector learnings

Finally, this review combines two different reviews into one learning exercise on transformational change. As part of this, we will discuss what can be learned from transformational change in the public health sector for climate change mitigation and adaptation in the energy sector. Given the

focus of the health sector, those learnings will concentrate on which type of interventions may lead to, predominantly individual, behavioral change. The categorization and coding frameworks in both sectors are designed to facilitate these learnings by making intervention and outcome categorization as similar as it is possible given the different natures of the two sectors. For instance, the intervention framework by Michie et al. (2011) is applied both in the health sector and to three intervention categories in the energy sector.

Cross-sector learning will not be a statistical exercise per se, but a discussion informed by the data synthesis. We propose the following steps: First, we will discuss which determinants and contributors of transformational change identified in our review are similar between the two sectors. Second, we will discuss potential reasons for areas of conflicting evidence between the sectors. Third, assuming a larger body of evidence in the health sector and consequently gaps in evidence in the energy sector, we will discuss which determinants of transformational change in the health sector could also apply to the energy sector. This step will be guided by thinking about the theoretic mechanisms behind long-term behavioral change in the health sector (as one example: commitment devices that can narrow the divide behind an intention to exercise and actually exercising). Then, we will ask about which outcomes in the energy sector the same theoretic mechanisms may also apply and lastly which interventions are therefore promising to achieve the same transformational change in the energy sector.

Climate change is one of the most pressing global priorities of the 21st Century. To achieve the necessary mitigation and adaptation activities, transformational changes are needed across systems and individual behaviour. This joint evidence review by the Green Climate Fund – Independent Evaluation Unit and the Climate Investment Funds, completed by the Center for Evaluation and Development with the assistance of the Africa Centre for Systematic Reviews & Knowledge Translation and with the advice of the Campbell Collaboration, will map out the landscape of evidence on transformational change in two sectors. The lessons from that landscape could contribute to making the globe a more habitable planet in the 21st Century and beyond.

D. DISTRIBUTION OF MAIN ROLES

PROJECT LEAD, CONCEPTION, FUNDING AND QUALITY CONTROL	
Prof. Dr. Jyotsna Puri	Independent Evaluation Unit, Green Climate Fund
Dr. Martin Prowse	Independent Evaluation Unit, Green Climate Fund
Joseph Dickmann	Climate Investment Funds
Neha Sharma	Climate Investment Funds
Eirini Maria Pitta	Climate Investment Funds
PROJECT EXECUTION	
	Center for Evaluation and Development (C4ED):
Prof. Dr. Markus Frölich	Quality assurance and technical support
Dr. Arne R. Weiss	Lead on the project execution and lead on the energy sector
Dr. Atika Pasha	Lead on the public health sector
Zharas Aitmambet	Project management
	Consultants of the Africa Centre for Systematic Reviews & Knowledge Translation, Makerere University:
Dr. Ekwaro A. Obuku	Africa Centre, Lead Consultant
Moses Ocan	Africa Centre, Supporting Consultant
Robert Apunyo	Africa Centre, Project Manager
Thomas Katairo	Africa Centre, Research Associate
EXTERNAL SUPPORT	
Dr. Frank Renkewitz	University of Erfurt, technical support on systematic review, meta-analysis and detection of publication bias
John Eyers	Information specialist, support in designing search strategies for multiple databases
Sarah Khan	University of Göttingen, technical support on systematic review, specifically health sector
INTERNAL GCF IEU REVIEW	
Emma De Roy	Independent Evaluation Unit, Green Climate Fund
THIRD-PARTY REVIEW	
Howard White	Campbell Collaboration
Ashrita Saran	Campbell Collaboration

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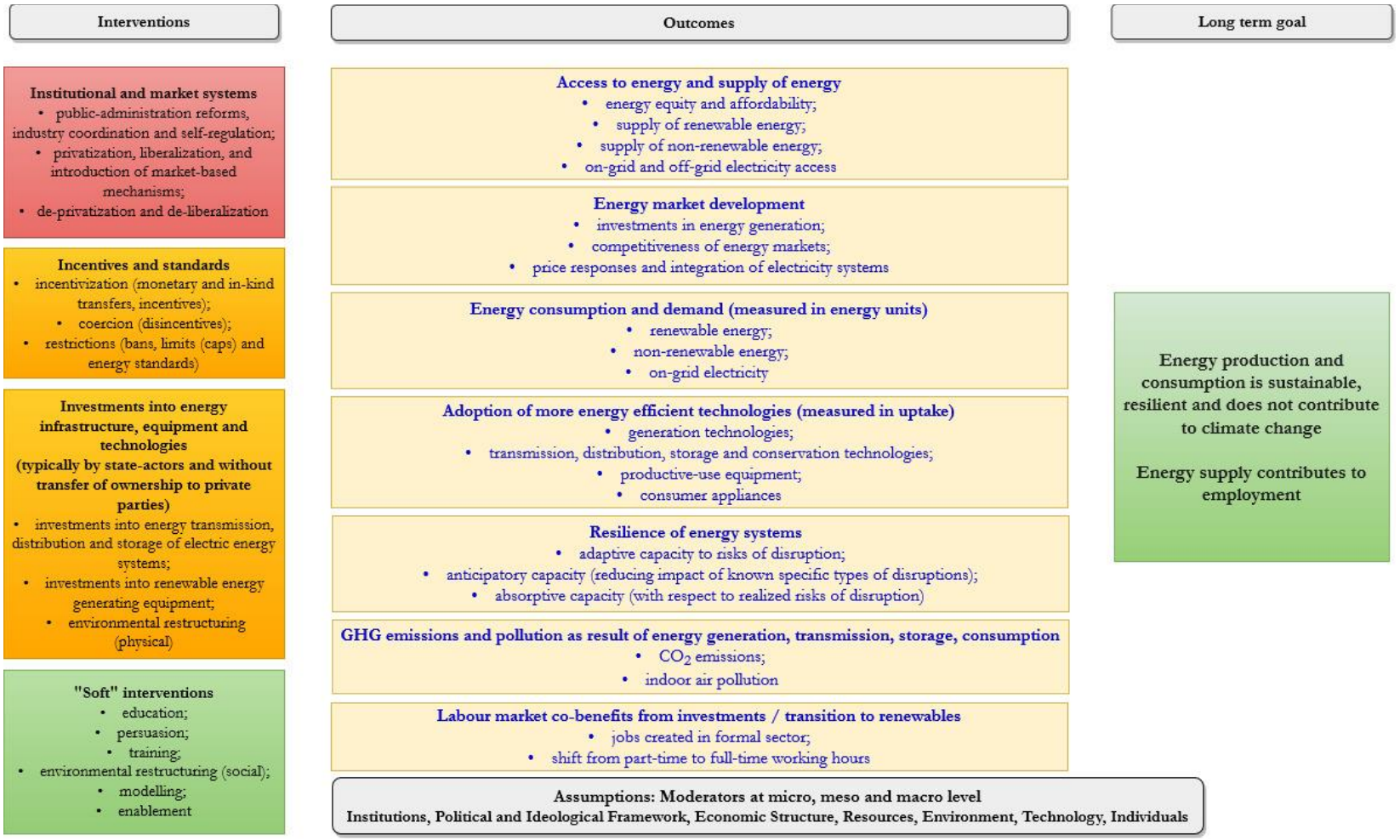
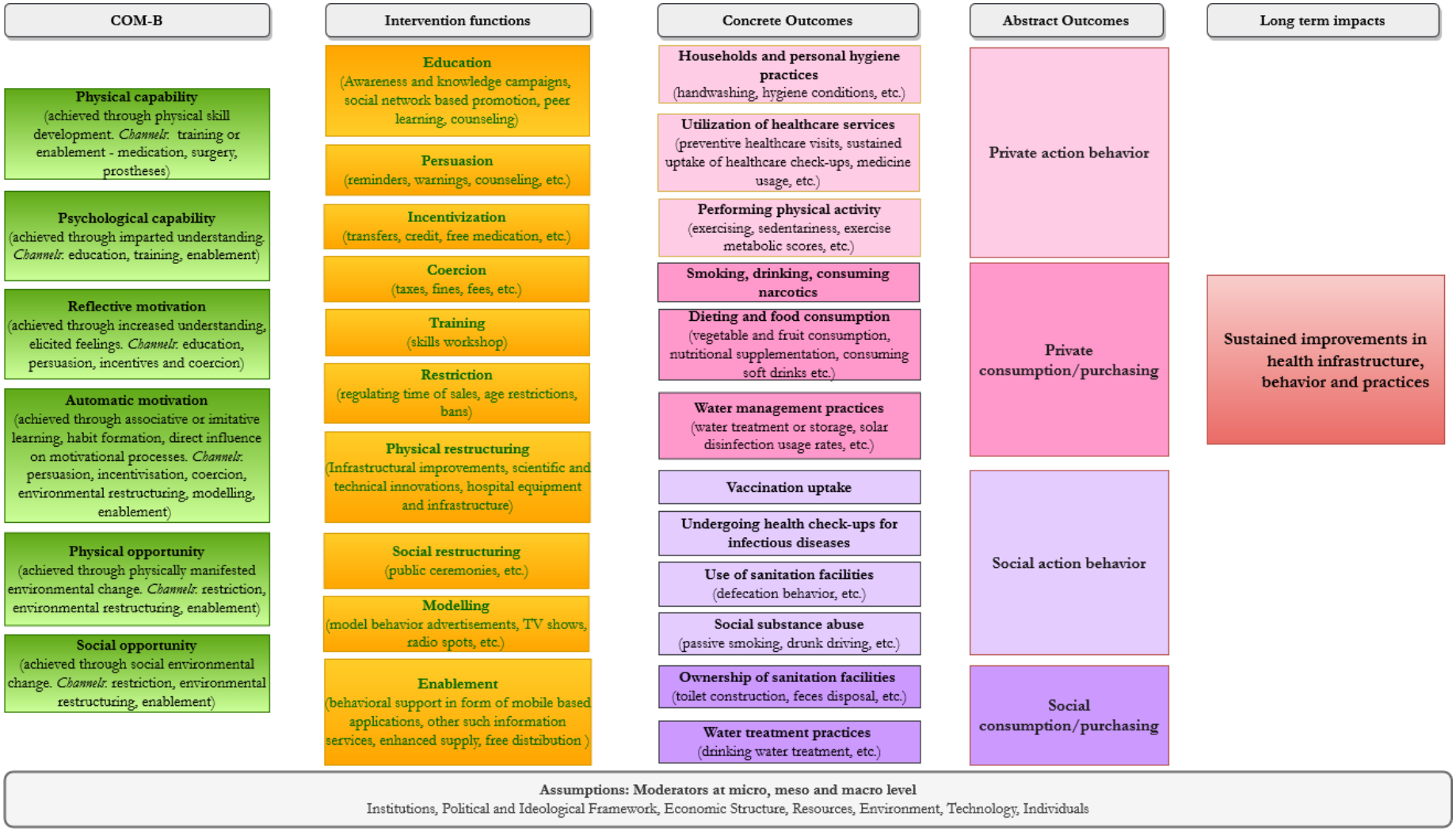
APPENDICES

Appendix 1. Theory of Change (ToC) for each sector

A. Energy



B. PUBLIC HEALTH



Appendix 2. EGM FRAMEWORKS

A. ENERGY

		OUTCOMES						
		Access to energy and supply of energy	Energy market development	Energy consumption and demand for (measured in energy units)	Adoption of more energy efficient technologies	Resilience of energy systems (adaptation)	GHG emissions and pollution as result of energy generation, transmission, storage, consumption	Labour market co-benefits (jobs creation, demand for workforce) from investments into energy infrastructure
INTERVENTIONS	Institutional and market systems							
	Incentives and standards							
	"Soft" interventions							
	Investments into energy infrastructure, equipment and technologies							

B. PUBLIC HEALTH

		OUTCOMES			
		Action behaviour (actions taken by individual to improve health)		Consumption/purchasing (by individuals to improve health)	
		Social (examples include less open defecation, less drunk driving)	Private (ANC, PNC, handwashing)	Social (handwashing and masks to prevent infections)	Private (less expenditure on alcohol tobacco/cigarettes)
INTERVENTIONS (POOLED ACROSS INTERV. AREAS)	Education				
	Persuasion				
	Incentivization				
	Coercion				
	Training				
	Restriction				
	Social Restructuring				
	Physical Restructuring				
	Modelling				
	Enablement				

