Does culturally-framed climate journalism lead to more climate action?

Evidence from South Africa

In partnership with LSE Consulting

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Executive Summary

Introduction

The climate crisis affects us all, so reporting on it shouldn't just be in stories about the climate. It should be part of our cultural narrative. ClimateXchange is a groundbreaking global non-profit initiative enabling a new kind of content movement: cultural climate journalism. We believe that climate belongs at the heart of our culture; that as journalists, together, we can help make a difference to our audiences where they are at.

To test this rationale, we designed a research agenda that keeps us honest and presents us with rigorous evidence for developing and adjusting our approach. This pilot research project aimed to provide proof of concept and a baseline for building the research design further – one that is reliable, valid, neutral, and generalisable.

About the research

Sample: 1,062 South African adults via Prolific platform
Method: Online randomized controlled experiment with 4 groups
Treatments: Participants read climate stories about livestock/beef
(see Appendix for a deep-dive into these climate stories)

- Control group: Neutral story about Table Mountain
- T1 group (Science): Scientific focus on climate impacts on livestock
- T2 group (Science+Culture): Scientific info + South African cultural context (meat as a part of South African diet and culture)
- T3 group (Culture): Cultural narratives about food traditions and alternatives

Outcomes tested: Policy preferences, lifestyle intentions, civic action, donation behavior Statistical approach: OLS regression with multiple hypothesis testing corrections

Key findings

Our research with the London School of Economics has shown that different audiences need different entry points to climate engagement. People with *lower life satisfaction* respond more to science narratives T2 (Science+Culture) and T1 (Science). Those with *weaker political engagement* responded positively to all narrative types, including culture-only stories (T3). However, culture-only narratives backfired among climate sceptics (those with *weak climate change beliefs*), actually reducing their support for climate policies, while those with *strong climate beliefs* responded more positively to cultural approaches. This proves we need multiple entry points to climate engagement, and culture can be a powerful one. If we want people to care about climate, one way is to embed it into their everyday cultural realities. Whether it's food, art, language, or Indigenous stories, culture shapes how we relate to issues and influences behaviour.

Finding 1: Science + Culture (T2) worked best for people who were struggling.

Who responded well:

- People with low life satisfaction (those dealing with personal challenges)

Why this makes sense:

- These individuals may feel more connected to messages that acknowledge both scientific reality AND cultural relevance
- They need both credible information AND something that feels personally meaningful

Important caveat:

- This approach was LESS effective for people with high life satisfaction
- Well-off, content people may see cultural appeals as unnecessary or manipulative

Finding 2: Culture-only (T3) had mixed results - great for some, terrible for others.

Who responded well:

- Politically disengaged people (those who normally don't care about politics)

Who had NEGATIVE reactions:

- Climate sceptics - they became LESS supportive of climate policies after reading culture-only messages
- This is a classic "backfire effect"

Why culture-only can backfire:

- Climate skeptics may see cultural appeals without strong scientific backing as emotional manipulation
- They might think: "They're trying to use my culture to push an agenda I don't believe in"
- This makes them more resistant, not less

Finding 3: Science-only (T1) was the "safe choice".

- Impactful across different groups (such as low life satisfaction and weak political interest)
- Didn't backfire with anyone
- Good baseline engagement
- If you're unsure about your audience, this is your safest bet

The big picture insights

Audience matters more than message.

- The same cultural message that energises politically disengaged people can alienate climate skeptics
- You can't just assume "more culturally relevant = better"

Cultural framing is high-risk, high-reward.

- When it works (politically disengaged, struggling populations), it can be powerful
- When it backfires (skeptics), it makes things worse
- Science-only is lower risk

Know your audience before choosing your approach.

- Use Science + Culture when:
  - Talking to people facing economic/personal challenges
  - You know your audience already has some climate concern
  - You want to make scientific information feel more personally relevant
- Use Culture-only when:
  - Your audience is politically disengaged but not actively climate skeptical
  - You're trying to mobilize people who usually don't engage with environmental issues
  - You're confident you're NOT talking to climate skeptics
- Use Science-only when:
  - You have a mixed audience
  - Credibility is your top priority
  - You're unsure about audience attitudes toward climate change

Key research limitations

- Single study in South Africa with immediate-effect measurement
- Online platform sample with existing high environmental concern

Next steps - building on what we've learned

This pilot study has provided us with a crucial starting point, revealing both the promise and the pitfalls of cultural climate narratives. But we recognise that these findings are just the beginning of a deeper exploration into how culture and climate storytelling intersect across different contexts. We're working closely with our LSE research partners and the newsrooms in our climateXchange community to address the constraints identified in this pilot.

