Understanding How Sustainability Initiatives Fail: A Framework to Aid Design of Effective Interventions

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Abstract

Background: Many sustainability initiatives are successful and produce results that benefit the environment. However, others miss the mark and fail to produce the desired outcome. Past research has typically focused on understanding *why* initiatives fail, without first considering differences in *how* they fail.

Focus of the Article: This manuscript is related to Research and Evaluation—specifically, the social marketing concept it focuses on is evaluating the outcome of sustainability initiatives.

Research Question: What are the different ways in which sustainability initiatives can fail?

Program Design/Approach: A multi-day workshop of interdisciplinary behavioral sustainability scholars led to the identification of five systematic differences in how sustainability initiatives can fail, suggesting that failure can take on not only different levels of severity, but different forms altogether. Within this framework, we provide examples of each type of failure.

Importance to the Social Marketing Field: We argue that diagnosing *how* instead of just *why* an initiative fails offers important insights that can reduce the likelihood of future failures—insights that may be missed by a narrow focus on the *why* behind any given failure.

Recommendations for Research or Practice: The identification of the different ways in which sustainability initiatives fail can lead to improvements in the design and implementation of behavioral

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interventions, facilitating successful sustainability outcomes and preventing unintended outcomes. Specific recommendations are discussed for each type of failure.

Limitations: The examples in our framework are not exhaustive, but are instead intended to be illustrative exemplars of each type of failure. Moreover, as our focus is on *how* sustainability initiatives fail, we do not attempt to diagnose *why* particular initiatives fail.

As a group of behavioral scholars interested in sustainability, we strongly support pro-environmental initiatives to change behavior. Many such initiatives and interventions have been successful, producing results that benefit the environment (e.g., Goldstein et al., 2008; Holland et al., 2006). But studies with unsuccessful behavioral interventions are frequently not published (Rosenthal, 1979; Simonsohn et al., 2014). Although the desire to celebrate (and publish) successes is understandable, the stark reality is that many sustainability interventions do not achieve their desired outcomes or simply fail altogether, often quite fantastically (e.g., Caitlin & Wang, 2013; Winther & Ericson, 2013).

When a sustainability initiative is unsuccessful, attention is typically focused on *why* it failed. Much less attention is usually paid to *how*—in what specific way(s)—an intervention failed. In his novel *Anna Karenina*, Leo Tolstoy noted that, "Happy families are all alike," but "every unhappy family is unhappy in its own way." This principle may apply to the *how* of sustainability interventions. Successful interventions are all alike—they all produce a desired effect on a targeted behavior. But unsuccessful interventions differ in how they fail. Some produce partial success, some have no net effect, and others backfire, resulting in greater negative impact. Certain types of failed interventions may even be difficult to detect due to flaws in the timing and/or scope of measurement.

The impetus for this article was a multidisciplinary, multi-day workshop on sustainable choice and behavior that led to the identification of five systematic ways in which sustainability interventions can fail. The purpose of our typology is not to simply highlight examples of failure but rather to learn from past failures in hopes of benefiting future sustainability and social marketing efforts. Much as medical texts provide physicians with a set of descriptive symptoms with which they can diagnose a particular disease, our goal is to highlight symptoms of failed social marketing sustainability efforts that can assist in properly diagnosing the underlying causes. We argue that an accurate understanding of *how* an intervention failed precedes a proper interpretation of *why* it failed. Incorrectly identifying the type of failure may lead to misdiagnosis of the underlying cause and, as a result, counterproductive remedies. At the outset of an intervention, understanding common types of possible failures can also promote greater clarity in goals, benchmarks, and metrics, even if constrained resources make it difficult to continuously monitor and revise the intervention mix. In short, by understanding both the *how* and the *why* of failure, researchers can be more effective at correcting failures and creating future initiatives designed to prevent unintended outcomes.