Appendix 3. Inclusion and Exclusion criteria

A. Energy

Included	Clarificatory examples of what will be captured	Excluded
1. Population		
Adults and adolescents as well as social systems in low and middle income countries. Studies combining a population in LMICs and high-income countries (HIC) if the analysis distinguishes the two samples		Interventions targeting children (under age of 12) and studies in high-income countries (HIC), combination of both LMICs and HICs if effects are not reported separately
2. Interventions in the energy sector[14]		
Institutional and market systems *(Interventions that change the institutional structure of energy systems or markets)*		• Interventions outside the energy sector or that do not target climate change mitigation or adaptation through energy production or usage are typically excluded: e.g. aforestation programs (e.g. REDD+), labor market reforms, labor-market trainings, agronomic trials, engineering, geological, geographical, , investments into infrastructure other than energy infrastructure • Economic growth is not an intervention. Studies only relevant if economic growth
• public-administration reforms, industry coordination and industry self-regulation	technical assistance, re-structuring of government units, changes in management practices; business associations, industry bodies	
• privatization, liberalization, and introduction of market-based mechanisms	energy and emissions trading platforms, frameworks for private sector involvement (PPPs)	
• de-privatization and de-liberalization		
Incentives and standards		

[14] In the spirit of Arnott et al. (2014), interventions are coded as „behavioral“ or „structural“. In light of cross-sector learnings, behavioral interventions are those that directly target behavioral change of individuals or household and measure a behavioral outcome (see footnote in outcomes). These will be classified according to the Behaviour Change Wheel (BCW, Michi et al. 2011). Structural interventions change are those that do not or only indirectly lead to individual or household-level behavioral change. Behavioral interventions fall mainly in the category of „soft“ interventions. The sub-categories within this category are therefore classified according to seven of the „invention functions“ of the BCW. Structural interventions fall mainly in the category of „institutional and market systems“. The remaining two categories, „incentives and standards“ and „investments into energy infrastructure“ are mixed, with both structural interventions and behavioral interventions expected. The sub-categories within „incentives and standards“ as well as the sub-category „physical environmental restructering“ within „investments into energy infrastructure“ reflect the BCW intervention functions.

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
• incentivization (monetary and in-kind transfers, incentives)	distribution of more energy efficient consumer appliances, subsidies, block tariffs, tax rebates, feed-in tariffs	is a mediator of the effects of an intervention in the energy sector on a relevant energy outcome (e.g. GHG emissions) to be causally identified. • Investments and distributions of small energy-generating appliances (smaller than 200W), like solar lanterns, solar household-systems • Investments into non-renewable and nuclear.
• coercion (disincentives)	taxes and fees, permits, green quotas	
• restrictions (bans, limits (caps) and energy standards)	command and control, damage control, prohibition	
"Soft" interventions *(Interventions that do not change the incentives of actors)*		
• education	awareness and knowledge campaigns	
• persuasion	reminders or warnings	
• training	community skills building workshops on efficient energy use	
• social environmental restructuring	social norms, peer pressure, feedback	
• (role) modelling	model behaviour advertisements, TV shows or posters	
• enablement	setting defaults, making options salient, creating options	
Investments into energy infrastructure, equipment and technologies (typically by state-actors and without transfer of ownership to private parties) and other physical environmental restructuring		
• investments into energy transmission, distribution and storage of electric energy systems	Batteries for storage, pumped-storage hydroelectricity	
• investments into renewable energy generating equipment	Dams for hydro-power	
• Other physical environmental restructuring	Changes to the physical environment other than investments into infrastructure and distribution of appliances, such as changing traffic signals	

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
3. Outcomes[15]		
Access to energy and supply of energy		• Implementation of new business model in energy sector; engineering or technological innovations other than related to energy-efficiency, economic growth, biomass production, agricultural yields • Carbon sequestration and (de)forestation • Labor market outcomes that are in measured in response to an intervention targeting climate-change mitigation or energy access • Disaster risk reduction measures (that only indirectly affect energy system resilience) • Time use other than for formal employment
• energy equity and affordability	energy inclusiveness, energy affordability (widening of access), energy cost reductions	
• supply of renewable energy (measured in units of energy) (traditional and next generation)	generation and supply of traditional renewable energy, next generation renewable energy	
• supply of non-renewable energy (measured in units of energy)	generation and supply of energy from coal, oil, gas, LPG, LNG, kerosene, petrol, diesel, nuclear	
• on-grid and off-grid electricity access	generation and supply of electricity, electricity coverage; adoption of grid access	
Energy market development		
• investments (measured in monetary terms) ((typically private) in energy generation (renewable energy (traditional and next generation), fossil fuels, nuclear energy, electricity)		
• competitiveness of energy markets (market power of energy suppliers, composition)	number of suppliers of energy products and services, concentration indices, service quality standards, power outages, variation in voltage, use of technological innovations	
• price responses and integration of electricity systems	liquidity, pricing regulation and instruments, price adjustments, spatial connectivity of electricity systems, linkages within the power supply chain	
Energy consumption and demand for (measured in energy units)		
• renewable energy (traditional and next generation)	consumption of and demand for traditional renewable energy, next generation renewable energy	

[15] In light of cross-sector learnings, behavioral outcomes at the level of individuals and households are coded according to the framework in health, i.e., along the four categories „action behavior - privat“, „action behavior - social“, „consumption / purchasing behavior - privat“ and „consumption / purchasing behavior - social“. Behavioral outcomes are mainly expected in the categories „Energy consumption and demand“; „Adoption of more energy efficient technologies“, sub-category „consumer appliances“.

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
• non-renewable energy	consumption of and demand for energy from coal, oil, gas, LPG, LNG, kerosene, petrol, diesel, nuclear; diesel-generators (off-grid)	
• on-grid electricity	consumption of and demand for on-grid electricity (produced by a mix of energy sources; otherwise, it is categorized under renewable or non-renewable)	
Adoption of more energy efficient technologies (measured in uptake, not in monetary units or through demand for energy)		
• generation technologies	adoption of energy-efficient generation technologies	
• transmission, distribution, storage and conservation technologies	adoption of energy efficient transmission, distribution, storage and conservation technologies	
• productive-use equipment	adoption of energy efficient technologies and equipment in manufacturing, infrastructure, services	
• consumer appliances	adoption of more energy efficient consumer appliances (lighting, transportation, cooking)	
Resilience of energy systems (adaptation)		
• adaptive capacity to risks of disruption (e.g. security of energy supply through diversification of energy sources, lower energy imports – e.g., forecasting)	energy security, reliance on energy imports, excess generating capacity, oil, gas, and LNG storage reservoirs	
• anticipatory capacity (reducing impact of known specific types of disruptions through preparedness and planning – e.g., proactive action to reduce vulnerability)	energy use planning, peak energy use, smoothing of energy consumption, decentralization of energy systems, integrating energy resilience into systems planning (heat, power, transportation systems)	
• absorptive capacity (with respect to realized risks of disruption - exercised during and after a disturbance)	ability of households to cope with energy production side blackouts, power quality, reliability of energy systems	
GHG emissions and pollution as result of energy generation, transmission, storage, consumption		
• GHG emissions (e.g. carbon capture at power plants)		

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
• indoor air pollution (e.g. from cookstoves)		
Labor market co-benefits (jobs creation, demand for workforce) from investments into energy infrastructure, equipment and technologies	employment, unemployment, number of new jobs, local-level multiplier effects on labor market	
• jobs created in formal sector		
• shift from part-time to full-time working hours		
• working hours in salaried / formal employment		
4. Study design		
• Impact evaluation methods (experimental and quasi-experimental), heckman selection, fixed effects with established control group; • Systematic reviews		• Correlation analysis and random effects without a clear control group (as often the case with time series analysis), input-output models, general-equilibrium models and other methods that are not based on control groups • Non-systematic reviews
5. Publication date		
After 01.01.1990		Before 01.01.1990
6. Number of beneficiaries (scale)		
Results need to be representative of a large-scale intervention, through two ways (Muralidharan and Niehaus, 2017). • Scale of intervention: at least 1000 individual beneficiaries (ToT) (automatically fulfilled if more than 1000 treated individuals in sample) If number of beneficiaries not given or for radio and other media-based interventions, intervention needs to target an entire administrative area larger than villages (e.g. districts, regions, …) • Scale of population represented: sample of treated individuals randomly drawn from a sampling frame of at least 1000 treated		• Interventions targeting less than 1000 beneficiaries; single household/village/community/firm interventions • Interventions targeting small group of individuals (e.g. a training program of energy sales agents in a small city) • Studies that are not representative of at least a population of 1000 treated individuals or an administrative area larger than a village

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
individuals (ToT) or from an administrative area larger than a village		
7. Timing of data collection		
Outcomes were measured at least one year after first full implementation of the causally identified intervention component of interest. When baseline values are used for identifying treatment effect, then time between baseline and endline needs to be at least one year		Outcomes are only measured for a period less than one year

B. PUBLIC HEALTH

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
1. Population		
Adults (> 18 years) in low and middle income countries. Studies combining a population in LMICs and high-income countries (HIC) if the analysis distinguishes the two samples		Interventions targeting children (under age of 18) and studies in high-income countries (HIC), combination of both LMICs and HICs if effects are not reported separately
2. Interventions		
Interventions targeting the five broad areas of: ***1) Substance abuse*** ***2) Utilization of health services*** ***3) Hygiene practices*** ***4) Nutrition and dietary habits*** *5)* ***Physical activity*** following the behavioural framework under Michie et al (2011) as defined below:	Within each broad intervention area: 1) ***Substance abuse***: a) Narcotics and Stimulant drug use b) Alcohol consumption c) Smoking ***2) Utilization of health services:*** a) Uptake of health care related services (participation in health care counseling, i.e. for ANC or PNC, vaccination, etc.)	• **Within each of the five broad intervention areas:** ***1) Substance abuse:*** a) Violence due to substance abuse ***2) Utilization of health services:*** a) Hospital/heath care quality improvement b) Insurance uptake ***3) Hygiene practices:*** a) Food storage b) Waste disposal and treatment

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
• **Education** (awareness and knowledge campaigns to promote frequent handwashing) • **Persuasion** (reminders or warnings per phone to not drink and drive or harms of smoking) • **Incentivization** (monetary and in-kind rewards such as free or subsidised medication, consultation, vaccines, etc.) • **Coercion** (price increases for alcohol or tobacco, or punishment) • **Training** (community skills building workshops for hygiene practices) • **Restriction** (prohibiting sales of alcohol to under 18, at only at particular times, smoking only in particular areas in a bar, etc.) • **Environmental restructuring** – **Physical** (improvements or creation of infrastructure to facilitate access to health services or use of health facilities or reduce unhealthy practices) – **Social** (setting defaults, prompts) • **Modelling** (model behaviour advertisements, TV shows or posters) • **Enablement**[16] (behavioural support for smoking cessation such as mobile based applications and services, or those that encourage health check-ups)	b) Uptake of health care check-ups (HIV testing, ANC, PNC) c) Compliance with health care service offered (use of ORS, malarial profilax, insecticide treated bednets, institutional delivery, vaccination, immunization, etc.) ***3) Hygiene practices:*** a) Drinking water treatment and storage b) Use of sanitation facilities c) Handwashing and personal hygiene ***4) Nutrition and dietary habits:*** a) Nutritional supplementation b) Dieting c) Nutritional equity/food equity d) Diet diversification e) Food fortification ***5) Physical activity:*** a) Exercise or fitness b) Sedentariness	c) Menstrual hygiene ***4) Nutrition and dietary habits*** a) Agricultural and related food fortification (biofortification) ***5) Physical activity:*** a) Exercise among athletes • **Natural interventions** (those that are not in the control of humans) such as due to sudden climate related shocks / natural disasters/ migration • **Laboratory/clinical trial/field lab interventions** targeting a hospital, clinic or laboratory (e.g. quality of care, PBF, health professional training/ education) • **Following policy changes from governmental authorities:** 1) (De)Regulation/decentralization/privatization/simplification of procedures (deregulation and liberalization of health sector) 2) Governmental change/laws or regulation (legislature, bills or policies, coordination of government at different levels- national, sub-national, etc.)