- Learning from limitations by developing more inclusive data collection methodologies beyond digital platforms
- Expanding across cultures by testing how these dynamics play out in different cultural contexts
- Leveraging global partnerships by collaborating with local journalists for more representative research design
- Designing for durability by addressing long-term impact and cross-cultural application

Does culturally-framed climate journalism lead to more climate action?

Pilot research study - findings report

1. Introduction

Background and Motivation This project investigates the causal effect of culturally-framed climate journalism on climate change attitudes, behavioural intentions, and actual behavioural outcomes. An overarching purpose of the study is to generate robust evidence that can inform the development of more resonant and impactful climate change communication strategies in diverse cultural settings, particularly within the South African context. This motivation stems from the need to communicate climate-related information in ways that resonate with target groups across different cultural contexts. This is a pilot study that aims to inform future directions of research.

Research Question The central research question of the study is: does culturally-framed climate journalism lead to improved climate change attitudes, behavioural intentions, and actual behavioural outcomes? To answer this question, we test the causal effects of three different climate-related news stories relative to a neutral control condition. The study specifically investigates how beliefs, attitudes, and lifestyle choices are actively shaped by local narratives and storytelling about South African food culture.

Research Design The research employs an online randomised controlled experiment. Participants are adult South Africans (18+) recruited via the online platform Prolific. They are then randomly assigned to one of four groups: a control condition or one of three experimental groups, each comprising a different news story about climate change. The three treatment groups consist of a Science narrative (Treatment 1), a Science + Culture narrative (Treatment 2), and a Culture-only narrative (Treatment 3). The control group reads a neutral story.

Hypotheses We test the following hypotheses:

H1 (Main Effect) Participants in any of the three treatment groups (Science, Science + Culture, Culture) will report significantly higher climate change attitudes, behavioural intentions, and behavioural outcomes than those in the control group.

H2 (Comparative Effectiveness) The effect of the treatment will vary by narrative framing. Specifically, we hypothesise that the Culture-based narrative will produce stronger effects on climate change attitudes, behavioural intentions, and behavioural outcomes than the purely Scientific narrative, with the Science + Culture narrative falling in between.

H3 (Moderation) The effectiveness of the treatment narratives will vary depending on individual-level moderators, including prior (pre-treatment) climate change concern, political interest, wellbeing, and optimism (predicted future wellbeing).

H4 (Mediation) The effect of the treatment narratives on climate change attitudes, behavioural intentions, and behavioural outcomes will be mediated by individuals' cognitive and emotional engagement with and response to the

treatment narratives. Mediating variables include article evaluation, narrative engagement, emotional response, psychological closeness, cultural resonance, perceived agency, knowledge gain, and social contagion.

The research is designed to test these hypotheses using inferential statistical models such as OLS and ordered logit regressions, with and without covariates. Outcomes measured include climate-related attitudes and intentions to engage in pro-environmental behaviours, assessed through a survey, covering aspects such as policy preferences, general and particular lifestyle changes (including meat consumption), civic action, and the likelihood of making a donation to environmental charities as an actual behavioural outcome.

1.1 Overview of the results.

Average Treatment Effects The primary analysis finds limited average treatment effects across the main outcome indices. The Science treatment (T1) shows a marginally significant positive impact on Climate Policy Preferences, particularly on Support for Taxation and Regulation, but this effect does not withstand correction for multiple hypothesis testing. The combined Science+Culture (T2) and Culture-only (T3) treatments do not yield significant effects on any aggregated indices, including Lifestyle Change intentions, Civic Action, or Donation Likelihood. Analysis of individual survey items reveals a few marginally or statistically significant effects, such as a positive effect of the Culture treatment (T3) on preparing traditional meat-free dishes and of the Science treatment (T1) on specific policy items, but none are robust after correcting for multiple hypotheses testing. Overall, while there are some promising patterns in isolated items, the treatments do not produce strong or consistent shifts in attitudes or behaviours when outcomes are examined in aggregate.