How Sustainability Initiatives Can Fail

The ideal outcome of a sustainability initiative is that it achieves its intended effect. For example, if the goal of a hotel's sustainability campaign is to reduce guests' towel usage by 20% during a calendar year, the initiative would be considered a success if it meets or exceeds that threshold. But there could be a variety of ways in which it may be considered unsuccessful. We consider the net effect on the environment and its resources over the long-term, referring to any program that does not achieve this goal as having failed.
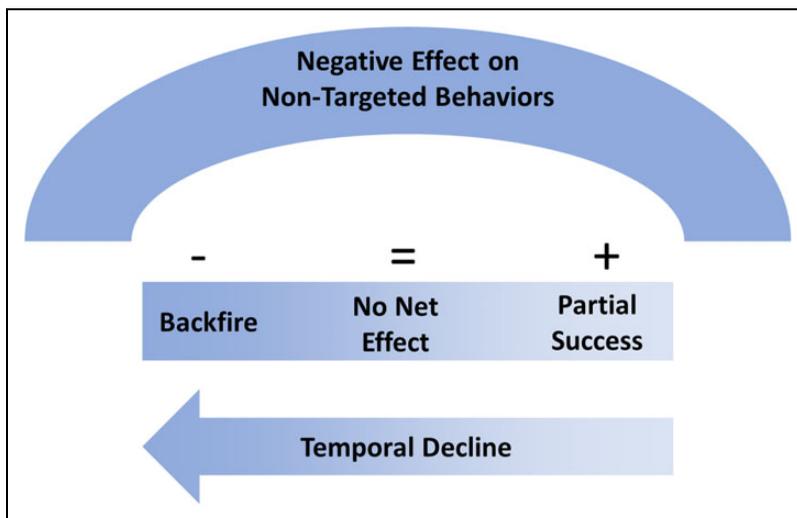
Figure 1. A framework for how sustainability initiatives fail.

We present and explore five distinct ways that behavioral interventions can (and often do) fail. The first three types of failures—Partial Success, No Net Effect, and Backfire—are outcomes that differ only in the degree of failure and the resulting valence of the intervention's environmental impact (positive, neutral, or negative). The next type of failure—Temporal Decline—is an outcome in which the accurate detection of failure depends on measurement timing. The final type of failure—Negative Effect on Non-Targeted Behaviors—is an outcome in which the accurate detection of failure depends on the scope of measurement, in that failure may not be apparent if measurement is limited to only the targeted behavior. This framework is illustrated in Figure 1.

Each of the five possible unintended outcomes in our framework will be described in further detail below. Table 1 highlights examples of each type of failure. Our intent is not to provide a comprehensive list, but rather to illustrate real-world examples of each type of failure. An in-depth case study is also provided for each type of failure.

Partial Success

A behavioral intervention may be deemed unsuccessful if it produces a substantially smaller effect than anticipated. For example, suppose a hotel's sustainability campaign intends to reduce towel usage by 20%, but the actual campaign results only in a 4% reduction. Although this is still a beneficial result, its magnitude is much less than expected and may not justify the cost of the campaign.

Partial Success can occur when an intervention is only minimally effective at changing individual behavior. In such cases, researchers might examine ways to improve the intervention itself. For example, one study intercepted students on their way to the locker room after exercising at the university gym (Dickerson et al., 1992). Students who were asked to make a commitment to conserve water reduced their shower time by one minute compared to a control group. While this effect was directionally and qualitatively consistent with the intention of the intervention, it did not produce a significant decrease in water use. This failure was transformed into success by making one minor adjustment to the intervention: students were first asked to reflect on how they typically wasted water.

Partial Success may also occur when an intervention is effective at an individual-level, but affects only a subset of the target population. Thus, when Partial Success is observed, researchers might explore whether the proportion of people within the target population who responded to the

Table 1. Examples of How Sustainability Initiatives Fail.

Partial Success	
Brown et al., 2013	Though small adjustments to default settings on office thermostats were effective at conserving energy, larger adjustments reverted back to original levels of energy consumption.
Sachdeva et al., 2019	Certain types of appeals (e.g., keep the Earth pure) were effective at impacting environmental action among only a subset of the population.
Dickerson et al., 1992	Students asked to make a commitment to conserve water reduced their shower time by one minute. While this outcome was consistent with the intention of the intervention, the decrease in water usage was so small that no significant effect was detected relative to the control group.

No Net Effect	
Beale & Bonsall, 2007	Marketing materials encouraging public transportation led more women, but fewer men, to travel by bus rather than by car. These divergent reactions from different segments resulted in no overall effect.
Campbell-Arvai et al., 2014	When information about the environmental benefits of reducing meat consumption was added to restaurant menus, it had no effect on consumers' choices.
Kristal & Whillans, 2020	Mailing letters to employees to encourage the use of a carpooling service was unsuccessful in getting employees to reduce single occupancy vehicle transportation. Further, offering a 1-week free bus trial failed to increase bus use.
Schultz et al., 2007	Informing residences about average energy usage of similar-sized homes in the neighborhood led higher-than-average users to conserve energy, but this benefit was cancelled out by increased energy usage among lower-than-average users.

Backfire	
Cialdini, 2003	Anti-theft signage at a Petrified National Forest *increased* theft almost threefold.
Luchs et al., 2010; Newman et al., 2014	Increasing a product's degree of sustainability resulted in decreased quality perceptions and a stronger preference for traditional products.
Wang et al., 2017	When high-priced hotels asked visitors to reduce electricity usage, visitors instead *increased* their electricity usage.

