Behavior and Social Issues
https://doi.org/10.1007/s42822-021-00058-y

ORIGINAL PAPER

Rebooting Behavioral Science to Reduce Greenhouse Gas Emissions

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Accepted: 9 April 2021/Published online: 06 July 2021

Abstract

There is no question that climate change threatens the very existence of the human species. Indeed, there is mounting evidence that the sixth mass extinction event is well and truly underway. Mitigating the threats imposed by a warming climate requires a dynamic and coordinated approach, including a strong international coalition embodied by the Paris Agreement, significant investment in technological innovations to redesign the way resource-intensive commodities are produced, and a renewed emphasis on shifting climate-relevant behavior toward more sustainable alternatives. The latter has been largely neglected by the international community and funding agencies. This article serves to identify the international context in which efforts to reduce emissions using behavioral science are embedded. We highlight some of the work of behavioral scientists to enhance pro-environmental behavior that will prove vital to large-scale efforts to reduce emissions. We propose a model for designing experimental evaluations of multisector community interventions to reduce emissions on large scales. Finally, we issue a call to action for behavioral scientists and community organizers to collaborate in a new age of behavioral science research to curb the climate crisis.

Keywords Climate change · Community intervention · Greenhouse gas emissions

The imminent and existential threats posed by a warming climate have been well documented (see Grant, 2011, and Thompson, 2010, for reviews). Achieving net-zero emissions as soon as possible is vital to mitigating these threats. But anthropogenic emissions continue to rise (Jackson et al., 2018), and climate-induced human migrations (termed "climigrations") are in full flux across the globe (Palinkas, 2020). The harsh impacts of climate change on human well-being are no longer in the future. They have arrived in full force.

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Climate change is fundamentally a problem of human behavior. It is, after all, our behavior that produces emissions. Solving this problem, therefore, requires consideration of the factors that influence climate-relevant habits. To that end, a large body of behavioral science research developed over the last 50 years has provided the building blocks for effective intervention. The implications of this corpus of knowledge, we believe, have not been fully realized.

In service of approaching net-zero emissions, this article has several goals. The first is to identify the international context in which efforts to reduce emissions using behavioral science are embedded—this is accomplished by reviewing some of the work that has been done by the international community. The second goal is to highlight some of the work of behavioral scientists with small samples of individuals to reduce emissions—this work will prove vital to large-scale efforts to reduce emissions. The third goal is to propose a model for conducting experimental evaluations of community interventions to reduce emissions—ours is not a novel approach, however, and to our knowledge, it has never been applied to reducing emissions. Finally, this article serves as a call to action for behavioral scientists and community organizers to collaborate in a new age of behavioral science research to reduce emissions on large scales.

Pillars of the International Approach to Reduce Emissions

Beginning in 1988 with the establishment of the Intergovernmental Panel on Climate Change (IPCC), governments worldwide have attempted to mobilize their nations to reduce emissions. But progress has been slow. In 2015, the Paris Agreement brought most of the world's countries into an agreement to limit warming to 2 °C (1.5 °C, if possible) this century. However, a 2018 special report from the IPCC showed that emissions had shown no signs of abatement. Warming will likely reach 1.5 °C between 2030 and 2052. Left unabated, warming will far exceed 2 °C by the end of the century (IPCC, 2018).

More needs to be done, and quickly, to solve this puzzle. Although the international response has been expansive, we have selected two mainstays of the international approach for consideration because of their implications for future efforts to reduce greenhouse gas (GHG) emissions using behavioral science. Specifically, an overreliance on carbon taxes[1] neglects a large arsenal of vetted interventions developed by behavioral scientists, and near-exclusive investment in technological innovations ignores the need for funding of behavioral science research to shift consumer behavior on large scales. In both cases, a stronger emphasis on human behavior will be essential.

Regulatory efforts to reduce the consumption of resource-intensive commodities often take the form of carbon taxes on fossil fuels. Carbon taxes are appealing because they can be conveniently applied on large scales and, importantly, because of their capacity to motivate consumers to reduce consumption. In some cases, moderate

[1] Carbon taxes refer to fines levied on the carbon content of goods and services, primarily in the transport and energy sectors. In application, they entail increasing the price of carbon-heavy commodities such as electricity and gasoline. For a more thorough treatment of carbon taxes and other similar policy mechanisms, interested readers should refer to Sumner et al. (2009) and Goulder and Schein (2013).

reductions in the consumption of fossil fuels have been observed following the implementation of carbon taxes (e.g., Murray & Rivers, 2015). But in other cases, carbon taxes have led to widespread upheaval when consumers cannot bear the financial burden that carbon taxes impose (Jetten et al., 2020).