Mediators The results for the mediators show that the Science (T1) and Science+Culture (T2) treatments generally performed better than the Culture-only (T3) treatment in terms of positively impacting variables like Article Evaluation and Narrative Engagement. All three treatments were effective at increasing Psychological Closeness and Perceived Agency, as well as eliciting significant Negative Emotions, though the Culture-only treatment (T3) elicited less. The Science+Culture treatment (T2) also showed a marginal positive effect on Cultural Resonance, though it does not survive multiple hypothesis testing. A notable finding, however, is that both the Science and the Culture treatments led to significant decreases in reported knowledge gain compared to the control group. The lack of significant effects on Positive Emotions, Social Contagion, and Value Orientation across all treatments is also evident.

Moderators Finally, we explore whether the effects of the treatments vary across key psychological and attitudinal moderators, measured pre-treatment. Overall, we find that respondents with higher baseline Life Satisfaction, stronger Climate Change Beliefs, greater Political Interest, and more Optimism About their Future tend to score higher on policy support and pro-environmental behaviours in the control condition. However, treatment effects are not uniform: individuals with lower Life Satisfaction respond more positively to Science (T1) and Science+Culture (T2) treatments whereas those with higher Life Satisfaction show attenuated or even negative responses to the same messages. Similarly, the Culture-only treatment (T3) appears counter-productive for respondents

with Weak Climate Change Beliefs, leading to reduced intention to support political action. In contrast, politically disengaged individuals are more responsive to all message types, suggesting that such narratives may be especially effective at mobilising the less politically engaged. These findings underline the importance of tailoring interventions to audience characteristics, as the same message can produce divergent effects depending on the recipient's baseline attitudes and beliefs, a result that resonates very well with the literature in applied behavioural science.

2. Data and Methods

2.1 Data Collection and Participants

Data were collected online in South Africa using the recruitment platform Prolific. The target sample size was determined through power calculations using G*Power for a non-parametric test of the difference in means (Wilcoxon-Mann-Whitney test) with a specified effect size, alpha level, and power (beta), resulting in a requirement of 265 participants per experimental group, or a total of 1,060 participants**.** Data collection took less than one working day. Ethics approval was obtained prior to data collection from the Research Division of the London School of Economics.

Participants were adult South Africans aged 18 or older. Before beginning the survey, informed consent was obtained, requiring participants to actively indicate their consent to participate. Participants who did not provide consent were excluded from the data (5 observations). Additionally, participants who indicated they did not take part seriously were also excluded (27 observations).

The final sample size available for analysis includes **1,062 observations**. By means of randomisation, participants were (almost) equally distributed across the four experimental groups as follows:

- Control Group (C): 262 participants
- Treatment 1 Group (Science): 263 participants
- Treatment 2 Group (Science + Culture): 274 participants
- Treatment 3 Group (Culture): 263 participants

Summary statistics and balancing properties for demographic variables across these groups are presented in **Table 1A**, indicating that the groups are, as expected, very similar and that randomisation was successful. There are, however, some minor differences, particularly in the 35 to 44 age group for Treatment 3 (Culture) and the 55 to 64 age group for Treatment 2 (Science + Culture) relative to the control group, in marital status (Widowed) and in number of children categories for Treatment 3 (Culture), as well as some differences in employment status (Treatment 1 "Science" and 2 "Science + Culture"), the share of people living in the suburbs (Treatment 2 "Science + Culture" and 3 "Culture") and the share of respondents in the R200,001 to R250,000 income band. Overall, however, the different groups seem well-balanced, allowing us to infer causality when comparing means in outcomes post-treatment between each treatment group and the control group.

Similarly, balancing properties for outcomes, mediators, and moderators are presented in **Tables 1B** to **1D**. As with demographics, for moderators we find little evidence for systematic, meaningful differences across groups.

2.2 Experimental Design and Manipulation

The study employed an online randomised controlled experiment. Participants were randomly assigned to one of four conditions: a control group or one of three treatment groups.

The manipulated variable was the type of news story about climate change that participants were exposed to:

- **Treatment 1 (Science):** Participants read a news story focused on the scientific aspects of climate change (438 words).
- **Treatment 2 (Science + Culture):** Participants read a culturally-enhanced news story where scientific information from the previous story was complemented with cultural narratives relevant to the South African context (588 words).
- **Treatment 3 (Culture):** Participants read a culturally-enhanced news story primarily focusing on cultural narratives and storytelling related to the effects of climate change in the South African context (463 words).
- **Control Group:** Participants read a neutral story of the same length about a mountain in South Africa, rather than a climate-related story (484 word).