Temporal Decline	
Ferraro & Price, 2013	Informing households how their water consumption compared to their neighbors' initially led to increased water conservation but the effects waned in the months following
Hargreaves et al., 2013	Residents initially paid a lot of attention to real-time energy use displays, but after a year most had stopped paying much attention to them

Negative Effect on Non-Targeted Behavior	
Catlin & Wang, 2013; Sun & Trudel, 2017	When recycling is an option, consumers increased usage to the point of wasting resources.
Homsy & Hart, 2019	A refuse reduction program (pay-as-you-throw, which charged for garbage bags) was successful in substantially reducing the amount of solid waste sent to the landfill, but increased litter throughout the community.
Klöckner et al., 2013	Initiatives to sell more electric vehicles were successful, but increased driving time led to suboptimal emissions reductions, if not a potential net increase in emissions.
Werfel, 2017	A campaign by the Japanese government succeeded at promoting household energy-reduction behaviors in the wake of the Fukushima power plant meltdown, but also undermined residents' support for a tax increase on carbon emissions.

intervention was smaller than expected. For example, Sachdeva et al. (2019) found that purity-based appeals (e.g., "let's keep the Earth pure") impacted environmental action, but only among consumers who felt a strong affiliation to other individuals. In this case, identifying ways to increase the proportion of people who feel social affiliation before introducing the environmental appeal may correct the failure. Collecting additional demographic or psychographic variables in pretesting or during implementation may assist researchers in identifying segments of the population for whom the intervention was successful.

A slightly different form of Partial Success is when the sustainable behaviors encouraged by an intervention are partially offset by non-sustainable behaviors that the intervention also unintentionally promotes. For example, Brown et al. (2013) conducted a workplace field experiment in which default settings on thermostats were altered during the winter heating season. Office temperature was set at a default of 20 degrees Celsius, and lowered by 1 degree each week over the course of a 3-week study period. Although small temperature decreases effectively reduced energy consumption, larger temperature changes instead *increased* energy consumption relative to the baseline. The net result was an overall decrease in energy consumption, but the outcome was a failure in the sense that the effect was smaller than anticipated. This demonstrates how an intervention can nudge people to a point, but loses effectiveness if it tries to nudge people too far.

Case Study 1: Brown et al., 2013 (Partial Success)

Brown et al. (2013) evaluated the effectiveness of lowering energy meter set points in decreasing energy consumption at a workplace office building. They found that lowering the default temperature slightly (by 1 degree) successfully reduced energy consumption, but when the default temperature was lowered 2 degrees Celsius, consumers were more likely to adjust the temperature setting, which did not result in energy savings. The authors conclude that when a default is adjusted to nudge consumers to conserve energy, a small reduction is more likely to be successful because the change might go unnoticed. However, when the change in consumption becomes noticeable, consumers may respond by consuming more than they would have originally.

The authors collected baseline data at a government office building to assess general energy consumption during the winter season. Then, over a 6-week period, they altered energy set points and evaluated energy consumption and office level temperature as reported by the building's heating and cooling ventilation system. The authors administered a randomized control trial with 93 offices and examined how energy use differed as a function of the heating setpoint. In the control condition, the temperature was set at 20 degrees Celsius (68 degrees Fahrenheit) and remained the same across the 6-week treatment period. In Treatment 1, the temperature in Week 1 was set at 20 degrees Celsius but was reduced to 19 degrees Celsius in Week 2, 18 degrees Celsius in Week 3, and 17 degrees Celsius (65 degrees Fahrenheit) in Weeks 4–6. In Treatment 2, the temperature in Week 1 was set to 20 degrees Celsius, but in Week 2 was increased to 21 degrees Celsius. In Week 3 the temperature dropped back down to 20 degrees Celsius, and in Weeks 4–6 the temperature was 19 degrees Celsius. Importantly, relative to control, in the final 3 weeks of the study the temperature was 3 degrees lower in the Treatment 1 arm and only 1 degree lower in the Treatment 2 arm. Employees across all 3 conditions were able to manually adjust their default office temperature throughout the duration of the 6-week study.

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> Relative to control, energy consumption was significantly reduced in Treatment 2 (where the default temperature was only 1 degree lower in the final weeks of the study). However, these effects weren't observed in Treatment 1 because workers manually altered the office temperature in the final weeks of the study when the default temperature reached 17 degrees Celsius.
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> Ultimately this treatment was only partially successful overall because the energy costs of manual overrides of the default temperature in Treatment 1 partially offset the energy savings of a lower default temperature in Treatment 2. The authors conclude that a small decrease in a default can lead to a reduction in energy consumption, however, when the reduction in the default temperature is too large, then occupants respond by actively increasing their temperature settings and over-riding the effects of the default.

Identifying a failed outcome as a Partial Success reinforces the value of designing the evaluation plan to assesses process, efficiency, quality, ethical practice, short-term impact and longer-term outcomes. It may also prompt researchers to pre-test intervention elements with target audience segments.