The use of taxes to modify the consumption of resource-intensive commodities makes sense from a political and behavioral-economic perspective. But more research is needed to enhance the acceptability and effectiveness of such tactics. Moreover, the wheels of government turn slowly, and a long tradition of behavioral science research has developed an arsenal of additional strategies that are ripe for immediate application on large scales. (More on this in what follows.)

A second mechanism employed by the international community to reduce emissions involves investment in technological innovation that aims to modify the way resource-intensive commodities are produced. For example, the development of renewable energy sources has been lauded as a clear path to reduced emissions. Innovations of this sort have garnered substantial support from national funding sources. A 2018 report from the U.S. Government Accountability Office revealed that between the years 2010 and 2017, U.S. federal funding to fight climate change increased by $4,400,000,000. Of that, 80% was funneled to technological development. Investment in renewable energy sources and other innovations to redesign the production or consumption of resource-intensive commodities is not without merit. But it is slow to develop, and it is becoming increasingly clear that technological innovations are not a silver bullet to end the climate crisis anytime soon (Harrabin, 2020).

Instead, experts are turning their attention to more comprehensive approaches that include support for regulatory and technological solutions while shining a light on the behavior of individuals and their communities as pathways to reduce emissions (Biglan et al., 2020; Faber et al., 2012; Hawken, 2017). This renewed emphasis on human behavior and the design of effective interventions to reduce emissions on large scales will be the focus of the rest of this article.

Influencing Behavior Relevant to GHG Emissions

On a fundamental level, all anthropogenic emissions stem from the production, transportation, and consumption of commodities. Take animal-based protein as a case in point. The agriculture, food, and other land-use sectors, as a whole, accounted for roughly a quarter of global emissions in 2010 (see Figure 1–3 in IPCC, 2014, WGIII), and the animal-agriculture sector, specifically, accounts for more GHG emissions than the entire transportation sector (Steinfeld et al., 2006). Emissions from this sector stem from the deforestation of the Amazon rainforest to graze animals and grow food to feed them. In the United States, emissions from concentrated animal-feeding operations are a significant concern (National Research Council, 2003). The slaughter, processing, and transportation of animal-based protein add more emissions to the total. Demand (consumption of a commodity at a given price; Hursh, 1980) is driven by the general population's purchasing power (the animal-agriculture industry is worth over $100,000,000,000 annually; U.S. Department of Agriculture, 2019). To be certain, and irrespective of the commodity (e.g., gasoline, electricty, meat, plastic goods), human behavior drives emissions at each point in the supply chain.

The link between human behavior and emissions has been clear from the start. Beginning in the 1970s (as word broke of the impending climate crisis), behavioral scientists began applying principles of learning to pro-environmental behavior. This body of research shows that several forms of intervention may be useful. For example, antecedent information, prompting, goal setting, feedback, incentives, and fines (or some combination of these) may reduce electricity consumption (e.g., Hayes & Cone, 1981), gasoline consumption (e.g., Foxx & Hake, 1977), water consumption (e.g., Aitken et al., 1994), meat consumption (e.g., Brunner et al., 2018), and trash production (e.g., Austin et al., 1993). And a recent paper by Schneider and Sanguinetti (2021) highlighted that other behavior-analytic interventions (that have heretofore been underutilized) carry significant promise. The extant body of literature (see Abrahamse et al., 2005; Gelino et al., 2021; Maki et al., 2016; Nisa et al., 2019; Osbaldiston & Schott, 2012; and Wynes et al., 2018, for reviews) is the foundation of knowledge for producing large-scale behavior change to reduce emissions.

However, insufficient attention has been paid to scaling these interventions by embedding them in experimental evaluations of community interventions (Biglan et al., 2020). And no effort has been made to evaluate interventions for getting climate-friendly policies adopted in entire communities or large polities. Conducting large-scale community interventions to reduce emissions and getting climate-friendly policies adopted represent the most immediate path to reduced emissions on large scales and mark future directions for behavioral scientists working in these areas.