[16] Capability beyond training and education; opportunity beyond environmental restructuring

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
3. Outcomes		
Outcome related to the five sectors of substance abuse, utilisation of health services, hygiene practices, nutrition and dietary practices and physical activity will be categorised under:		
Action behavior (actions taken by individual to improve their health status)		
• Social (HIV testing, open defecation, drunk driving, passive smoking, etc.)		
• Private (ANC, PNC, institutional delivery, handwashing, etc.)		
Consumption/purchasing (purchasing drugs or alcohol, nutritious food)		
• Social (toilet construction, etc.)		
• Private (expenditure on drugs, alcohol bought, spending on tobacco/cigarettes, etc.)		
4. Study design		
• Impact evaluation methods (experimental and quasi-experimental), heckman selection, fixed effects with established control group; • Systematic reviews		• Correlation analysis and random effects, input-output models, general-equilibrium models and other methods that are not based on control groups • Time series analysis of indicators at the aggregated (macro) level • Non-systematic reviews
5. Publication date		
After 01.01.2000		Before 01.01.2000
6. Number of beneficiaries (scale)		
Results need to be representative of a large-scale intervention, through two ways (Muralidharan and Niehaus, 2017).		• Interventions targeting less than 1000 beneficiaries; single household/village/community/firm interventions • Interventions targeting small group of individuals (e.g. a training program of energy sales agents in a small city)

INCLUDED	CLARIFICATORY EXAMPLES OF WHAT WILL BE CAPTURED	EXCLUDED
• Scale of intervention: at least 1000 individual beneficiaries (ToT) (automatically fulfilled if more than 1000 treated individuals in sample) If number of beneficiaries not given or for radio and other media-based interventions, intervention needs to target an entire administrative area larger than villages (e.g. districts, regions, …) • Scale of population represented: sample of treated individuals randomly drawn from a sampling frame of at least 1000 treated individuals (ToT) or from an administrative area larger than a village		• Studies that are not representative of at least a population of 1000 treated individuals or an administrative area larger than a village
7. Language		
English		Other languages
8. Timing of data collection		
Outcomes were measured at least one year after first full implementation of the causally identified intervention component of interest. When baseline values are used for identifying treatment effect, then time between baseline and endline needs to be at least one year		Outcomes are only measured for a period less than one year

Appendix 4. ILLUSTRATIVE DATA EXTRACTION FORM DRAFT

The following data extraction form depicts the range of potential data that could be extracted. We use the public health sector for illustrative purposes. The final version will be tailored towards the included studies and will consequently be considerably shorter.

GENERAL INFORMATION

Date when form was completed		
ID of person extracting data		
Publication Title		
Publication Authors		
Publication Year		
Publication ID		
Publication Type		
Funder/Research Institution		
Region	East Asia and Pacific	☐
	Europe and Central Asia	☐
	Latin America and Caribbean	☐
	Middle East and North Africa	☐
	South Asia	☐
	Sub-Saharan Africa	☐
Country of implementation		
Start date of the study		
End date of the study		
Notes		

INTERVENTION

Type of Intervention	**Education**	☐
	Persuasion	☐
	Incentivization	☐
	Coercion	☐
	Training	☐
	Restriction	☐
	Physical (environmental) restructuring	☐
	Social (environmental) restructuring	☐

	Modelling	☐
	Enablement	☐
Description of Intervention(s)		
Timing of intervention	One time	☐
	1 to 12 months	☐
	1 to 3 years	☐
	More than 3 years	☐
	Can´t tell	☐
Scale and size of study/program (if applicable)	*Number of units of observation (program participants)* *Estimated study budget, USD*	
Region and City (if applicable)		
Target Population Gender	Female	☐
	Male	☐
	Female and Male	☐
Target Population	Individual	☐
	Household	☐
	Villages/communities	☐
	Subnational (district/state/county/etc.)	☐
	National	☐
Target Population Age	Young adults (18-35)	☐
	Adults (36-65)	☐
	Elderly (65+)	☐
	Mixed	☐
	Not specified	☐
Target Population Income	Low	☐
	Middle	☐
	Diverse	☐
	Not specified	☐
Target Population Living Environment	Rural	☐
	Urban	☐
Target population specific restrictions	*Please provide details*	☐
Number of treatment arms	*Choose a number*	
Number of intervention components	*Choose a number from 1 to 5*	

COMPONENT 1

Please repeat the section as many times as required by the answer to "number of intervention components".

Origin of Intervention	**Community-based**		☐
	NGO		☐
	Local/National Government		☐
	Foreign Government		☐
	Other		
Study Design	RCT		☐
	Regression Discontinuity		☐
	Matching/ Propensity Score Matching (PSM)		☐
	Instrumental Variable/2SLS		☐
	Difference in Difference		☐
	Interuppted Time series		☐
	Controlled Before and After		☐
	Heckman		☐
Commentary on methods (if multiple methods are selected)			
Nature of comparison group ***(only answer if RDD, IV, Matching or RCT)***	Sample Size		
	Method of sample assignment	Randomized experiment	☐
		Quasi-experiment, prospective assignment	☐
		Quasi-experiment, ex-post assignment	☐
		Non-random	☐
		Can´t tell	☐
	Unit of assignment (if applicable)	Individual	☐
		Group of individuals	☐
		Can´t tell	☐
Outcome Category	Health seeking behavior with social externalities		☐
	Health seeking behavior with largely private benefits		☐
	Consumption or purchasing decisions with social externalities		☐
	Consumption or purchasing decisions with largely private benefits		☐
Outcome timing	1 to 3 years		☐
	More than 3 years		☐
	Can´t tell		☐

Number of outcomes	*Choose a number from 1 to 5*	☐
Timing of outcome measurement	*Only after*	☐
	Before and after	☐
	Can´t tell	☐
Direction of the Effect	*Effect favors treatment*	☐
	Effect favors comparison	☐
	Zero effect	☐
	Can't tell	☐
What intervention (if any) did the comparison group receive?	*No treatment*	☐
	Treatment as usual	☐
	Alternative Intervention	☐
	Other	☐
	Can´t tell	☐
Were there any differences in the measurement of this outcome between the treatment group participants and the comparison?	*Yes*	☐
	No	☐
	Can't tell	☐
Effect is statistically significant?	*Yes*	☐
	No	☐
	Can't tell	☐
Treatment Sample Size		
Control Sample Size		
Nature of the measures	*Continuous*	☐
	Dichotomous	☐
	Hand Calculated Data	☐
The following group of questions applies only if Nature of the Measures is "Continuous"		
Treatment Group Mean		
Comparison Group Mean		
Are means reported above adjusted?	Yes	☐
	No	☐
Treatment Group Standard Deviation		
Comparison Group Standard Deviation		
Treatment Group Standard Error		
Comparison Group Standard Error		

t-value from an independent t-test		
The following group of questions applies only if Nature of the Measures is "Dichotomous"		
Treatment group number of participants who experienced a change		
Comparison group number of participants who experienced a change		
Treatment group proportion of participants who experienced a change		
Comparison group proportion of participants who experienced a change		
Are the proportions above adjusted for pretest variables?	Yes	☐
	No	☐
Logged odd-ratio		
Standard error of logged odds-ratio		
Logged odds-ratio adjusted?	Yes	☐
	No	☐
Chi-square with df=1 (2 by 2 contingency table)		
Correlation Coefficient		
The following group of questions applies only if Nature of the Measures is "Hand Calculated Data"		
Hand calculated d-type effect size		
Hand calculated error of the d-type effect size		
Hand calculated odds-ratio effect size		
Hand calculated odds-ratio standard error		
Intermediate outcomes or themes (knowledge, skills)		
Questions applying to all studies		
Are there results coming from regressions?	Yes	☐
	No	☐
Sample Size		
The following group of questions applies only if there are results coming from regressions		

Method: Econometric model?		
Effect (mean)		
Standard Deviation Effect		
Controls		
Standard Deviation: Y		
Standard deviation: X		
B (beta)		
Standard error B (beta)		
Degrees of Freedom		
Data Type	Panel	☐
	Cross-Section	☐
	Time Series	☐

Appendix 5. SEARCH TERMS FOR EACH SECTOR

A. LONG-TERM AND LARGE-SCALE DIMENSION

("long-term" OR "long term" OR longitudinal OR "over time" OR "multiple wave*" OR ((two OR three OR four OR five OR six OR seven OR eight OR nine OR ten) NEAR/0 wave*) OR transformat* OR prolonged OR wane* OR waning OR sustain* OR unsustain* OR "not sustainable" OR ("year*-long" NEAR/0 (stud* OR data*)) OR ("month*-long" NEAR/0 (stud* OR data*)) OR ((panel OR longitudinal) NEAR/2 (study OR analysis OR data)) OR ((paradigm* OR "ground-breaking" OR "ground breaking") NEAR/2 (shift* OR chang*)) OR large-scale OR largescale OR "large scale" OR year* OR month* OR time* OR "long-period" OR "long time period" OR "over a long period" OR "long run" OR "long-run" OR "follow*up")

B. METHODOLOGY

(("quasi experiment*" OR quasi-experiment* OR quasiexperiment* OR "random* control* trial*" OR "random* trial*" OR RCT OR randomi* OR (matching NEAR/2 (study OR procedure OR "using" OR use* OR observable*)) OR "propensity score" OR psm OR "regression discontinuity" OR "regression kink" OR "fuzzy regression" OR "sharp regression" OR "discontinuous design" OR rdd OR "difference in difference*" OR "difference-in-difference*" OR "diff in diff" OR "diff-in-diff" OR (random* NEAR/1 (allocat* OR assign* OR select*)) OR "research synthesis" OR "fixed effect*" OR "synthetic control" OR "rapid evidence assessment*" OR "systematic literature review*" OR "systematic* review*" OR metaanaly* OR "meta analy*" OR meta-analy* OR "control* evaluation" OR "control* treatment" OR "instrumental variable*" OR (as NEAR/2 instrument) OR (heckit NEAR/2 (model* OR estimat* OR procedure OR method)) OR (heckman* NEAR/5 (sample OR selection OR model OR correction)) OR ((treatment OR intervention OR comparison OR control OR subsidy) NEAR/0 group) OR ((counterfactual OR "counter factual" OR "counter-factual" OR random*) NEAR/2 (stud* OR analysis OR experiment*)) OR ((counterfactual OR "counter factual" OR "counter-factual" OR random*) NEAR/2 (outcome*)) OR causal* OR "control group*" OR "comparison group*" OR ((control OR treatment) NEAR/0 (communit* OR village*)) OR (experiment* NEAR/1 (stud* OR analysis OR design*)) OR IV OR ITT OR ((treatment OR intervention) NEAR/2 effect*) OR "intention-to-treat" OR "intention to treat" OR ("econometric analysis") OR (impact* NEAR/1 (evaluation OR stud*)) OR "controlled before?and?after" OR "controlled before?after" OR "quasi?experimental time series" OR "interrupted time series") NOT (granger OR "kuznets curve" OR "unidirectional causality" OR "uni-directional causality" OR "bidirectional causality" OR "cointegrated equation" OR cointegration OR "panel causality" OR "co-integration" OR "causality test*" OR "wavelet coherence" OR "spatial econometric" OR nexus OR "response surface" OR "choice experiment*" OR ((root OR "cross-section* dependence" OR "cross-sectional augmented") NEAR/0 test)))

[additional terms for the Public Health sector:] not ("clinical study" OR "clinical trial" OR clinical* OR "phase I" OR "phase ii" OR "phase iii" OR "phase iv")

C. COUNTRY

((Africa OR Caribbean OR "West Indies" OR "Middle East" OR "Central America" OR "Pacific Islands" OR Micronesia OR Polynesia OR Melanesia) OR (Asia NOT (Japan OR Korea OR "Hong Kong" OR Hong-Kong)) OR ("South America" OR "Latin America") OR