By comparing means in outcomes post-treatment between these groups, our research design allows us to isolate the causal effect of story-telling rooted in either science, culture, or both culture and science. The stories were kindly provided by the ClimateXChange team and can be found in **Appendix A.**

2.3 Measured Variables

The participants completed a survey assessing various outcomes, mediators, and moderators. The full survey can be found in **Appendix B**.

Outcomes The primary outcomes measured include climate change attitudes, behavioural intentions, and behavioural outcomes. These were assessed through items related to:

- Policy Preferences (i.e., support for stricter climate regulation, higher taxes).
- General Lifestyle Changes (i.e., intentions to reduce electricity use, reduce red meat, buy local, reduce plastic).
- Particular Lifestyle Changes, including meat reduction intentions (i.e., meat-free day, traditional meat-free dish, plant-based restaurant).
- Civic Actions (i.e., intentions to ask a vendor for local produce, check if bank invests in fossil fuels, identify one environmental practice, attend a clean-up event).
- Likelihood of Donation (as an actual behavioural outcome).

These measures were collected using Likert scales. For the analysis, they were converted into z-scores (which have means of zero and standard deviations of one, thereby making variables comparable in terms of standard deviation changes) as well as binary indicators whereby 1 represents higher values and 0 lower ones, respectively. Outcomes were also aggregated into indices (weighted averages) as per pre-registration at the Open Science Foundation (OSF).

Mediators Several mediating variables were measured to understand the process through which the narratives might affect outcomes:

- Article Evaluation (i.e., convincing, reliable).
- Narrative Engagement (i.e., engaged, emotion, familiarity).
- Emotional Response (i.e., outraged, moved, sad, fearful, responsible, hopeful/optimistic, empowered).
- Psychological Closeness.
- Cultural Resonance.
- Perceived Agency.
- Knowledge Gain.
- Social Contagion.
- Value Orientation.

These were also collected using Likert scales and analysed individually as well as in indices.

Moderators Measured individual-level moderators included prior Climate Beliefs, Political Interest, Wellbeing (measured by Life Satisfaction), and Optimism (measured by predicted Future Life Satisfaction).

2.4 Analytical Approach

The study used OLS to estimate the **average treatment effects** of the different treatments. Analyses were conducted both with and without covariates. To study **mediation**, the analysis included models using mediators as outcomes. **Moderation** effects were examined through the inclusion of interaction terms between the treatment indicator and relevant moderators measured pre-treatment, again analysed both with and without covariates.

The results are adjusted for multiple hypothesis testing using Romano and Wolf stepdown-adjusted P values. The analyses were conducted using Stata statistical software.

3. Results

3.1 Average Treatment Effects

The primary average treatment effect results for aggregated outcome indices using natural units and controlling for individual characteristics are presented in **Table 2.** Robust standard errors are provided in parentheses, and statistical significance is indicated by asterisks: * p<0.1, ** p<0.05, *** p<0.01.

The results for the main outcome indices generally show limited statistically significant average treatment effects. The Science treatment (T1) had a marginally significant positive effect of 0.193 points compared to the control group (* p<0.10) on the Policy Preferences Index (1-to-7 scale), which is an average of the reported preference for taxation and that of stricter climate regulation. The Science+Culture (T2) and Culture (T3) treatments did not show significant effects on this index. Note that the effect of T1 does not survive adjustments for multiple hypothesis testing using Romano-Wolf stepdown-adjusted P values (p = 0.359).

None of the treatments had a statistically significant effect on Index of Lifestyle Changes in General (1-to-7 scale), Index of Lifestyle Changes in Particular (1-to-7 scale), Index of Intentions for Meat Reduction (1-to-5 scale), Index for Civic Action (1-to-7 scale), or the Likelihood of Donation (0-to-1 scale).

The tables in the Appendix provide a more nuanced view by examining the effects on the outcome indices without controls (**Table A1**), using alternative index constructions (**Table A2**), and on individual items constituting indices within each outcome category (**Tables B1** to **B5** and **Tables C1** to **C5**).