This is not to say that comprehensive community-based initiatives (CBIs) to reduce emissions are not taking place; they are (e.g., Castán Broto & Bulkeley, 2013; Landholm et al., 2018; McNamara & Buggy, 2016; Penha-Lopes & Henfrey, 2019). At their core, these CBIs demonstrate the presence of an establishing operation to reduce emissions in large community samples. Although many of these initiatives show promise, their technological precision is insufficient, and experimental evaluations of these strategies are absent. As a result, they are nearly impossible to replicate, and the differential effectiveness of one approach over another remains unknown. The cumulative and self-correcting characteristics of normal scientific practice are lacking.

Interestingly, Paul Stern (an eminent researcher in the area of community initiatives) wrote, "Experimental methods indeed have the values you identify, but are also very hard to organize at the community level" (personal communication, April 21, 2020). However, one need look no further than the *Journal of Organizational Behavior Management*'s most recent issue for exemplars of experimental evaluations of group behavior.

Organizations and businesses are themselves microcommunities in which practitioners and consultants have successfully modified the context in which organizational problems occur. Moving from the organizational level to the cultural level requires no remarkable changes in processes and procedures—only a larger field of view. To that end, methods employed by organizational behavior management (OBM) specialists are incredibly relevant. What follows stems from those practices and is prescriptive. It serves as a call to action for behavioral scientists and community organizers to join forces and begin the process of experimentally evaluating community interventions to reduce emissions.

The Design of Community Interventions

If one assumes that GHG emissions are fundamentally driven by human behavior, it follows that communities of people are the most appropriate subjects for large-scale interventions to reduce emissions. By "communities of people," we mean groups who live and work in geographic proximity (e.g., neighborhoods, towns, or cities). We exclude from this definition communities of people who share geographic space more expansive than a city (e.g., all Americans); groups who share similar values, interests, or goals, scattered across geographic locations (e.g., behavioral scientists); and groups linked by standard policies (e.g., the Americans With Disabilities Act). Presumably, different sorts of tactics are needed to effectively target these communities as subjects.

Community interventions for target groups (as here defined) require consideration of two primary areas. The first area has to do with intervention components and their selection and scope, and the second pertains to measurement and experimental evaluation. Each of these areas will be addressed separately.

Community Intervention Elements

There is no shortage of vetted interventions to reduce emissions with small samples of individuals (some have been mentioned previously). The first question to be asked is, which components should be employed in a given community? Traditionally, behavior-analytic interventions have been informed by assessment procedures designed to identify the variables that control a given behavior (Iwata et al., 1994). Following identification of the controlling variables, intervention agents modify the contingencies to favor an appropriate alternative behavior. This functional approach to intervention development has proven immensely powerful. It has even been written into federal law (Losinski et al., 2014). A parallel process could involve ascertaining the particular values that individual subjects bring to bear in a specific context and then using that information to inform the intervention by tailoring components to those values.

For example, Bonner and DeLeon (2021) developed the Environmental Awareness and Responsibility Treatment Hierarchy (EARTH) to assess each subject's relational network relevant to climate change. After the authors identified the relative strength of the values that individuals hold concerning climate change, intervention components were tailored to those relational nodes. Preliminary data suggest that the EARTH scores predicted the effectiveness of interventions to reduce gasoline consumption for some subjects. In the context of community interventions, the EARTH scale could be applied through a smartphone application (e.g., Dallery et al., 2021), and intervention tactics could be tailored to each individual or community of individuals who share similar values.

Examples such as this are nonexistent in the published record, and more work is needed to develop them and understand their predictive utility. Future research that pinpoints and subsequently alters climate-relevant values and beliefs thereby producing cascading effects throughout an entire relational network stands to significantly improve the state of knowledge in this area. In the meantime, another sort of assessment process prevails in the area of community research.

Over the last 40 years, Stephen Fawcett and his colleagues at the University of Kansas have developed a broad infrastructure for conducting community-level

research. This includes methods for engaging community members in the process of identifying and monitoring community-wide targets (Collie-Akers et al., 2013; Fawcett et al., 1980; Fawcett et al., 2003) and, importantly, methods for empowering community members to play a central role in the implementation and evaluation of community-wide initiatives (Fawcett et al., 1995; Fawcett et al., 1996; Fawcett et al., 2013). Additionally, the importance of community involvement in developing the capacity to reduce emissions has begun to emerge in other areas of inquiry using a similar participatory approach to that pioneered by Fawcett (e.g., Mapfumo et al., 2013). Moreover, Fawcett and colleagues have described methods for cultivating multisectoral participation in community interventions (Fawcett et al., 2010; Roussos & Fawcett, 2000), which, as described in what follows, is a vital element of community interventions. Although the work of Fawcett and colleagues over the last 4 decades has been conducted in a disparate field of work (mostly in the area of public health), their work provides a foundation on which to inform prospective interventions to reduce emissions on large scales.