(Afghanistan OR Albania OR Algeria OR "American Samoa" OR Angola OR Argentina OR Armenia OR Armenian OR Azerbaijan OR Bangladesh OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brazil OR Bulgaria OR "Burkina Faso" OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR "Cabo Verde" OR Cambodia OR "Khmer Republic" OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR "Cape Verde" OR "Central African Republic" OR Chad OR China OR Colombia OR Comoros OR "Comoro Islands" OR Comores OR Mayotte OR Congo OR Zaire OR "Costa Rica" OR "Cote d'Ivoire" OR "Côte d'Ivoire" OR "Ivory Coast" OR Cuba OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR "East Timor" OR "East Timur" OR "Timor Leste" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR "Equatorial Guinea" OR Eritrea OR "Eswatini" OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR Gaza OR Georgia OR "Georgia Republic" OR "Georgian Republic" OR Ghana OR Grenada OR Guatemala OR Guinea OR Guiana OR Guyana OR "Guinea-Bissau" OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Kosovo OR Kyrgyzstan OR Kirghizia OR "Kyrgyz Republic" OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Maldives OR Mali OR "Marshall Islands" OR Mauritania OR Mauritius OR "Agalega Islands" OR Mexico OR Micronesia OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nauru OR Nepal OR "Netherlands Antilles" OR Nicaragua OR Niger OR Nigeria OR Muscat OR Pakistan OR Palestine OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR "Papua New Guinea" OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR "Saint Lucia" OR "St Lucia" OR "St. Lucia" OR "Saint Vincent" OR "St Vincent" OR "St. Vincent" OR Grenadines OR Samoa OR "Samoan Islands" OR "Navigator Island*" OR "Sao Tome" OR "São Tomé and Principe" OR Senegal OR Serbia OR "Sierra Leone" OR "Sri Lanka" OR "Solomon Islands" OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR "South Africa" OR Syria OR Syrian OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR "Togolese Republic" OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Tuvalu OR Uganda OR Ukraine OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR "Viet Nam" OR "West Bank" OR Gaza OR Yemen OR Zambia OR Zimbabwe) OR ((developing OR "less* developed" OR "less-developed" OR "under developed" OR underdeveloped OR "middle income" OR "middle-income" OR "low* income" OR "low*-income" OR underserved OR "under served" OR deprived OR poor*) NEAR/0 (countr* OR nation OR nations OR population* OR world OR state*)) OR ((developing OR "less* developed" OR "under developed" OR underdeveloped OR "middle income" OR "low*-income" OR "low* income" OR underserved OR "under served" OR deprived OR poor*) NEAR/0 (economy OR economies)) OR (low* NEAR/0 (gdp OR gnp OR "gross domestic" OR "gross national")) OR (low NEAR/3 middle NEAR/3 countr*) OR (lmic OR lmics OR "third world" OR "lami countr*" OR "global south") OR "former soviet" OR "post-soviet" OR "commonwealth of independent states" OR "non-OECD" OR ((transition* OR cis) NEAR/0 (countr* OR state* OR economy OR economies)))

D. INTERVENTIONS

1. ENERGY

a. Institutional and market systems

"electricity reform*" OR "electricity sector reform*" OR "institutional framework*" OR (reform* NEAR/2 (electricity OR power OR investment OR administrative OR regulatory OR institutional)) OR "independent regulator*" OR "cap-and-trade" OR "emission* allowance*" OR "emission* credit*" OR PPP OR "public-private partnership*" OR "public-private-partnership*" OR (emission* NEAR/1 (trad* OR tax* OR certificat*)) OR privatiz* OR privatis* OR "deregulation" OR "market-oriented reform*" OR "market reform*" OR "electricity dispatch reform" OR (competition NEAR/1 (electricity OR power)) OR (restructuring NEAR/3 (electricity OR power)) OR (restructur* NEAR/2 (firm* OR effect* OR industry)) OR "unbundling" OR ((corporatisation OR corporatization) NEAR/2 (state-owned)) OR ("open access" NEAR/2 (transmission OR distribution) NEAR/1 (network* OR system* OR grid* OR line*)) OR ("private participation" NEAR/2 (transmission OR distribution)) OR "independent power produc*" OR IPPs OR "business association*" OR "industry body" OR "industry self-regulation"

b. Incentives and standards

(("cooking stove*" OR cookstove) NEAR/1 improve*) OR (("prepaid metering" OR "graded tariff*" OR "pay-as-you-go" OR "pay as you go" OR "flexible tariff*") NEAR/1 (electricity OR power)) OR ((carbon OR fuel) NEAR/1 (tax* OR pricing)) OR (((renewable OR reusable) NEAR/1 energy) NEAR/1 subsid*) OR (("fossil-fuel subsid*" OR "fossil fuel subsid*") NEAR/1 removal*) OR (("tax credit*" OR "tax incentive*" OR credit*) NEAR/1 "renewable energy") OR "feed-in tariffs" OR "infrastructure treasury guarantees" OR "power purchase agreement*" OR PPA OR PPAs OR ((energy OR power OR electricity OR "water heating" OR heating OR solar OR wind OR hydro* OR micro-hydro* OR microhydro* OR pico-hydro* OR renewable*) NEAR/4 ("loan guarantee*" OR "credit guarantee*" OR "soft loan*" OR "concessional loan*" OR "loan program*" OR "lending facilit*" OR "project financ*" OR financ* OR "private equity" OR "investment fund*" OR insurance OR micro-insurance OR microinsurance OR co-insurance OR coinsurance OR "risk-sharing" OR "risk sharing")) OR ("market commitment" NEAR/1 advanced) OR (("micro-loan*" OR "micro loan*" OR "micro financ*" OR "microfinanc*" OR "credit guarantee fund*" OR "credit line") NEAR/3 (energy OR electricity OR power OR solar OR wind OR hydro* OR micro-hydro* OR microhydro* OR pico-hydro* OR renewable*)) OR "clean technology fund" OR (("results based" OR "results-based") NEAR/1 (financ* OR funding)) OR CDM OR "clean development mechanism" OR ((energy OR power) NEAR/1 "local financ* intermed*") OR REFINe OR (("R&D" OR "Research and Development") NEAR/1 fund*) OR "green bonds" OR (("adapt* programme" OR "development polic*" OR "sector investment") NEAR/1 loan) OR "waterfall payment mechanism*" OR ((bended OR carbon) NEAR/1 finance) OR "carbon support" OR "block pricing" OR "block tariff*" OR (price NEAR/2 (shock OR schedule OR "determination mechanism*")) OR (incentive* NEAR/1 (monetary OR financial)) OR "utility bill" OR (voucher* NEAR/2 (distribution OR status OR allocation OR non-transferable OR discount* OR recipient*)) OR "subsidy program*" OR "cross subsid*" OR "cross-subsid*" OR "subsidy payback period" OR "electricity tariff*" OR "feeder load" OR "backup tariff*" OR "tariff order" OR "tariff rationalisation" OR "tariff rationalization" OR (rebalanc* NEAR/2 price*) OR "energy efficien*" OR (emission* NEAR/1 (control* OR standard* OR target*)) OR ("end-

of pipe emission*" NEAR/1 control*) OR ((renewable* OR green OR clean) NEAR/1 "portfolio standard*") OR "green quota*" OR "green certificate*" OR "renewable energy quota*" OR "renewable obligation*" OR "renewable energy source*" OR ((policy OR policies OR govern* OR legisl* OR law* OR legal) NEAR/4 (energy OR electricity OR power OR renewable OR "fossil fuel" OR nuclear OR gas OR oil OR LNG OR LPG OR biofuel OR biogas OR biomass OR firewood OR carbon OR biodiesel OR bioethanol OR gasoline OR diesel OR kerosene OR heating OR wind OR hydro* OR geothermal OR thermal)) OR "energy standard*"

c. "Soft" interventions

"behavioral intervention*" OR "behavioural intervention*" OR training OR (technology NEAR/2 demonstration) OR (campaign* NEAR/1 awareness) OR ((promot* OR awareness OR inform*) NEAR/2 (reusable OR green OR renewable OR solar OR wind OR hydro* OR "micro-hydro*" OR microhydro* OR "pico-hydro*" OR thermal OR geothermal OR saving OR efficien* OR sustainab*) NEAR/1 (energ* OR electricity OR power)) OR ((promot* OR awareness OR inform*) NEAR/2 (biofuel OR biogas OR "cooking stove" OR cookstove)) OR "information incentive*" OR (defaults NEAR/1 ("green electricity" OR "carbon offsets")) OR (("social norm*" OR implementation) NEAR/1 intervention*) OR "social network*" OR (peer NEAR/2 (learn* OR effect* OR influence*)) OR (interaction* NEAR/1 (social OR preference)) OR "social learning" OR (neighbor* NEAR/2 ("connection behavior*" OR "connection behaviour*")) OR (simplif* NEAR/1 (choice OR environment)) OR disclosure OR warning* OR reminder* OR precommitment OR (inform* NEAR/1 choice*) OR sign* OR suggest* OR (information NEAR/2 nudge*) OR "respon* to nudge*"

d. Investments into energy infrastructure, equipment and technologies (typically by state-actors and without transfer of ownership to private parties)

((government* OR public) NEAR/1 ("tech* investment" OR research OR development OR "research and development" OR "R&D")) OR ("superconduct* elec*" NEAR/1 (elem* OR equip*)) OR ((mini OR micro OR smart) NEAR/1 (grid NEAR/1 (expan* OR improv* OR increas*))) OR ((LNG OR "liquefied natural gas") NEAR/1 infrastructur*) OR "gas pipeline*" OR (centrali* NEAR/2 "energy access") OR "grid flexibilit*" OR (decentrali* NEAR/2 (energy OR power OR electricity OR heating)) OR "dry cell battery" OR ((household* OR rural) NEAR/2 (electrification)) OR (grid* NEAR/1 (smart OR small OR mini OR micro OR electricity)) OR ((transmission OR distribution OR electricity) NEAR/1 (line* OR network* OR station* OR substation OR infrastructur*)) OR ((electricity OR grid) NEAR/1 expansion) OR "infrastructur* investment*" OR (electric* NEAR/1 infrastructure) OR "grid-electricity generation" OR "energy conservation" OR "fuel conversion" OR "utilization of reusable energy" OR electrif* OR (investment NEAR/1 (energy OR "renewable energy" OR "reusable energy" OR electric* OR "clean energy")) OR "solar power" OR (wind NEAR/1 (turbine* OR power OR wheel OR mill* OR energy)) OR (solar NEAR/1 (plant OR "power plant" OR panel* OR battery OR "water heaters" OR power OR grid* OR electricity)) OR "photovoltaic tech*" OR "offshore wind turbine*" OR ((hydro* OR "micro-hydro*" OR microhydro* OR "pico-hydro*") NEAR/1 (batter* OR fuel OR power OR electric* OR energy)) OR (water NEAR/1 (power OR electric* OR energy)) OR (tidal NEAR/1 (power OR energy OR electric* OR "stem gener*" OR barrage)) OR (wave NEAR/1 (energy OR power)) OR "wave energy converter" OR (damless NEAR/1 (power OR energy)) OR (marin* NEAR/1 (power OR electric* OR energy)) OR (("liquid-dominat*" OR reservoir* OR electric* OR power OR energy OR "heat pump*" OR plant* OR system* OR generat*) NEAR/1 (thermal OR geothermal)) OR biofuel* OR biodiesel OR

bioethanol* OR ((algae* OR algal*) NEAR/1 (fuel OR oil)) OR "fuel from waste" OR "fuel cell" OR "carbon-neutral fuel" OR ((first-gener* OR "first-gener*" OR "second-gener*" OR "second-gener*") NEAR/1 biofuel*) OR "fuel switch" OR "low carbon tech*" OR ((small OR micro) NEAR/1 dams) OR ((thermal OR photovoltaic*) NEAR/1 solar NEAR/1 (power OR energy)) OR CSP OR "concentrated solar power" OR "home energy system*" OR "solar home system*" OR "carbon capture and storage" OR CCS OR "solar technolog*" OR (biogas NEAR/1 (stove* OR domestic OR digester* OR program*)) OR (solar NEAR/1 (microgrid* OR grid* OR electric* OR energy)) OR "hydroelectric dam*" OR "hydropower dam*" OR "hydropower" OR "hydroelectric"