No Net Effect

A second type of failure occurs when a behavioral intervention to promote sustainable behavior fails to produce any significant net effect. Unlike Partial Success, this type of failure has no positive net effect on the environment whatsoever. For example, a hotel's sustainability campaign may not affect towel usage at all.

A No Net Effect failure can occur when an intervention is simply ineffective at changing behavior. An example of this type of failure was observed by Campbell-Arvai et al. (2014), who tested how providing information on restaurant menus about the environmental benefits of reducing meat consumption would influence customer's choices. They did not detect differences; no effect was observed in levels of meat consumption between groups that received environmental information and those that did not.

A No Net Effect failure can also indicate that countervailing forces are at play. Thus, when No Net Effect is observed, researchers might explore whether the non-sustainable reactions to the intervention amongst one population segment are obscuring the sustainable reactions of another segment. In an example from the transportation literature, Beale and Bonsall (2007) disseminated marketing materials to improve consumer attitudes towards bus service and encourage more consumers to travel by bus rather than by car. Overall, this intervention did not change public bus utilization. However, closer examination revealed the materials successfully encouraged bus use among women and discouraged bus use among men, resulting in No Net Effect. Based on these and other insights from examining the impact on different segments, the researchers were able to correct the failure and improve bus ridership by revising the materials.

A related example of No Net Effect stemming from divergent effects on different customer segments was observed in the energy domain. In hopes of decreasing home energy consumption, residents were informed about the average energy usage of similar-sized homes in the neighborhood (Schultz et al., 2007). For homes that used more energy than average, this information effectively decreased energy usage. But for homes that used less energy than average, the information *increased* energy usage, resulting in no overall energy conservation across all the homes. Acknowledging that specific sub-groups may respond differently to various aspects of an intervention could improve experimental design.

Case Study 2: Beale & Bonsall, 2007 (No Net Effect)

Transportation is the economic sector with the largest contribution to greenhouse gas emissions, largely relying upon petroleum-based fuel (U.S. EPA, 2017). One means to reduce carbon emissions is to encourage people to shift from driving cars to utilizing shared public transportation, such as buses. A group of researchers sought to encourage use of the public bus service in Leeds, England via a messaging campaign (Beale & Bonsall, 2007). In an initial survey conducted in 2001-2002, local citizens provided their perceptions of the bus service and of personal car usage. The researchers then designed marketing materials aimed to encourage public bus use. The materials incorporated both positive information about utilizing the bus service (e.g., "Save money! Leeds and back for as little as £1.30", "A bus every 10 min!") as well as negative information about personal car usage (e.g., "Journey times by bus don't include all those annoying things you have to do when driving... filling up with petrol, finding a parking space...", "The average cost of all day parking in Leeds is £4.60... And that's not counting petrol, insurance, other running costs..."). These marketing materials were then sent to half of the participants, while the other half served as a control group. Six months later participants were contacted and asked about changes in their public bus utilization during the intervening time and their perceived reasons for those changes.

Unfortunately, initial analyses suggested that the marketing materials had no net effect on public bus usage. However, a closer examination of the data suggested that the intervention had different impacts on different customer segments. Specifically, the materials appeared to have a positive influence on women and those who already used the bus service either habitually or occasionally, whereas it had a negative influence on men and those who did not typically use the bus. Thus, the overall null effect of the intervention belied these more subtle moderation effects.

The researchers conducted additional research to understand why their marketing materials were not effective for some citizens. Residents who did not use the bus did not view the information as personally relevant. Building on these insights, the research team designed an alternate set of marketing materials designed to appeal specifically to men and non-bus users. This batch of materials openly acknowledged that car travel was the first choice for many people, but that under certain circumstances the bus could be more convenient. These materials were distributed to citizens in another Leeds suburb, and bus usage was assessed via subsequent interviews. Analyses revealed that the newly tailored materials had a marked, positive influence on the behavior of men, such that those receiving the materials (versus those who did not) were more likely to report using the bus both after 6 weeks and after 6 months.

These results highlight the importance of understanding the nature of a failed intervention. In this case, although there was no net effect, knowing which groups were negatively influenced by the marketing campaign helped the researchers design novel messaging to target specific segments and change their behavior.

Identifying a failed outcome as No Net Effect can help researchers identify means to adjust and target future marketing. It may prompt them to examine whether there were differential effects across different consumer segments. When possible, researchers should pretest interventions among different segments and/or collect information on key moderating factors during the intervention so a No Net Effect failure can be re-examined for positive (and negative) effects among specific segments. This approach may require collecting larger sample sizes of different population segments in order to have sufficient statistical power.