Given that various strategies could be useful to a community, it is easy to predict that change efforts are most likely to be successful when developed emergently by those who will be affected by them (i.e., by using a participatory approach). Therefore, the intervention agents' and administrators' goals and mindsets must shift accordingly to match those of the communities they intend to serve. And it should be assumed that the specific things that might be tried in a community should be developed and implemented only with the full participation, and indeed control, of leaders of the community who represent the voices of their constituents.

Such a participatory approach may be carried out according to several phases. First, influential people in each sector should be identified and then rank ordered in terms of the likelihood that they would be supportive of a community-wide effort to reduce emissions. A protocol to persuasively discuss the community-wide effort and enlist the support of community leaders in each sector should be developed and implemented. Enlisting the most influential people or organizations in each sector may lead to widespread support. Second, organizers should cultivate growing coalitions of supporting members within and across relevant sectors of the community. Doing so will facilitate the development of, and support for, sector-wide tactics to reduce emissions. Third, action plans for each sector to implement and test the strategies should be articulated and disseminated to all participating members.

We submit that any attempt to reduce emissions on large scales will fail to achieve its objectives if it does not include an increasing number of relevant sectors of the community that controls emissions. For example, Hayes and Cone (1981), and others, showed that providing households with feedback on their electricity consumption promoted a reduction in the kilowatt-hours consumed. When utility providers scaled these interventions up and applied them throughout entire states with hundreds of thousands of households, reductions in kilowatt-hours were observed (e.g., Ayres et al., 2012). In the years since these empirical demonstrations, utility providers across the country have rolled out similar programs, yet emissions continue to rise. That is because households comprise just one sector of a given community, and emissions on a community scale are controlled by many relevant sectors, not just one. Therefore, community interventions aiming to reduce emissions should stratify intervention development and application across as many relevant sectors of a community as possible.

Each sector is defined in terms of the context that binds community members together. For example, households are bound together by a context that all people who inhabit them have in common—they all live in houses or apartments. Community sectors that could be included in a community intervention to reduce emissions include business and retail organizations, criminal justice and law enforcement organizations, educational institutions, faith-based institutions, foundations, health care institutions, households, local media outlets, municipal governments, neighborhoods, and non-profits. (This list is by no means exhaustive.) Once the relevant sectors are appropriately mobilized, a multisector approach to community interventions to reduce emissions comes with the added benefit of promoting synergies across sectors.

Community members often participate in multiple sectors. Reaching people through all the sectors they participate in stands to compound the impacts of the overall approach. For example, a business owner who is also a homeowner and parent of two school-aged children participates in several community sectors, including (but not limited to) the business sector, the household sector, and the education sector. They may also participate in the faith-based sector, a civic organization, and a sporting or recreation sector. A community intervention that targets each sector will reach this person on several fronts, and the community intervention approach stands to compound and synergize reductions across each sector.

Altogether, an intervention that is concurrently and systematically developed by, and applied throughout, each relevant sector of a given community stands to produce significant GHG emissions reductions. However, this leads to another serious question: How should such an intervention be evaluated—that is, what are the relevant design elements and metrics of impact? No scientific tradition can progress in the absence of such evaluations, but as Paul Stern's comments previously indicated, doing so on a community scale is challenging.

Experimental Evaluation of Community Interventions

Traditionally, community trials of school-based or public-health initiatives have been evaluated in the context of randomized-control trials (RCTs; Murray, 1998). According to group-design logic, subjects (in this case, communities of people) are randomly assigned to experience either the experimental manipulation or no intervention. If desirable changes are observed in the experimental group, while the no-intervention group demonstrates no meaningful changes, the intervention is assumed to provide the causal mechanism. However, in the context of community interventions to reduce GHG emissions, RCTs are inefficient and resource intensive. As Biglan, Ary, and Wagenaar (2000) pointed out, the primary limitations of RCTs for community-level research are that (a) they are very costly owing to the number of communities needed to demonstrate a causal effect, (b) they are a poor vehicle for identifying functional relationships in one community but not others, and (c) the requirement that all experimental communities receive the same intervention does not permit experimenters to refine the intervention tactics until the next randomized trial. A more cost-effective and flexible alternative is found using interrupted time-series designs (Kazdin, 2011).