2. PUBLIC HEALTH

a. Substance abuse

(("nicotine replacement" OR "smoking cessation" OR replacement OR anti-smoking OR antismoking OR no-smoking OR "no smoking" OR "non smoking" OR non-smoking OR nonsmoking OR drug OR anti-drug OR "substance abuse" OR alcohol) NEAR/2 (therap* OR intervention* OR program* OR initative* OR campaign* OR counsel* OR treat* OR polic*)) OR ((smoking OR tobacco OR cigar* OR bidi* OR beedi* OR hooka* OR waterpipe* OR kretek* OR shisha* OR chutta* OR dhumti* OR hookli* OR chillum* OR alcohol OR liquor* OR drug* OR marijuana OR cocaine OR crack OR heroin OR meth OR methamphetamine OR amphetamine OR narcotic OR opium OR MDMA OR LSD) NEAR/2 (restriction* OR ban* OR prevent* OR polic* OR prohibit*)) OR (nicotine NEAR/2 (patch* OR spray* OR inhaler* OR lozenge* OR gum*)) OR bupropion OR ((label* OR pack* OR packet* OR package*) NEAR/2 warn*) OR ((behavioral OR cessation) NEAR/2 (support OR aid OR therap* OR instruct*)) OR "cigarette* price" OR ((indoor OR workplace OR work-place OR office OR hospital OR employee*) NEAR/2 ((restriction* OR ban* OR polic* OR prohibit*) NEAR/2 smok*))

b. Utilization of available health services

(("door to door" OR home OR clinic OR "preventive healthcare" OR monthly) NEAR/2 (visit OR checkup* OR check-up* OR test OR tests OR testing)) OR ((health OR healthcare OR "health care" OR medical) NEAR/2 (availab* OR provision* OR provid* OR promot* OR prevent* OR barrier* OR constrain* OR imped* OR facilitat* OR hinder* OR block* OR obstacle OR restrict* OR optimiz* OR optimis* OR adher* OR access* OR motivat* OR accept* OR availabl*)) OR ("insecticide treated" NEAR/2 (net* OR bednet* OR "bed net*")) OR "insurance provi*" OR "facility based delivery" OR "institutional* delivery" OR "village council meeting" OR (elimination NEAR/2 ("user fee" OR fee OR charge)) OR checkup* OR ((vaccin* OR immuniz* OR innocul* OR "antenatal care" OR ANC OR "postnatal care" OR PNC OR health OR "health care" OR healthcare OR medical) NEAR/2 (therap* OR intervention* OR program* OR initative* OR campaign* OR counsel* OR treat* OR polic* OR camp)) OR (train* NEAR/2 ("GPs" OR "service provider" OR "health worker" OR midwife))

c. Hygiene practices

(water NEAR/2 (drink* OR provide OR provis* OR filter* OR sanitiz* OR sanitis* OR purifi* OR treat* OR guard OR manage* OR disinfect* OR steriliz* OR sterilis* OR boil* OR sedimentation OR biofilter* OR "anti-bacterial agent*" OR antimicrobial*)) OR "sodium hypochlorite" OR SODIS OR "water management" OR sanitizer OR sanitiser OR "sanitary engineering" OR ("household water treatment" NEAR/2 "safe storage") OR hwts OR "water safety plan*" OR "water supply" OR ((chemical OR heat) NEAR/2 treatment) OR ((ultraviolet OR UV) NEAR/2 (radiation

OR treatment)) OR (chlorine NEAR/2 (dispenser OR filter)) OR ((sanitation OR handwash* OR "WASH" OR hwipc OR "toilet construction" OR "sewage construction" OR hygiene OR wastewater) NEAR/2 (facilit* OR station OR intervention* OR program* OR campaign* OR initiative*)) OR "pour toilet*" OR "flush toilet*" OR "pit latrine*" OR "composting toilet*" OR "on?site system*" OR "off?site system*" OR sewerage OR "septic tank*" OR "Community Led Total Sanitation" OR CLTS OR "WASH" OR ("water sanitation" NEAR/2 hygiene) OR ((water OR sanitation) NEAR/2 hygiene) OR ("Participatory Hygiene" NEAR/2 "Sanitation Transformation") OR SARAR OR "Urban Led Total Sanitation" OR "community approach*" OR "supply side improvements" OR "hygiene promot*" OR "water closet*" OR ((hygiene OR mother OR mothers OR health) NEAR/2 club*)

d. Nutrition

((food* OR diet* OR nutritio* OR nutrient*) NEAR/2 (choice OR mediterranean OR health* OR balance* OR fat OR fats OR salt* OR sugar* OR unhealthy OR therapy OR polic* OR diversi* OR balanc* OR prepar*)) OR ((beverage* OR drink* OR liquid*) NEAR/2 (sweet OR sweetened OR carbonated OR cola OR sugar OR caloric OR energy)) OR ((physical* OR game* OR leisure* OR fitness) NEAR/2 (event* OR setting* OR program* OR venue* OR site* OR center OR centre)) OR ((media OR community OR school OR family OR parent*) NEAR/2 (intervention* OR program* OR campaign* OR initiative*)) OR ((lifestyle OR "life style" OR life-style) NEAR/2 (intervention OR change OR improv* OR better*)) OR ((food NEAR/2 (ration* OR supplement* OR fortif*)) NEAR/2 (program* OR intervent* OR campaign* OR initiative*)) OR ((vitamin* OR mineral* OR iodin* OR iron OR zinc OR micronutrient* OR nutrient*) NEAR/2 (suppl* OR capsule* OR inject* OR deficiency*)) OR (food NEAR/2 label*) OR ((weight OR "weight control" OR "weight reduction") NEAR/2 (program* OR intervent* OR campaign* OR initiative*))

e. Physical activity

((prevent* OR health OR primary OR community OR "peer group" OR group) NEAR/2 (care OR service OR program* OR session OR educat* OR re-educat* OR reducat* OR intervention OR train* OR retrain* OR re-train* OR check* OR knowledge OR support)) OR ((physical* OR game* OR leisure* OR fitness OR wellness OR health OR care) NEAR/2 (event* OR setting* OR program* OR venue* OR site* OR center OR centre OR check OR check-up OR checkup)) OR ((prevent* OR intervention* OR campaign* OR initiative*) NEAR/2 (diabetes OR obesity OR cardiac)) OR ((acquatic OR resistance OR physical) NEAR/2 (training OR exercis* OR exert*)) OR ((lifestyle OR "life style" OR life-style) NEAR/2 (intervention* OR change OR improv* OR better* OR campaign*)) OR ((activity OR movement OR fitness) NEAR/2 (track* OR sens* OR monitor*)) OR pedometr* OR step count* OR mhealth OR (self NEAR/2 (help* OR manag* OR monitor* OR track*)) OR (walk* OR run* OR jog* OR swim* OR danc* OR garden* OR cycl* OR bicycl* OR bike* OR recreation*)

f. Generic terms

((education* OR information*) NEAR/2 (campaign* OR session* OR poster* OR leaflet* OR counseling)) OR (technical NEAR/2 information) OR "home based counselling" OR stickers OR broadcasting OR leaflets OR meetings OR "individual advice" OR "social mobilization" OR advocacy OR advocat* OR "behavior change communication" OR "family based home health education" OR ((messag* OR SMS OR "short message service" OR email* OR e-mail* OR "electronic mail*" OR television OR tv OR televised OR radio OR newspaper OR movie OR in-store OR "in store" OR magazine* OR internet OR web OR print) NEAR/2 (campaign* OR commercial OR commercials* OR display OR displays OR retail OR store OR "point of purchase" OR "point-of-purchase" OR "point of sale" OR "point-of-sale")) OR "cash transfer" OR ((monetary

OR financial) NEAR/2 incentive*) OR "tax reform" OR subsid* OR voucher* OR microcredit OR micro-credit* OR loan* OR financ* OR price* OR prices OR tax OR taxes OR taxation OR training OR "technical information" OR "capacity building" OR restrict* OR forbid* OR warning* OR ban OR bans OR banning OR prohibiti* OR ordinance OR ((mobile OR "smart phone" OR smartphone OR phone OR cellphone OR "cell phone" OR tablet* OR electronic) NEAR/2 (app OR apps OR application* OR messag*)) OR community motivation OR "Participatory Rural Appraisal" OR "Community Action Planning" OR remind* OR prompt* OR cue* OR cuing OR advertis* OR brand* OR marketing OR mass distribution campaign OR enable* OR infrastructur* OR "mass media campaign" OR "social media campaign" OR stickers OR broadcasting OR leaflet* OR promot* "social marketing" OR "role modelling" OR "technical assistance" OR "behavioral support session" OR "behavioral support" OR "self help material" OR aid

E. OUTCOMES

1. ENERGY

a. Access to energy and supply of energy

((energy OR electricity OR power OR ((solar OR thermal OR geothermal OR wind OR wave OR hydro* OR "micro-hydro*" OR microhydro* OR "pico-hydro*" OR nuclear) NEAR/1 (power OR energy OR electric*))) NEAR/2 (production OR reliabilit* OR supply OR provision OR penetration OR generation OR expansion OR consumption OR use OR access)) OR ((biofuel OR biogas OR biomass OR biodiesel OR firewood OR bioethanol OR gasoline OR diesel OR kerosene OR "fossil fuel*" OR fuel OR coal OR "natural gas" OR "shale gas" OR LNG OR LPG) NEAR/2 (consumption OR use OR access)) OR (levelized NEAR/2 "cost of energy") OR ("avoided cost" NEAR/2 (energy OR "new generation")) OR (access NEAR/2 ((reusable OR modern OR clean OR renewable) NEAR/1 energy)) OR (price NEAR/2 electricity) OR "non electrified household*" OR "non-electrified household*" OR "residential energy consumption" OR ((energy OR fuel) NEAR/2 (expenditure* OR expense* OR cost*)) OR (access NEAR/2 (electricity OR power OR energy OR biogas OR solar OR thermal OR geothermal OR wind)) OR ((transit* OR switch* OR shift* OR "phasing in") NEAR/2 ("clean energy" OR "renewable energy")) OR "from coal to gas" OR (access NEAR/2 ((clean OR renewable OR reusable OR green) NEAR/2 energy)) OR (access* NEAR/2 energy) OR ((renewable OR reusable) NEAR/2 energy NEAR/2 (supply OR provision)) OR "solar home system*" OR "solar technolog*" OR ((((solar OR thermal OR geothermal OR wind OR wave OR hydro* OR "micro-hydro*" OR microhydro* OR "pico-hydro*") NEAR/1 (power OR energy OR electric*)) OR power OR heating OR electricity) NEAR/2 ("generation capacity")) OR (baseload OR "base load") OR (capacity NEAR/1 installed) OR "household electricity" OR "residential electricity" OR "generation plant*" OR "electrified grid points" OR ((effect* OR impact OR household* OR rural OR "grid-based" OR "grid based") NEAR/3 electrification) OR "electrification rate" OR "household* with* electricity" OR "non-electrified household*" OR "electrified household*"

b. Energy market development

(investment* NEAR/2 (energy OR power OR electricity OR solar OR wind OR hydro* OR "micro-hydro*" OR microhydro* OR "pico-hydro*" OR renewable* OR thermal OR geothermal OR biofuel OR biogas OR biodiesel OR bioethanol OR nuclear OR "fossil fuel*" OR gas OR LNG OR LPG OR liquefied)) OR "industrial economics" OR ((outage OR blackout) NEAR/2 (electricity OR power OR planned OR unplanned)) OR "day* without electricity" OR ("electricity service" NEAR/2 (reliability OR quality)) OR "independent power producer*" OR (separation NEAR/2

(generation OR transmission OR distribution)) OR (access NEAR/2 ((transmission OR distribution) NEAR/2 (network* OR line* OR grid))) OR "market concentration" OR (voltage NEAR/1 variation*) OR ("technological innovation*" NEAR/2 (energy OR power OR electricity)) OR "forward capacity auction" OR "marginal price" OR "price elasticity" OR "cost covering price" OR ((competitive OR discriminatory OR regulation* OR instrument*) NEAR/2 pricing) OR ("cross subsid* " OR "cross-subsid*") OR (pric* NEAR/2 (distort* OR adjustment* OR mechanism*)) OR "grid extension" OR "connection decision" OR "decision to connect" OR "choose to connect" OR "choice to connect" OR (connect* NEAR/2 ("electrical grid*" OR grid*)) OR "connection rate" OR "connection behavior" OR "connection behaviour" OR "grid-connected" OR (connection NEAR/2 (price* OR fee* OR cost*)) OR ((discount OR status OR electricity) NEAR/2 connection) OR "metered individually" OR "electrical connectivity" OR ((electricity OR power) NEAR/3 unconnected)

c. Energy consumption and demand (measured in energy units)