Backfire

A third type of failure is a Backfire effect—one that is opposite the intended effect, harming rather than benefiting the environment. For example, perhaps the hotel's sustainability campaign leads to an increase rather than a decrease in towel usage.

A classic example of Backfire occurred when the Petrified National Forest Park attempted to discourage theft of petrified wood by posting signs informing visitors about the prevalence of theft. To the park's surprise, this anti-theft signage *increased* theft almost threefold rather than discouraging it (Cialdini, 2003). Another example of Backfire was observed when high-priced hotels asked visitors to reduce electricity usage but did not demonstrate their own investment in reducing environmental impact (e.g., by supplying low-cost, plastic toothbrushes vs. costly, bamboo toothbrushes). In response to the request, visitors actually increased their electricity usage (Wang et al., 2017).

While Backfire failures are sometimes characterized by consumers' obstinate refusal to cooperate, they can also occur when interventions unexpectedly increase the attractiveness of non-sustainable behaviors. For example, a retailer recently attempted to encourage the use of reusable bags by printing embarrassing slogans on single-use plastic bags (and also charging a fee of one nickel per bag). Instead of encouraging more customers to use reusable shopping bags, the initiative led to a surge in demand for the single-use bags as a mass of customers who were anxious to collect all the different designs happily purchased them (McMahon, 2019).

Backfire can also be observed in consumers' response to products with environmental attributes. Although the development of green products is intended to reduce (though not eliminate) the environmental impact of consumption, one study showed that introducing them can increase consumer preferences for traditional products that lack environmental attributes (Luchs et al., 2010), particularly when consumers value product strength. Similarly, Newman et al. (2014) found that when consumers perceive a company to have intentionally reduced a product's environmental impact, they are less likely to purchase the product because they perceive such products are lower in quality.

Case Study 3: Wang et al., 2017 (Backfire)

Consumers' perceptions of a conservation program could lead them to take actions that oppose the program's goals. For example, if consumers perceive that a company is unconcerned about the environment, they may be less willing to engage in conservation behavior. Wang et al. (2017) demonstrate that to encourage consumer conservation behavior, firms with a high-price image (e.g., luxury brands or firms that charge high prices) need to demonstrate their commitment to the environment through a financially costly action. Without this shift in perceptions of how "green" the company is, consumers may respond with annoyance and anger to energy conservation requests and perceive such communications to be restrictions on their freedom—particularly when they have paid a high price for a good.

The authors came to these conclusions after evaluating actual energy consumption of 281 Chinese hotel guests, and examined how energy conservation differed as a function of three variables: (1) the cost of the room (some guests stayed in a relatively expensive hotel at $125/ night, while others stayed in a relatively less expensive hotel at $37/ a night), (2) whether the guest received an explicit request from the hotel to conserve energy (for half of participants a sign was posted near the electrical outlets in the room asking participants to conserve energy and reduce thermostat settings), and (3) whether the hotel had demonstrated a costly commitment to

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> sustainability (by providing an environmentally friendly bamboo toothbrush) whereas some hotel guests received a traditional plastic toothbrush (which was not perceived to be sustainable).
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> Consumers conserved more electricity when the hotel provided the guest with a bamboo toothbrush. This is because the bamboo toothbrush enhanced consumer's perceptions that the firm was committed to helping the environment, and consumers behaved according to these perceptions, irrespective of whether they received an explicit request to conserve energy from the hotel or how costly the room was. However, when the hotel provided a traditional plastic toothbrush, consumers did not perceive the hotel to be more environmentally friendly, which resulted in less energy conservation. However, receiving a traditional plastic toothbrush at a high-cost hotel actually resulted in more energy consumption when the hotel made an explicit request to conserve energy. A follow-up experiment demonstrated that consumers perceive they should have more freedom to behave how they wish when they pay a relatively high price for the hotel room. Therefore, customers of the high price hotel became angrier and more annoyed from the request to conserve energy, especially when the firm had not already demonstrated their commitment outright.
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> These findings suggest that the presence of cues from which consumers can infer that the firm is doing their part to help the environment should strengthen a request asking consumers to change their behavior and conserve energy. When requests are absent of such cues, they are likely to invoke reactance by decreasing perceptions of the firm's "greenness" and ultimately reducing consumer motivation and behavior to conserve. Such backfire effects can negate the benefits of pro-environmental behavioral interventions.

Acknowledging the possibility of Backfire can encourage researchers to pretest interventions to identify the necessary factors for the desired behavior to occur. One example, demonstrated by Wang et al. (2017), involved pretesting whether consumers perceive the intervention as genuine or are skeptical of the intervener's intentions. It may be that marketing messages only need a slight modification when Backfire is recognized (e.g., pairing a descriptive norm with a consistent injunctive norm (Schultz et al., 2007) or emphasizing product quality (Luchs et al., 2010; Newman et al., 2014).