In an interrupted time-series design (also referred to as single-case designs), repeated measurements of the dependent variables are obtained during a no-intervention baseline condition. Then, the intervention is introduced while repeated measurement of the

dependent variables continues. To demonstrate functional control of the effects attributable to the intervention (as opposed to some other factor), a return to the no-intervention condition may be arranged (as in a reversal design; e.g., Fritz et al., 2017), or the staggered application of the intervention may be arranged for another community or community sector (as in a multiple-baseline design; e.g., Clayton & Nesnidol, 2017). The latter is the most flexible because it permits refinement of the independent variable across staggered applications.

Two important features of multiple-baseline design logic should be emphasized. First, the independent variables should be applied in a staggered fashion. Experimental control is demonstrated when changes in the dependent variable are observed when, and only when, the independent variable is introduced. Next, the independent variable must be the same across all staggered applications. If the independent variable is modified across applications, demonstrations of functional control cannot be obtained. However, during the development of effective community interventions, staggered sequences of A-B designs may be the most efficient tactic. Following the refinement of the intervention and demonstrated effectiveness across A-B sequences, the final arrangement can be applied in the context of a more stereotypical multiple-baseline design to demonstrate functional control over the dependent variables—which leads to another set of serious questions. What are the metrics of impact, and how should they be measured?

In traditional behavior-analytic interventions to reduce emissions, the primary dependent variables are objective measurements of proxies of the behavior of interest for each subject (e.g., gallons of fuel, kilowatt-hours, the weight of trash). However, in the context of community interventions, the relevant metrics are objective measurements of the cumulative products of proxies of the behavior of interest in each community (e.g., community gasoline consumption, community electricity use, or waste produced by the entire community). This is akin to the behavior-based safety movement in OBM. As opposed to measuring each employee's safety behaviors, experimenters use a cumulative proxy measurement of the safety behavior of the entire organization as the dependent variable (e.g., recordable injuries; Gravina et al., 2019). Similarly, a community intervention to reduce GHG emissions should track the cumulative emissions of each sector (indeed, of the entire community).

Doing so requires no particular changes to measurement procedures that are characteristic of behavior-analytic literature in this area (see Gelino et al., 2021, for exemplars of measurement tactics). What is needed is for each organization involved in the community intervention to track and report their emissions so that emissions may be aggregated from individual units up to the total-sector level. (Access to the data collected by utility providers, organizations, and other sectors of the community relevant to GHG emissions is also a given.) Creating feedback channels to provide each sector with information on its emissions may also be useful (i.e., performance feedback). If the relevant data are not being collected, then a first step requires collaborative efforts to initiate suitable measurement practices. Make no mistake, we understand that a proposal to conduct multisector, community-wide interventions to reduce emissions is an ambitious goal, but it is not without precedent. Several empirical demonstrations of community interventions serve as models for how this could be done.

Exemplars of Community Interventions

One example of a multisector community intervention was conducted by Biglan, Ary, Smolkowski, et al. (2000) to prevent adolescent tobacco use. Eight matched pairs of Oregon communities were selected for inclusion in the study. Half were randomly assigned to receive a multisector intervention, whereas the other half served as control communities. The experimental evaluation was conducted in the context of a mixed between-groups design (Protopopova & Wynne, 2015). The experimental intervention mobilized several community sectors, and each sector received a different form of intervention—at least five community sectors were mobilized.

The first sector mobilized was the educational sector wherein both experimental and control communities received a school-based tobacco prevention program. The goal of this component was to educate youth about the harmful impacts of tobacco use. The program consisted of several weeks of guided instruction. The instructional package was related to health facts about smoking, refusal-skills training and practice, video-assisted instruction, public commitment activities, and peer-led discussions. This was the only sector in which both experimental and control communities received the same form of intervention. For all other sectors, only the experimental communities experienced the interventions.

The second sector that was mobilized was local media outlets to publicize the smoking prevention program. Experimenters ran ads on local television, local newspapers, and billboards in and around the experimental communities. Presentations were given at civic meetings, and periodic mailings were sent out to households of each community. These elements were included to influence adults in the local communities to support youth tobacco prevention.

The third sector that was mobilized was the after-school community care sector. Experimenters provided youth coordinators with assistance in developing youth anti-tobacco activities, thereby engaging at-risk youth and persuading them to abstain from smoking. A menu of activities was created emergently with youth coordinators to foster antitobacco values. These activities included creative engagement strategies such as T-shirt design and sidewalk-art drives, policy review and revision sessions for older students, tobacco paraphernalia trade-in drives, antitobacco swag giveaways, antitobacco carnival games at local fairs, and antitobacco parade floats.