When individual controls are removed in **Table A1**, the Science treatment's positive effect on the Policy Index is still marginally significant (0.200, * p<0.10); however, this result still does not survive multiple hypothesis testing.

Table A2 presents the results with the alternative indices as outcomes. These are constructed by summing the number of individual items within a category (Policy, Lifestyle Changes in General, Lifestyle Changes in Particular, Civic Action) for which the participant gave a response score of 5 or higher on the original 1-to-7 scale. None of the effects are statistically significant.

The results for individual items are reported in **Tables B1** to **B5** and **Tables C1** to **C5.** The outcomes are normalised to z-scores by subtracting the mean and dividing by the standard deviation of the responses**.** Hence, the coefficients should be interpreted as the effect of treatment on the outcome variable measured in standard deviations.

Examining individual questions reveals some marginally significant effects that were not strong enough to appear in the aggregated indices when controls were included. In particular, we find a marginally significant effect of the Science treatment (T1) on respondents' preferences for taxation (0.151, * p<0.01; **Table B1**). The result, however, does not survive multiple hypothesis testing. There are now effects on the subscales of the Life Changes in General (**Table B2**).

The Culture treatment (T3) that focused specifically on food has a significant positive effect on the likelihood of preparing a Traditional Meat-Free Dish (0.179, ** p<0.05; **Table B3**). Using binary coding (1 if >=5), the Culture treatment also had a significant positive effect (0.078, ** p<0.05; **Table C3**) on this item with controls. None of the two survive multiple hypothesis testing, though.

The Science treatment (T1) showed significant positive effects on individual policy preference items (Regulation and Taxation) using z-scores *without* controls, but these were not significant with controls and did not aggregate to a strongly significant effect on the overall Policy Index with controls.

The Science + Culture treatment (T2) showed marginal positive effect on the binary index for the intention to Buy Local (0.043, * p<0.10; **Table C2**). The effect did not survive multiple hypothesis testing and did not show up in the z-score analysis.

Effects on other items were non-significant in both z-score and binary-outcome analyses.

3.2 Mediators

The study included measurements of several variables intended to function as mediators, captured after participants read the assigned text but before they reported their main outcomes. These mediators were designed to help understand the potential mechanisms through which the different news stories

might influence subsequent attitudes and behavioural intentions. The mediator variables included indices for Article Evaluation, Narrative Engagement, Positive Emotions, Negative Emotions, as well as single measures for Psychological Closeness, Cultural Resonance, Perceived Agency, Knowledge Gain, Social Contagion, and Value Orientation.

The average treatment effects of each treatment group (Science, Science+Culture, and Culture) relative to the control group on these mediators are presented in **Table 3**. These results routinely control for individual characteristics. The analysis indicates that the three climate-related stories had varying but often significant effects on these immediate post-reading responses when compared to the control group.

Index for Article Evaluation (an average of Convincing and Reliable scores). The Science treatment (T1) had a highly significant positive effect (0.402, *** p<0.01). The Science+Culture treatment (T2) also showed a highly significant positive effect (0.381, *** p<0.01). The Culture treatment (T3) had a positive effect, but it was not statistically significant (0.093). This suggests the Science-based stories were perceived as more credible or well-presented. Effects for T1 and T2 remain significant even after controlling for multiple hypothesis testing.

Index for Narrative Engagement (an average of Engaged, Affected Emotionally, and Familiar with the Topic scores). As with the previous mediator, the Science treatment (T1) resulted in a highly significant positive effect (0.430, *** p<0.01). The Science+Culture treatment (T2) also had a highly significant positive effect (0.368, *** p<0.01). The Culture treatment (T3) showed a positive effect, but it was not statistically significant (0.080). This implies the Science-based stories were more effective at drawing readers into the narrative.

Index Positive Emotions (an average of Moved, Hopeful/Optimistic, and Empowered scores). None of the treatment groups had a statistically significant effect on positive emotions relative to the control group. The effects were small and non-significant for T1 (0.129) and T2 (0.101), with a small yet non-significant negative effect for T3 (-0.082).

Index Negative Emotions (an average of Outraged, Sad, and Fearful scores). All three treatment groups led to large in magnitude and highly significant increase in negative emotions relative to the control group. T1 (1.457, *** p<0.01), T2 (1.237, *** p<0.01), and T3 (0.630, *** p<0.01) all showed strong positive effects, with the Science-focused treatments (T1 and T2) eliciting larger increases than the Culture-only treatment (T3).