Temporal Decline

A fourth type of failure is Temporal Decline. Whereas Partial Success, No Net Effect, and Backfire each describe the effect of an intervention at its initial measurement, Temporal Decline describes a response to a sustainability initiative that, regardless of initial success, becomes less effective over time and ultimately fails to meet the desired long-term objective. For example, perhaps the hotel's campaign produces a short-term reduction in towel usage, but that initial positive impact is not maintained over time or is followed by a longer-term increase in towel usage that offsets any net benefits in sustainability (e.g., a long-term rebound or boomerang effect).

One type of Temporal Decline occurs when the positive effects of an intervention do not persist after the initiative ends. For example, Ferraro and Price (2013) provided U.S. households with a one-time report of how their water consumption compared to that of neighbors. Although households initially responded by conserving water, the effect did not persist in the 3 months following receipt of the report. In such cases, sending reminders via email, implementing cell phone apps with notifications, or encouraging steps to automate conservation (e.g., resetting sprinkler timers) may aid in habit formation that will prevent Temporal Decline.

Another type of Temporal Decline occurs when an intervention becomes less impactful upon repeat exposure (De Young, 1993). For example, an intervention that provided United Kingdom residents with real-time home electricity monitors was initially successful in encouraging residents to track their energy use (Hargreaves et al., 2013). However, a follow-up study 1 year later found that as the novelty of the electricity monitors wore off, many residents stopped paying attention to them. In this case, perhaps adjustments could be made to restore the novelty of the intervention (e.g., changing the content, format, and/or delivery mode of the messaging or other elements of the intervention mix such as incentives).

Case Study 4: Ferraro & Price, 2013 (Temporal Decline)

Conserving water helps communities cope with water shortages that might arise due to drought. Ferraro and Price (2013) partnered with the water system agency in Cobb County, Georgia (population 680,000) to encourage water conservation among its 150,000 residential water customers. In 1998, periodic droughts began reducing the county's surface water supply.

Starting in 2006, the Cobb County Water System began initiatives to encourage conservation. The researchers designed three treatments aimed at lowering water use. The first treatment involved technical advice. In this treatment, residents were provided with a tip sheet featuring information about how to reduce their water consumption, such as fixing leaks, watering lawns less frequently, and running only full laundry loads. The second treatment included this tip sheet along with a personal letter from the county's Water Conservation Coordinator outlining the reasons why residents should reduce their water consumption, such as protecting wildlife and coping with low rainfall. The final treatment included the tip sheet and letter alongside information about how the resident's prior water consumption compared with their neighbors (e.g., "You consumed more water than 72% of your Cobb County neighbors"). Materials for each of these treatments were mailed to households on the same day in May 2007 in official Cobb County Water System envelopes, and a follow-up tip sheet was also sent 4 weeks later. Approximately 11,700 households received each one of the three treatments, with 71,779 households serving as controls. The county then measured water usage at households in the county over the coming months, focusing on water usage during the summer.

Analyses of water usage revealed that the treatments reduced water consumption during the summer months. Providing technical advice via the tip sheet resulted in a small reduction of approximately 1% in household water usage, while providing information about how one's consumption compared with other households generated a marked reduction in water consumption of 4.8%. The effect of this treatment was especially strong among households that typically have higher water usage (5.28%) compared to households that typically have lower water usage (2.72%).

However, these reductions in water consumption waned over the summer months. While the treatment had a strong effect on water consumption in the month following the treatment (reducing usage by 5.62% in June), it showed a weaker effect on consumption at the end of the summer (reducing usage by only 3.63% in September). Even with this temporal decline, the intervention still reduced overall water consumption in Cobb County. Nevertheless, understanding how rapidly the effect of the treatment decays over time is critical to determining the extent to which a treatment would be successful in encouraging long-term water reduction. Depending on the rate of temporal decline, interventions that initially appear to be successful could ultimately be considered failures without follow-up intervention.

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> Classifying Temporal Decline as a distinct form of failure can provide useful insights for how to improve future interventions. It requires researchers to consider the timeframe of measurements and what might be done to prevent Temporal Decline. For example, sending out additional reminder materials 3 months after the intervention might help refresh the effect and sustain the observed reductions in water consumption.

Neglecting the temporal component of measurement can lead researchers to potentially misdiagnose an outcome. Researchers should plan their intervention evaluation to have repeated measurements spaced over time to determine initial and long-term success. Moreover, recognizing Temporal Decline may suggest that additional and/or varied messages or reminders are needed to retain the success of an intervention. Adjustments to other elements of the social marketing intervention mix, such as improved products, services, policies, incentives and socially approved sanctions, may also be useful to counter Temporal Decline.