"consumption response" OR ((renewable OR reusable) NEAR/2 (energy OR electricity OR "energy service*") NEAR/2 (demand OR "peak demand" OR usage OR use OR consumption OR switch*)) OR ((energy OR biofuel OR biogas OR biomass OR biodiesel OR bioethanol OR gasoline OR firewood OR "traditional fuel*") NEAR/2 (demand OR consumption OR usage OR use OR switch*)) OR "off-grid solar electricity" OR "digester owner" OR ((waste NEAR/2 conver*) NEAR/2 (energy OR power OR electricity)) OR "waste-to-energy" OR "waste to energy" OR ((anaerobic OR biogas OR biofuel) NEAR/2 (digest* OR plant)) OR ((demand OR consumption OR usage OR use OR replac* OR switch*) NEAR/2 (diesel OR kerosene OR petrol* OR coal OR charcoal OR gas OR LNG OR LPG OR oil OR nuclear OR "fossil fuel*" OR fuel)) OR "fossil fuel fired electricity generation" OR "captive power" OR "kerosene displacement" OR "kerosene lamp" OR "kerosene lantern" OR ((electricity OR power) NEAR/2 (demand OR consumption OR usage OR use OR switch* OR connect*))

d. Adoption of more energy efficient technologies

(("energy efficien*" OR "energy-efficien*" OR "energy-saving" OR "energy sav*") NEAR/2 technolog*) OR ((fuel OR "conventional fuel" OR "fuel usage" OR "fuel use") NEAR/3 (efficienc* OR inefficienc* OR productivity OR saving*)) OR “technical efficienc*" OR "technical inefficienc*" OR "sectoral efficienc*" OR "sectoral inefficienc*" OR ((efficienc* OR inefficienc* OR productivity OR loss* OR saving*) NEAR/3 ("generation plant*" OR "electricity generation" OR "generation segment")) OR (((power OR electricity) NEAR/2 (transmission OR distribution)) NEAR/3 (efficienc* OR inefficienc* OR productivity)) OR ((transmission OR distribution) NEAR/2 loss*) OR (("energy efficien*" OR "energy inefficienc*" OR "energy saving") NEAR/2 (building* OR cit* OR industr*)) OR (("industrial consum*" OR "industrial demand") NEAR/2 (electricity OR power)) OR (fuel NEAR/10 (efficienc* OR inefficienc* OR econom*)) OR "miles per gallon" OR "miles/gallon" OR "mpg" OR "liters per 100 kilometers" OR "liters per 100 km" OR "litres per 100 kilometers" OR "litres per 100 km"OR "l/100km" OR "negative pric*" OR "A-rated appliance*" OR "incandescent bulb*" OR "incandescent lightbulb*" OR "energy efficient bulb*" OR "incandescent lightbulb*"

e. Resilience of energy systems (adaptation)

((generation OR nameplate OR installed OR "peak load") NEAR/2 capacity) OR (storage NEAR/2 regasification) OR (energy NEAR/2 (security OR resilien* OR relian* OR dependen*)) OR (import* NEAR/2 (energy OR oil OR gas OR LNG)) OR "peak load" OR "peak deficit" OR "peak demand" OR "peak energy use" OR ((sustainab* OR planning OR smooth*)

NEAR/2 ((energy OR power OR electricity) NEAR/2 (use OR usage OR consumption OR demand OR system*))) OR "backup power" OR "backup electricity" OR "grid supply-demand imbalances" OR ((shortage OR deficit) NEAR/2 (energy OR power OR electricity))

f. GHG emissions and pollution as result of energy generation, transmission, storage, consumption

"low emission transport" OR ((car OR vehicle) NEAR/2 (green OR "carbon neutral" OR electric OR sharing)) OR ("low emission" NEAR/2 ("energy supply" OR provision)) OR (reduc* NEAR/2 (GHG OR "greenhouse gas" OR "greenhouse-gas" OR "greenhousegas" OR "carbon intens*" OR fuel OR "carbon dioxide" OR "household carbon dioxide" OR CO2 OR Nox OR SOx OR CH4)) OR decarbonization OR decarbonisation OR (avoid* NEAR/2 (GHG OR "greenhouse gas*" OR "greenhouse-gas*" OR "greenhousegas*" OR emission*)) OR ("carbon capture" NEAR/2 (sequestration OR storage)) OR "low carbon" OR "low-carbon" OR (decarbon* NEAR/2 (electricity OR energy)) OR "low-carbon" OR (("carbon" OR "carbon-dioxide" OR CO2) NEAR/1 emission*) OR (("carbon" OR "GHG" OR "emission*") NEAR/2 avoid*) OR "household air pollution" OR "respiratory disease symptom*" OR "indoor air pollution" OR "indoor air quality" OR "overnight pm concentration"

g. Labour market co-benefits (jobs creation, demand for workforce) from investments / transition to renewable energy

"employment rate*" OR "unemployment rate*" OR "employment effect*" OR "unemployment effect*" OR "employment impact*" OR "unemployment impact*" OR "formal employment" OR "unemployment" OR "waged-employment" OR "waged employment" OR (("excess supply" OR surplus OR supply OR outcome OR increase OR reduction) NEAR/2 (labor OR labour)) OR "working-age" OR (employ* OR unemploy* NEAR/2 ("men" OR "women" OR "female" OR "male" OR "worker*" OR "formal*" OR structure)) OR "market work" OR (propensity NEAR/5 work) OR ((day* OR hour* OR time OR transition) NEAR/3 (work* OR employment OR unemployment)) OR "work* behavior*" OR "work* behaviour*"

2. PUBLIC HEALTH

a. Substance abuse

"substance abuse" OR "substance*" OR "drug abuse" OR "drug*" OR "smok*" OR "alcohol*" OR "drunk" OR "cigar*" OR "narcotic*" OR "stimulant*" OR "bidis" OR "drink*" OR ((alcohol OR drink* OR cigarette OR tobacco) NEAR/2 (consumption OR use OR abuse OR misuse* OR intoxicat* OR harmful OR excess* OR binge* OR heavy OR temperance OR abstinence OR exposure OR quit OR quitting OR reduction OR stop OR stopping)) OR "smoke free" OR "smoke-free" OR "abstinence" OR (smoking NEAR/2 (cessation OR quit OR quitting OR reduction OR stop OR stopping)) OR "tobacco smoke" OR "second hand smoke" OR "nicotine replacement" OR "demand cigarette" OR "waterpipe smoking" OR "addiction" OR "addictive behavior" OR "tobacco" OR "nicotine" OR "temperan*" OR "drinking behavior" OR "drink*" OR "beer" OR "wine" OR "ethanol" OR addict* OR recidivism

b. Utilization of available health services

"ANC" OR "ante-natal care" OR "antenatal care" OR "postnatal care" OR "post-natal care" OR "PNC" OR "institutional deliver*" OR "deliver*" OR "hospital delivery" OR "childbirth*" OR "child birth*" OR "bed net*" OR "bednet*" OR "itn use" OR "oral rehydration solution" OR (hiv NEAR/2 (test* OR learn*)) OR "check-up*" OR "checkup*" OR "check up*" OR "vaccin*" OR

"immuni*" OR "deworm*" OR ((medicine* OR "medical device*" OR condom* OR "therapy session*") NEAR/2 (use OR usage OR purchas*)) OR "visitation" OR "counsel*" OR (("health care" OR healthcare OR "health service*") NEAR/2 (utilization OR utilisation OR entry)) OR inocul* OR innocul* OR "knowledge practice" OR (patient NEAR/2 (complian* OR adheren* OR dropout* OR attrition OR capacitance)) OR "treatment refusal" OR ((drug OR medication) NEAR/2 adherence) OR ltfu OR "loss* to follow-up" OR "self-directed exercise*" OR "self directed exercise*"

Hygiene practices

"hygien*" OR "sanita*" OR "wash*" OR "open defecation" OR "water treatment" OR "water disinfect*" OR "water quality" OR "handwash*" "hand-washing" OR ((toilet OR latrine) NEAR/2 usage) OR "SODIS" OR "handwashing" OR "hand disinfection" OR "hand cleansing" OR "handscrubbing" OR "chlorine test" OR (("faeces" OR "feces" OR fecal OR "faecal" OR "defecat*" OR "excrement*" OR "human waste" OR "night soil" OR "excreta") NEAR/2 ("dispos*" OR "manag*")) OR "drinking water" OR "drinkwater" OR "soap" OR "water quality" OR "water supply" OR "water contamination" OR "water storage" OR "water source" OR "point of use" OR "environmental health" OR "water access" OR "potable water" OR (infection NEAR/2 (control OR prevention OR management)) OR "cross infection" OR "waste disposal" OR "adaptive behavior" OR "behaviour change" OR "adaption" OR "adoption" OR "adopting" OR "rejecting" OR "rejection" OR "observance" OR "conformity" OR "compliance" OR "diffusion"

c. Nutrition

"nutrit*" OR "supplement*" OR "feed*" OR "nutrient" OR "intake" OR "diet*" OR "meal frequency" OR "vegetable consumption" OR "leafy" OR "fruit-based" OR "food fortification" OR "vitamin intake" OR "glucose tolerance" OR "soft drink consumption" OR "iycn knowledge" OR "appetite regulation" OR "eating" OR "energy consumption" OR "portion size" OR "ingestion" OR "*food" OR "(food OR fruit* OR vegetable* OR salt* OR fat* OR sugar*) NEAR/2 (intake* OR consum* OR eat* OR ate) OR "overweight" OR "over weight" OR "obesity" OR "overeat*" OR "over eat" OR "(waist* NEAR/2 (circumference* OR measur*)) OR "(weight OR bmi OR body mass index) NEAR/2 (gain* OR loss* OR lose* OR lost OR change*)) OR "body weight" OR "(diet* NEAR/2 (chang* OR education OR behavio*r OR pattern*)) OR (water NEAR/2 (increas* OR intake* OR consum*)) OR ("drinking water" NEAR/2 (increas* OR intake* OR consum* OR decreas* OR reduction)) OR "undernutrition" OR "undernourish*" OR "under-nutrition*" OR "under-nourish" OR ((sugar* OR fizzy OR carbonated OR cola) NEAR/2 (beverage* OR drink*)) OR (liquid* NEAR/2 carbohydrate*) OR cordial*

d. Physical activity

(physical* NEAR/2 (activ* OR inactiv* OR fit* OR train* OR exertion OR "effort exert*" OR "functioning score" OR condition)) OR "activ*" OR "walk" OR "walking" OR "run" OR "running" OR "jog" OR "jogging" OR "exercise" OR "fitness" OR (gym* NEAR/2 member*) OR "cycling" OR "sedentar*" OR "metaboli*" or "inactiv*" OR (lifestyle NEAR/2 (change OR health*)) OR "sport*" OR (("sedentar*" OR "sitting" OR "seat*" OR "lying" OR "reclin*" OR "recumben*" OR screen OR computer OR TV OR television) NEAR/2 time) OR "screentime" OR "self track*" OR "fitness track*" OR (keep* OR cardio* OR aerobic OR fitness) NEAR/2 (fit* OR activ* OR train*) OR "motor activity" OR "exercise"

e. Generic terms

"uptake" OR "take up" OR "satisfaction" OR "compliance" OR "comply" OR "complie*" OR "refus*" OR "modif*" OR "adaptation" OR "adaptive behavior" OR "behaviour change" OR

"adaption" OR "adoption" OR "adopting" OR "rejecting" OR "rejection" OR "observance" OR "conformity" OR "diffusion" OR (knowledge NEAR/2 attitudes NEAR/2 practice)