The fourth sector mobilized was the household sector. Intervention components for this sector consisted of activities designed to facilitate antitobacco parent–child interactions at home. Students were given pamphlets and worksheets at school to take home, where they interviewed their parents about tobacco use. These materials were designed to prompt noncoercive discussions about abstaining from tobacco use.

Finally, to reduce access to tobacco products for youth, the tobacco-retail sector was mobilized. Merchant education, combined with feedback and incentives for clerks who refused tobacco sales to minors, was arranged. Public acknowledgment for clerks who refused to sell tobacco to minors was included as an added incentive. This form of intervention was developed and evaluated in advance by testing its impact on the proportion of stores that were willing to sell to youth in a series of multiple-baseline designs across eight communities.

The dependent variables were measured periodically by surveying students about their tobacco use across 3 years and by examining tobacco sales to minors during that

period. Altogether, results showed that the community intervention produced significant (or approached significant) effects on the prevalence of weekly cigarette, alcohol, and marijuana use at several time points throughout the study. Undoubtedly, the multisector approach contributed to these outcomes. Moreover, the staggered application of the independent variable across communities in the context of a multiple-baseline design permitted the identification of a functional relationship between rewards for clerks refusing tobacco sales to minors and the rate of sales to underage buyers.

Several other community interventions also serve as positive exemplars of this approach. The Community Intervention Trial for Smoking Cessation (Glynn et al., 1995) experimentally evaluated a comprehensive community intervention to reduce adult smoking. The Minnesota Heart Health Program (Luepker et al., 1994) and the Stanford Five-City Project (Farquhar et al., 1990) both employed a multisector approach to reducing cardiovascular disease. Probably the best contemporary example of a community intervention is the Communities That Care (CTC) program. The CTC program is still operating in many U.S. communities and has effectively used multisector preventative interventions to reduce youth delinquency, including drug and alcohol use (Hawkins et al., 2002). The CTC program has recently been shown to produce economic benefits that exceed its implementation costs (Kuklinski et al., 2015).

However, to our knowledge, a multisector community intervention to reduce GHG emissions has not been conducted. This represents a serious gap between what we know about behavioral interventions to reduce emissions and their widespread dissemination. A likely reason for this gap has to do with funding. The projects outlined previously required considerable investment to carry out, and so far, funding for behaviorally-based interventions to reduce emissions has been sparse. This brings us to our final area of discussion—funding.

Funding for Behavioral Science on Reducing Emissions

Conducting experimental evaluations of community interventions to reduce emissions is impossible without appropriate funding. Nothing short of a fully coordinated effort by the larger behavioral science community will be needed to induce funding agencies to appropriate the funding that is needed to reduce GHG emissions. The Coalition of Behavioral Science Organizations[2] formed the Climate Change Task Force to ascertain the state of behavioral science research related to climate change. The task force analyzed the extent of behavioral science research involving experimental evaluations of strategies for reducing emissions in communities. We could find none (Biglan et al., 2020). In a forthcoming article, we will report on the dismal state of federal funding for behavioral science research on reducing emissions. We feel that the behavioral science community needs to become more assertive in advocating for far more funding of

[2] The Coalition of Behavioral Science Organizations currently consists of the Association for Behavior Analysis International, the Association for Contextual Behavioral Science, the Association for Positive Behavior Support, the Evolution Institute, the National Prevention Science Coalition, and the Society of Behavioral Medicine.

behavioral science research on the development and experimental evaluation of strategies for reducing emissions in entire populations.

Conclusion

There is no question that climate change threatens the very existence of our species and every other species on earth. Indeed, there is mounting evidence that the sixth mass extinction event is well and truly underway (Barnosky et al., 2011; Ceballos et al., 2015; Ceballos et al., 2020; Torres-Romero et al., 2020). Mitigating the threats imposed by a warming climate necessarily entails modifying the human behavior of which emissions are a function. However, the international approach has mostly abstained from allocating resources to and calling for evaluations of behaviorally-based interventions to reduce emissions on large scales. This comes in light of 50 years of behavioral science research aiming to modify human behavior in the name of emissions reductions. The building blocks for large-scale reductions in emissions are available. The time has come to begin scaling these methods and embedding them in experimental evaluations of community interventions to reduce emissions.

Availability of data and material Not applicable.

Code availability Not applicable.

Declaration

Conflicts of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval Not applicable.

Consent to participate Not applicable.

Consent for publication Not applicable.

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