Negative Effect on Non-Targeted Behaviors

A fifth type of failure occurs when a behavioral intervention produces a Negative Effect on Non-Targeted Behaviors. Unlike the first four types of failures, this type of failure is entirely independent of the effect on the targeted behavior. For example, suppose the hotel's campaign successfully reduces towel usage by 20% but has the unintentional side effect of increasing electricity usage as guests turn up the heat to dry the towels they are re-using. In this sense, the campaign was successful at benefiting the environment through the targeted behavior, but failed because it directly caused another form of behavior that was harmful to the environment.

For example, a refuse reduction program (pay-as-you-throw, which charged for garbage bags) was successful in substantially reducing the amount of solid waste sent to the landfill, but increased litter throughout the community (Homsy & Hart, 2019). In another example, a campaign by the Japanese government succeeded at promoting household energy-reduction behaviors in the wake of the Fukushima power plant meltdown, but also undermined residents' support for a tax increase on carbon emissions (Werfel, 2017).

Licensing effects often describe this type of failure (Maki et al., 2019). For example, a campaign may successfully persuade some individuals to be more sustainable. However, those individuals may then feel that because they have already done something good for the environment in one context, they are entitled to engage in non-sustainable behaviors in other contexts. Thus, the campaign may have a positive effect on the targeted sustainable behavior, but a negative effect on non-targeted sustainable behaviors.

Another example of a Negative Effect on Non-Targeted Behaviors is overconsumption. For example, providing subsidies to buy electric vehicles may be successful at encouraging consumers to purchase environmentally-friendly vehicles. However, evidence from Klöckner et al. (2013) suggests that households often buy alternative fuel vehicles as a second car rather than as a substitute for their conventional one. They also tend to drive their electric vehicles more often for everyday trips than they had previously driven their conventional vehicles. The result is that although the targeted behavior of promoting electric car sales was successful, the subsidies can have a negative effect on carbon emissions.

Similarly, Catlin and Wang (2013) sought to encourage recycling behavior by providing a recycle bin in the restroom. Although recycling behavior did in fact increase, so did total resource usage; people used more paper towels when washing their hands in the restroom when there was an option to

recycle the paper towels relative to when there was no recycling option. Thus, the addition of the recycling bin led to a positive effect on the targeted behavior (recycling), but a negative effect on a non-targeted behavior (total resource use). Sun and Trudel (2017) also suggest that when a recycling option is present, consumers may use more of a product than they need, thereby increasing total resource use.

Case Study 5: Klöckner et al., 2013
(Negative Effect on Non-Targeted Behaviors)

Governments in many countries have taken pro-environmental measures to promote the purchase of alternative fuel vehicles to conserve conventional fuels and lower vehicle carbon emissions. The Norwegian government, for example, subsidized electric vehicles by eliminating purchase taxes, reducing annual taxes, and offering free or discounted use of toll roads, parking places, ferries, and bus lanes to those who purchased an electric car. As a result, electric car sales in Norway increased dramatically during 2012 until it boasted the highest number of electric cars per capita. Thus, based only on the measurement of the targeted behavior of increasing electric vehicle purchases, the Norwegian government's intervention appeared to be successful.

However, during this time, Klöckner et al. (2013) distributed surveys to 13,362 car buyers and compared responses from those who had purchased conventional combustion engine cars to those who had purchased electric cars. The survey results indicated that electric car buyers were more likely to own a higher number of vehicles per household, suggesting that electric cars were typically purchased as an additional vehicle rather than as a substitute for a conventional car. Specifically, only 9.5% of electric car buyers had only one car per household, compared to nearly 50% of conventional car buyers. Moreover, expected annual mileage for the upcoming year increased significantly with the number of cars per household, and electric vehicle owners were likely to take more frequent trips (e.g., shopping, transporting children). By increasing the amount of traffic (which prolongs the time that conventional vehicles are on the road), the increased driving behavior of electric vehicle owners could add to carbon emissions. Electric car buyers also reported significantly lower scores than conventional car buyers on attitudes, intentions and perceived moral obligation to reduce car use, suggesting that they may feel they had already "done their share" to reduce the negative impacts from car travel.

Overall, the results of this study suggest that although the Norwegian government's targeted behavior of promoting electric car sales was successful, the subsidies it offered may have a negative effect on non-targeted but pro-environmental behaviors, such as reducing the average number of vehicles per household, limiting traffic, and inspiring pro-environmental attitudes. If the cumulative negative impact of the intervention on these non-targeted behaviors offsets the positive impact of the intervention on the targeting behavior, leading to an overall increase rather than decrease in carbon emissions and hurting rather than benefiting the overall environment, the intervention could be deemed a failure rather than a success.