F. SECTOR SPECIFYING TERMS

1. ENERGY

(renewable OR (("liquid-dominat*" OR reservoir* OR electric* OR power OR energy OR "heat pump*" OR plant* OR system* OR generat*) NEAR/1 (thermal OR geothermal)) OR " thermal insulation" OR solar OR energy OR electricity OR "water heating" OR "home heating" OR on-grid OR off-grid OR "wind turbine*" OR ("hydropower" OR "hydro-power" OR "hydroelectric*" OR "hydro-electric*" OR "micro-hydro*" OR microhydro* OR "pico-hydro*") OR biofuel OR biogas OR biomass OR biodiesel OR bioethanol OR gasoline OR diesel OR kerosene OR "cooking stove*" OR cookstove* OR firewood OR "fossil fuel*" OR fuel OR coal OR "natural gas" OR "shale gas" OR LNG OR LPG OR electrif* OR grid OR "micro-grid*" OR "micro grid*" OR microgrid* OR ((clean OR reusable OR green OR sustainable OR wind OR traditional OR modern OR plant OR generation OR transmission OR distribution OR dispatch OR network OR line OR storage OR sector OR industry OR demand OR supply OR access OR regulat* OR framework) NEAR/1 power) OR "power market*") NOT (crop* OR "energy intake" OR "gas exchange" OR "agroforestr*" OR ((biodiesel OR bioethanol OR biogas OR biomethane OR hydrogen OR biomass* OR ethanol*) NEAR/1 (production OR purification OR yield)) OR soil* OR seed* OR ((palm OR cooking OR methanol OR vegetable) NEAR/1 oil) OR "biomass burning" OR "fatty acid*" OR "molar ratio" OR "transition state*" OR (reaction NEAR/0 (time OR temperature)) OR "energy surface*" OR "activation energy" OR "catalyst concentration" OR "specie*" OR "kinetic*" OR "pyrolysis" OR "sediment*" OR "energy balance" OR "plasma" OR "spectromet*" OR "physiological*" OR "fertiliz*" OR "neutron*" OR "thermodynamic*")

G. PUBLICATION DATE

Limit year to “1990-current”/ “01-01-1990- 31-05-2020” (for energy sector) or “2000-current”/ “01-01-2000- 31-05-2020” (for health sector)

H. LANGUAGE

Limit to English

Appendix 6. Draft search strategy example (sector public health, Web of Science)

Search	Results #	Search expression
#1	1,428,140	(TS=("long-term" OR "long term" OR longitudinal OR "over time" OR "multiple wave*" OR ((two OR three OR four OR five OR six OR seven OR eight OR nine OR ten) NEAR/0 wave*) OR transformat* OR prolonged OR wane* OR waning OR sustain* OR unsustain* OR "not sustainable" OR ("year*-long" NEAR/0 (stud* OR data*)) OR ("month*-long" NEAR/0 (stud* OR data*)) OR ((panel OR longitudinal) NEAR/2 (study OR analysis OR data)) OR ((paradigm* OR "ground-breaking" OR "ground breaking") NEAR/2 (shift* OR chang*)) OR large-scale OR largescale OR "large scale" OR year* OR month* OR time* OR "long-period" OR "long time period" OR "over a long period" OR "long run" OR "long-run" OR "follow*up")) AND LANGUAGE: (English) Indexes=SSCI Timespan=2000-2020
#2	474,013	(TS=(("quasi experiment*" OR quasi-experiment* OR quasiexperiment* OR "random* control* trial*" OR "random* trial*" OR RCT OR randomi* OR (matching NEAR/2 (study OR procedure OR "using" OR use* OR observable*)) OR "propensity score" OR psm OR "regression discontinuity" OR "regression kink" OR "fuzzy regression" OR "sharp regression" OR "discontinuous design" OR rdd OR "difference in difference*" OR "difference-in-difference*" OR "diff in diff" OR "diff-in-diff" OR (random* NEAR/1 (allocat* OR assign* OR select*)) OR "research synthesis" OR "fixed effect*" OR "synthetic control" OR "rapid evidence assessment*" OR "systematic literature review*" OR "systematic* review*" OR metaanaly* OR "meta analy*" OR meta-analy* OR "control* evaluation" OR "control* treatment" OR "instrumental variable*" OR (as NEAR/2 instrument) OR (heckit NEAR/2 (model* OR estimat* OR procedure OR method)) OR (heckman* NEAR/5 (sample OR selection OR model OR correction)) OR ((treatment OR intervention OR comparison OR control OR subsidy) NEAR/0 group) OR ((counterfactual OR "counter factual" OR "counter-factual" OR random*) NEAR/2 (stud* OR analysis OR experiment*)) OR ((counterfactual OR "counter factual" OR "counter-factual" OR random*) NEAR/2 (outcome*)) OR causal* OR "control group*" OR "comparison group*" OR ((control OR treatment) NEAR/0 (communit* OR village*)) OR (experiment* NEAR/1 (stud* OR analysis OR design*)) OR IV OR ITT OR ((treatment OR intervention) NEAR/2 effect*) OR "intention-to-treat" OR "intention to treat" OR ("econometric analysis") OR (impact* NEAR/1 (evaluation OR stud*)) OR "controlled before?and?after" OR "controlled before?after" OR "quasi?experimental time series" OR "interrupted time series") NOT (granger OR "kuznets curve" OR "unidirectional causality" OR "uni-directional causality" OR "bidirectional causality" OR "cointegrated equation" OR cointegration OR "panel causality" OR "co-integration" OR "causality test*" OR "wavelet coherence" OR "spatial econometric" OR nexus OR "response surface" OR "choice experiment*" OR ((root OR "cross-section* dependence" OR "cross-sectional augmented") NEAR/0 test)))) AND LANGUAGE: (English) Indexes=SSCI Timespan=2000-2020
#3	561,959	(TS=((Africa OR Caribbean OR "West Indies" OR "Middle East" OR "Central America" OR "Pacific Islands" OR Micronesia OR Polynesia OR Melanesia) OR (Asia NOT (Japan OR Korea OR "Hong Kong" OR Hong-Kong)) OR ("South America" OR "Latin America") OR (Afghanistan OR Albania OR Algeria OR "American Samoa" OR Angola OR Argentina OR Armenia OR Armenian OR Azerbaijan OR Bangladesh OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brazil OR Bulgaria OR "Burkina Faso" OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR

		"Cabo Verde" OR Cambodia OR "Khmer Republic" OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR "Cape Verde" OR "Central African Republic" OR Chad OR China OR Colombia OR Comoros OR "Comoro Islands" OR Comores OR Mayotte OR Congo OR Zaire OR "Costa Rica" OR "Cote d'Ivoire" OR "Côte d'Ivoire" OR "Ivory Coast" OR Cuba OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR "East Timor" OR "East Timur" OR "Timor Leste" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR "Equatorial Guinea" OR Eritrea OR "Eswatini" OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR Gaza OR Georgia OR "Georgia Republic" OR "Georgian Republic" OR Ghana OR Grenada OR Guatemala OR Guinea OR Guiana OR Guyana OR "Guinea-Bissau" OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Kosovo OR Kyrgyzstan OR Kirghizia OR "Kyrgyz Republic" OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Maldives OR Mali OR "Marshall Islands" OR Mauritania OR Mauritius OR "Agalega Islands" OR Mexico OR Micronesia OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nauru OR Nepal OR "Netherlands Antilles" OR Nicaragua OR Niger OR Nigeria OR Muscat OR Pakistan OR Palestine OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR "Papua New Guinea" OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR "Saint Lucia" OR "St Lucia" OR "St. Lucia" OR "Saint Vincent" OR "St Vincent" OR "St. Vincent" OR Grenadines OR Samoa OR "Samoan Islands" OR "Navigator Island*" OR "Sao Tome" OR "São Tomé and Principe" OR Senegal OR Serbia OR "Sierra Leone" OR "Sri Lanka" OR "Solomon Islands" OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR "South Africa" OR Syria OR Syrian OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR "Togolese Republic" OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Tuvalu OR Uganda OR Ukraine OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR "Viet Nam" OR "West Bank" OR Gaza OR Yemen OR Zambia OR Zimbabwe) OR ((developing OR "less* developed" OR "less-developed" OR "under developed" OR underdeveloped OR "middle income" OR "middle-income" OR "low* income" OR "low*-income" OR underserved OR "under served" OR deprived OR poor*) NEAR/0 (countr* OR nation OR nations OR population* OR world OR state*)) OR ((developing OR "less* developed" OR "under developed" OR underdeveloped OR "middle income" OR "low*-income" OR "low* income" OR underserved OR "under served" OR deprived OR poor*) NEAR/0 (economy OR economies)) OR (low* NEAR/0 (gdp OR gnp OR "gross domestic" OR "gross national")) OR (low NEAR/3 middle NEAR/3 countr*) OR (lmic OR lmics OR "third world" OR "lami countr*" OR "global south") OR "former soviet" OR "post-soviet" OR "commonwealth of independent states" OR "non-OECD" OR ((transition* OR cis) NEAR/0 (countr* OR state* OR economy OR economies)))) AND LANGUAGE: (English) Indexes=SSCI Timespan=2000-2020
#4	1,530,495	(TS=(((prevent* OR health OR primary OR community OR "peer group" OR group) NEAR/2 (care OR service OR program* OR session OR educat* OR re-educat* OR reducat* OR intervention OR train* OR retrain* OR re-train* OR check* OR knowledge OR support)) OR ((physical* OR game* OR leisure* OR fitness OR wellness OR health OR care) NEAR/2 (event* OR setting* OR program* OR venue* OR site* OR center OR centre OR check OR check-up OR checkup)) OR ((prevent* OR intervention* OR campaign* OR initiative*) NEAR/2 (diabetes OR obesity OR cardiac)) OR ((acquatic OR resistance OR physical) NEAR/2 (training OR exercis* OR exert*)) OR ((lifestyle OR "life style" OR life-style) NEAR/2 (intervention* OR change OR improv* OR better* OR campaign*)) OR ((activity OR movement OR fitness) NEAR/2 (track* OR

sens* OR monitor*)) OR pedometr* OR step count* OR mhealth OR (self NEAR/2 (help* OR manag* OR monitor* OR track*)) OR (walk* OR run* OR jog* OR swim* OR danc* OR garden* OR cycl* OR bicycl* OR bike* OR recreation*) OR ((food* OR diet* OR nutritio* OR nutrient*) NEAR/2 (choice OR mediterranean OR health* OR balance* OR fat OR fats OR salt* OR sugar* OR unhealthy OR therapy OR polic* OR diversi* OR balanc* OR prepar*)) OR ((beverage* OR drink* OR liquid*) NEAR/2 (sweet OR sweetened OR carbonated OR cola OR sugar OR caloric OR energy)) OR ((physical* OR game* OR leisure* OR fitness) NEAR/2 (event* OR setting* OR program* OR venue* OR site* OR center OR centre)) OR ((media OR community OR school OR family OR parent*) NEAR/2 (intervention* OR program* OR campaign* OR initiative*)) OR ((lifestyle OR "life style" OR life-style) NEAR/2 (intervention OR change OR improv* OR better*)) OR ((food NEAR/2 (ration* OR supplement* OR fortif*)) NEAR/2 (program* OR intervent* OR campaign* OR initiative*)) OR ((vitamin* OR mineral* OR iodin* OR iron OR zinc OR micronutrient* OR nutrient*) NEAR/2 (suppl* OR capsule* OR inject* OR deficiency*)) OR (food NEAR/2 label*) OR ((weight OR "weight control" OR "weight reduction") NEAR/2 (program* OR intervent* OR campaign* OR initiative*)) OR (water NEAR/2 (drink* OR provide OR provis* OR filter* OR sanitiz* OR sanitis* OR purifi* OR treat* OR guard OR manage* OR disinfect* OR steriliz* OR sterilis* OR boil* OR sedimentation OR biofilter* OR "anti-bacterial agent*" OR antimicrobial*)) OR "sodium hypochlorite" OR SODIS OR "water management" OR sanitizer OR sanitiser OR "sanitary engineering" OR ("household water treatment" NEAR/2 "safe storage") OR hwts OR "water safety plan*" OR "water supply" OR ((chemical OR heat) NEAR/2 treatment) OR ((ultraviolet OR UV) NEAR/2 (radiation OR treatment)) OR (chlorine NEAR/2 (dispenser OR filter)) OR ((sanitation OR handwash* OR "WASH" OR hwipc OR "toilet construction" OR "sewage construction" OR hygiene OR wastewater) NEAR/2 (facilit* OR station OR intervention* OR program* OR campaign* OR initiative*)) OR "pour toilet*" OR "flush toilet*" OR "pit latrine*" OR "composting toilet*" OR "on?site system*" OR "off?site system*" OR sewerage OR "septic tank*" OR "Community Led Total Sanitation" OR CLTS OR "WASH" OR ("water sanitation" NEAR/2 hygiene) OR ((water OR sanitation) NEAR/2 hygiene) OR ("Participatory Hygiene" NEAR/2 "Sanitation Transformation") OR SARAR OR "Urban Led Total Sanitation" OR "community approach*" OR "supply side improvements" OR "hygiene promot*" OR "water closet*" OR ((hygiene OR mother OR mothers OR health) NEAR/2 club*) OR (("nicotine replacement" OR "smoking cessation" OR replacement OR anti-smoking OR antismoking OR no-smoking OR "no smoking" OR "non smoking" OR non-smoking OR nonsmoking OR drug OR anti-drug OR "substance abuse" OR alcohol) NEAR/2 (therap* OR intervention* OR program* OR initative* OR campaign* OR counsel* OR treat* OR polic*)) OR ((smoking OR tobacco OR cigar* OR bidi* OR beedi* OR hooka* OR waterpipe* OR kretek* OR shisha* OR chutta* OR dhumti* OR hookli* OR chillum* OR alcohol OR liquor* OR drug* OR marijuana OR cocaine OR crack OR heroin OR meth OR methamphetamine OR amphetamine OR narcotic OR opium OR MDMA OR LSD) NEAR/2 (restriction* OR ban* OR prevent* OR polic* OR prohibit*)) OR (nicotine NEAR/2 (patch* OR spray* OR inhaler* OR lozenge* OR gum*)) OR bupropion OR ((label* OR pack* OR packet* OR package*) NEAR/2 warn*) OR ((behavioral OR cessation) NEAR/2 (support OR aid OR therap* OR instruct*)) OR "cigarette* price" OR ((indoor OR workplace OR work-place OR office OR hospital OR employee*) NEAR/2 ((restriction* OR ban* OR polic* OR prohibit*) NEAR/2 smok*)) OR (("door to door" OR home OR clinic OR "preventive healthcare" OR monthly) NEAR/2 (visit OR checkup* OR check-up* OR test OR tests OR testing)) OR ((health OR healthcare OR "health care" OR medical) NEAR/2 (availab* OR provision* OR provid* OR promot* OR prevent* OR barrier* OR constrain* OR imped* OR facilitat* OR hinder* OR block* OR obstacle OR restrict* OR optimiz* OR optimis* OR adher* OR access* OR motivat* OR accept* OR availabl*)) OR ("insecticide treated" NEAR/2 (net* OR bednet* OR "bed net*")) OR "insurance provi*" OR "facility based delivery" OR "institutional* delivery" OR "village council meeting" OR (elimination