Recognizing that interventions may create negative effects on non-targeted behaviors is a critical consideration to the design of successful interventions. It requires researchers to consider the scope of what is measured and what might be done to prevent negative effects on non-targeted behaviors. For example, future electric vehicle purchase incentives might be limited to households that have only one car.

Neglecting the scope of measurement can lead researchers to potentially misdiagnose an outcome. Typically, researchers only measure the effect of their intervention on the behaviors that they set out to target. Yet the existence of the Negative Effect on Non-Targeted Behaviors failure means that interveners should also measure related, but non-targeted behaviors that could be affected by the intervention. Recognizing which non-targeted behaviors might also be affected by the intervention will allow researchers to assess whether an otherwise successful-seeming intervention might be doing more harm than good, and thus should be stopped. Alternatively, researchers can prevent this failure by highlighting to participants that the targeted and non-targeted behaviors share similar goals or features (Maki et al., 2019; Margetts & Kashima, 2017).

Implications for Theory and Practice

The identification of these five ways that sustainability initiatives can fail has implications for both theory and practice. From a theoretical standpoint, we distinguish between diagnosing *how* an intervention failed and diagnosing *why* it failed. This important distinction offers a more nuanced view of unsuccessful initiatives, acknowledging that failure can take on not only different levels of severity, but different forms altogether. Imagine the difficulty of trying to diagnose the underlying medical cause of a patient whose single symptom is "pain." Obviously, understanding the magnitude, location, and specific kind of pain would be useful (e.g., does it come and go or is it constant; is it dull or sharp). Likewise, we argue that merely knowing that a sustainability initiative failed is insufficient—an understanding of how it failed will facilitate a proper diagnosis of the underlying cause and aid in the determination of appropriate corrective actions. By contrast, incorrectly identifying the type of failure may lead to counterproductive actions—for instance, consider two interventions which were ineffective in achieving long-term energy reduction (Hargreaves et al., 2013; Wang et al., 2017). Without understanding the type of failure, researchers might decide to use reminders to refresh the interventions. However, while reminders may be an effective solution for a Temporal Decline failure, they are likely to exacerbate a Backfire failure. Thus, if a Backfire failure is misclassified as Temporal Decline, sending a reminder email to remedy the failure may do more harm than good.

We further contribute to the literature by providing a framework of how sustainability initiatives can fail that allows for a standardized classification of unsuccessful initiatives across a wide variety of domains. To illustrate, the examples we draw upon in this article, which are meant to be illustrative rather than comprehensive, span domains including energy, transportation, food, recycling, green products, and waste management. We hope that our typology will aid in an enhanced understanding of these different types of failures and provide a useful tool for researchers in any domain.

From a practical standpoint, we argue that diagnosing *how* an initiative failed (before diagnosing *why* it failed) is an important but often overlooked step in preventing and remedying future failures. Our identification of the different ways in which sustainability initiatives can fail arms researchers and practitioners with additional questions to explore when an intervention does fail—understanding the type of failure can help in diagnosing why it failed and in determining the level and type of adjustments that may be needed to transform the failure into a future success.

Understanding the potential for sustainability initiatives to fail in different ways can help researchers leverage core social marketing principles and processes to improve the design, implementation, and evaluation of behavioral interventions. For example, researchers who understand the different ways in which initiatives might fail are likely to be more specific about what a successful initiative would look like, defining explicit and realistic benchmarks, goals, and metrics at the outset of a sustainability initiative. They are more likely to use theory and data to identify priority audience segments and sustainability behaviors, to understand the benefits an initiative offers to a target audience, and to anticipate key barriers that might prevent audience engagement.

Our framework should prompt researchers to consider the extent to which resources allow the timeline and scope of monitoring an audience's response to an intervention to be expanded. For example, researchers may expand the duration of measurement to capture long-term results (e.g., Temporal Decline) and ensure that the breadth of measurement is not limited to only targeted behaviors but broad enough to capture possible changes in other behaviors that might possibly be affected by the intervention (e.g., Negative Effect on Non-Targeted Behaviors). In addition, our framework should prompt researchers to invest in appropriate pretesting elements of the intervention mix prior to launching and capture measures of heterogeneity within the target population, as unintended outcomes can stem from differences across subsets.

In conclusion, although many sustainability initiatives are successful and produce results that benefit the environment, not all are effective at producing the desired magnitude of outcome over time. Here we identify and provide examples of five different ways in which sustainability initiatives can fail. Given that the large majority of published interventions demonstrate success while a much larger proportion of failed interventions remain in the file drawer (Rosenthal, 1979; Simonsohn et al., 2014), we hope this typology increases awareness of how interventions may fail and leads to designs that are better equipped to detect different types of failures. In doing so, this typology will aid in the development of more effective behavioral interventions and benefit future sustainability efforts.

Declaration of Conflicting Interests

Funding

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