		NEAR/2 ("user fee" OR fee OR charge)) OR checkup* OR ((vaccin* OR immuniz* OR innocul* OR "antenatal care" OR ANC OR "postnatal care" OR PNC OR health OR "health care" OR healthcare OR medical) NEAR/2 (therap* OR intervention* OR program* OR initative* OR campaign* OR counsel* OR treat* OR polic* OR camp)) OR (train* NEAR/2 ("GPs" OR "service provider" OR "health worker" OR midwife)) OR ((education* OR information*) NEAR/2 (campaign* OR session* OR poster* OR leaflet* OR counseling)) OR (technical NEAR/2 information) OR "home based counselling" OR stickers OR broadcasting OR leaflets OR meetings OR "individual advice" OR "social mobilization" OR advocacy OR advocat* OR "behavior change communication" OR "family based home health education" OR ((messag* OR SMS OR "short message service" OR email* OR e-mail* OR "electronic mail*" OR television OR tv OR televised OR radio OR newspaper OR movie OR in-store OR "in store" OR magazine* OR internet OR web OR print) NEAR/2 (campaign* OR commercial OR commercials* OR display OR displays OR retail OR store OR "point of purchase" OR "point-of-purchase" OR "point of sale" OR "point-of-sale")) OR "cash transfer" OR ((monetary OR financial) NEAR/2 incentive*) OR "tax reform" OR subsid* OR voucher* OR microcredit OR micro-credit* OR loan* OR financ* OR price* OR prices OR tax OR taxes OR taxation OR training OR "technical information" OR "capacity building" OR restrict* OR forbid* OR warning* OR ban OR bans OR banning OR prohibiti* OR ordinance OR ((mobile OR "smart phone" OR smartphone OR phone OR cellphone OR "cell phone" OR tablet* OR electronic) NEAR/2 (app OR apps OR application* OR messag*)) OR community motivation OR "Participatory Rural Appraisal" OR "Community Action Planning" OR remind* OR prompt* OR cue* OR cuing OR advertis* OR brand* OR marketing OR mass distribution campaign OR enable* OR infrastructur* OR "mass media campaign" OR "social media campaign" OR stickers OR broadcasting OR leaflet* OR promot* "social marketing" OR "role modelling" OR "technical assistance" OR "behavioral support session" OR "behavioral support" OR "self help material" OR aid))
		AND LANGUAGE: (English)
		Indexes=SSCI Timespan=2000-2020
#5	1,484,963	(TS=((physical* NEAR/2 (activ* OR inactiv* OR fit* OR train* OR exertion OR "effort exert*" OR "functioning score" OR condition)) OR "activ*" OR "walk" OR "walking" OR "run" OR "running" OR "jog" OR "jogging" OR "exercise" OR "fitness" OR (gym* NEAR/2 member*) OR "cycling" OR "sedentar*" OR "metaboli*" or "inactiv*" OR (lifestyle NEAR/2 (change OR health*)) OR "sport*" OR (("sedentar*" OR "sitting" OR "seat*" OR "lying" OR "reclin*" OR "recumben*" OR screen OR computer OR TV OR television) NEAR/2 time) OR "screentime" OR "self track*" OR "fitness track*" OR (keep* OR cardio* OR aerobic OR fitness) NEAR/2 (fit* OR activ* OR train*) OR "motor activity" OR "exercise" OR "nutrit*" OR "supplement*" OR "feed*" OR "nutrient" OR "intake" OR "diet*" OR "meal frequency" OR "vegetable consumption" OR "leafy" OR "fruit-based" OR "food fortification" OR "vitamin intake" OR "glucose tolerance" OR "soft drink consumption" OR "iycn knowledge" OR "appetite regulation" OR "eating" OR "energy consumption" OR "portion size" OR "ingestion" OR "*food" OR "(food OR fruit* OR vegetable* OR salt* OR fat* OR sugar*) NEAR/2 (intake* OR consum* OR eat* OR ate) OR "overweight" OR "over weight" OR "obesity" OR "overeat*" OR "over eat" OR "(waist* NEAR/2 (circumference* OR measur*)) OR "(weight OR bmi OR body mass index) NEAR/2 (gain* OR loss* OR lose* OR lost OR change*)) OR "body weight" OR "(diet* NEAR/2 (chang* OR education OR behavio*r OR pattern*)) OR (water NEAR/2 (increas* OR intake* OR consum*)) OR ("drinking water" NEAR/2 (increas* OR intake* OR consum* OR decreas* OR reduction)) OR "undernutrition" OR "undernourish*" OR "under-nutrition*" OR "under-nourish" OR ((sugar* OR fizzy OR carbonated OR cola) NEAR/2 (beverage* OR drink*)) OR (liquid* NEAR/2 carbohydrate*) OR cordial* OR "hygien*" OR "sanita*" OR "wash*" OR "open defecation" OR "water treatment" OR "water disinfect*" OR

		"water quality" OR "handwash*" "hand-washing" OR ((toilet OR latrine) NEAR/2 usage) OR "SODIS" OR "handwashing" OR "hand disinfection" OR "hand cleansing" OR "handscrubbing" OR "chlorine test" OR (("faeces" OR "feces" OR fecal OR "faecal" OR "defecat*" OR "excrement*" OR "human waste" OR "night soil" OR "excreta") NEAR/2 ("dispos*" OR "manag*")) OR "drinking water" OR "drinkwater" OR "soap" OR "water quality" OR "water supply" OR "water contamination" OR "water storage" OR "water source" OR "point of use" OR "environmental health" OR "water access" OR "potable water" OR (infection NEAR/2 (control OR prevention OR management)) OR "cross infection" OR "waste disposal" OR "adaptive behavior" OR "behaviour change" OR "adaption" OR "adoption" OR "adopting" OR "rejecting" OR "rejection" OR "observance" OR "conformity" OR "compliance" OR "diffusion" OR "substance abuse" OR "substance*" OR "drug abuse" OR "drug*" OR "smok*" OR "alcohol*" OR "drunk" OR "cigar*" OR "narcotic*" OR "stimulant*" OR "bidis" OR "drink*" OR ((alcohol OR drink* OR cigarette OR tobacco) NEAR/2 (consumption OR use OR abuse OR misuse* OR intoxicat* OR harmful OR excess* OR binge* OR heavy OR temperance OR abstinence OR exposure OR quit OR quitting OR reduction OR stop OR stopping)) OR "smoke free" OR "smoke-free" OR "abstinence" OR (smoking NEAR/2 (cessation OR quit OR quitting OR reduction OR stop OR stopping)) OR "tobacco smoke" OR "second hand smoke" OR "nicotine replacement" OR "demand cigarette" OR "waterpipe smoking" OR "addiction" OR "addictive behavior" OR "tobacco" OR "nicotine" OR "temperan*" OR "drinking behavior" OR "drink*" OR "beer" OR "wine" OR "ethanol" OR addict* OR recidivism OR "ANC" OR "ante-natal care" OR "antenatal care" OR "postnatal care" OR "post-natal care" OR "PNC" OR "institutional deliver*" OR "deliver*" OR "hospital delivery" OR "childbirth*" OR "child birth*" OR "bed net*" OR "bednet*" OR "itn use" OR "oral rehydration solution" OR (hiv NEAR/2 (test* OR learn*)) OR "check-up*" OR "checkup*" OR "check up*" OR "vaccin*" OR "immuni*" OR "deworm*" OR ((medicine* OR "medical device*" OR condom* OR "therapy session*") NEAR/2 (use OR usage OR purchas*)) OR "visitation" OR "counsel*" OR (("health care" OR healthcare OR "health service*") NEAR/2 (utilization OR utilisation OR entry)) OR inocul* OR innocul* OR "knowledge practice" OR (patient NEAR/2 (complian* OR adheren* OR dropout* OR attrition OR capacitance)) OR "treatment refusal" OR ((drug OR medication) NEAR/2 adherence) OR ltfu OR "loss* to follow-up" OR "self-directed exercise*" OR "self directed exercise*" OR "uptake" OR "take up" OR "satisfaction" OR "compliance" OR "comply" OR "complie*" OR "refus*" OR "modif*" OR "adaptation" OR "adaptive behavior" OR "behaviour change" OR "adaption" OR "adoption" OR "adopting" OR "rejecting" OR "rejection" OR "observance" OR "conformity" OR "diffusion" OR (knowledge NEAR/2 attitudes NEAR/2 practice))) AND LANGUAGE: (English) Indexes=SSCI Timespan=2000-2020
#6	12,448	#5 AND #4 AND #3 AND #2 AND #1 Indexes=SSCI Timespan=2000-2020

Appendix 7. BENCHMARK STUDIES IN THE ENERGY SECTOR

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Appendix 9. FINDINGS FROM THE PILOT SCREENING IN THE ENERGY SECTOR

The review team screened 200 titles and abstracts for the energy sector. The C4ED team submitted these. Out of the 200 articles, 117 (58.5%) were included for full text screening. Of these 95 (81%) were retrieved and 30 of them (31.5%) included for coding. The following are the detailed results.

Summary of outputs from piloting the energy sector:

REVIEW STEP	RESULT
Total articles collated	200
Number of TiAb screened	200
Number of TiAb duplicates excluded	1
Number of TiAb screened in duplicate and excluded (see reasons in table 4)	83 (41.5%)
Number of TiAb included for full text screening: (After §reconciliation/consensus)	117 (58.5%)
Full texts retrieved for screening (Google Scholar)	95 (81%)
Full texts NOT YET retrieved due to pay wall access	22 (19%)
Full texts not yet screened in duplicate	0
Full texts screened in duplicate and disagreed/pending (§reconciliation ongoing)	4
Full texts screened in duplicate and excluded (reasons in table 5)	61
Full texts screened in duplicate and included	30 (31.5%)

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