Psychological Closeness. All three treatment groups significantly increased psychological closeness relative to the control group. T1 (0.745, *** p<0.01), T2 (0.775, *** p<0.01), and T3 (0.648, *** p<0.01) all had highly significant positive effects similar in magnitudes. This suggests all stories were effective at making participants feel more connected to the issues presented, relative to the control text.

Cultural Resonance. The Science treatment (T1) showed a non-significant positive effect (0.192). The Science+Culture treatment (T2) had a marginally significant positive effect (0.239, * p<0.10), yet it does not survive adjustments for multiple hypothesis testing. The Culture treatment (T3) showed a non-significant positive effect (0.202). Only the combined Science+Culture story showed some evidence of increasing perceived cultural resonance.

Perceived Agency. All three treatment groups resulted in a highly significant increase in perceived agency relative to the control group. T1 (0.978, *** p<0.01),

T2 (0.893, *** p<0.01), and T3 (0.851, *** p<0.01) all had strong positive effects. This indicates that all stories were successful in making participants feel more capable of taking action, relative to the control text.

Knowledge Gain. Contrary to expectations, both the Science (T1) and the Culture treatment (T3) had a highly significant *negative* effect on reported knowledge gain relative to the control group. T1 (-0.316, *** p<0.01) and T3 (-0.406, *** p<0.01) reported learning less than the control group. The Science+Culture treatment (T2) showed a non-significant negative effect (-0.158). This is a surprising finding, suggesting the experimental stories might not have conveyed new information effectively or participants in the control group may have felt they learned more general knowledge.

None of the treatment groups had a statistically significant effect on the likelihood of discussing or sharing the article with others (Social Contagion) or on how important participants felt protecting the natural environment was (Value Orientation).

3.3 Moderators

The study pre-registered and measured several variables before participants were exposed to the news stories, with the intention of testing whether the effects of the different treatments varied depending on these pre-existing characteristics. The specific potential moderator variables measured were:

- Life Satisfaction.
- Predicted Life Satisfaction in Five Years (interpreted as a measure of optimism).
- Climate Change Beliefs.
- Political Interest.

These continuous variables were converted into binary variables for moderation analysis. This was done using median splits. Specifically:

- High Life Satisfaction was coded 0 if life satisfaction was 0-6 and 1 if it was 7-10.
- Predicted High Life Satisfaction in 5 Years was coded 0 if future life satisfaction was 0-8 and 1 if it was 9-10.
- Strong Climate Beliefs were coded 0 if items ‘Climate change is caused by human activities’ and ‘Urgent action is needed to address climate change’ were both between 0 and 4, and 1 if both were equal to 5.
- Strong Political Interest was coded 0 if political interest was 0-3 and 1 if it was 4-5.

Before examining moderation, we check the balancing properties of these moderator variables across the different experimental groups using t-tests. The results are presented in **Table 1D**. There is a marginally significant difference in Predicted Life Satisfaction in 5 Years between the control group and the first treatment group (Science) (mean difference -0.288*, p<0.10). There is also a significant difference in a Climate Beliefs items ‘Urgent Action Needed’ between the control group and the second treatment group (Science+Culture) (mean difference 0.162**, p<0.05). Other moderator variables like Life Satisfaction

or Political Interest did not show significant differences.

The primary analysis for moderators involved testing for interaction effects between the treatment variables and these moderator variables. The results are presented in **Table 4**, which is structured into panels, with each panel dedicated to a different moderator:

- Panel A: Moderation by High Life Satisfaction.
- Panel B: Moderation by Predicted High Life Satisfaction in Five Years.
- Panel C: Moderation by Strong Climate Change Beliefs.
- Panel D: Moderation by Strong Political Interest.

In these panels, the coefficients represent:

- The effect of each treatment group (T1, T2, T3) compared to the control group for participants who are in the low category of the moderator variable (e.g., Low Life Satisfaction).
- The effect of being in the high category of the moderator variable compared to the low category in the control group. This is shown on the 'High' or 'Strong' row.
- The interaction effect between each treatment variable and the moderator variable (e.g., T1 x High). A significant interaction term indicates that the treatment effect is statistically different for participants in the high moderator category compared to those in the low category.

In this way, treatment effects for the 'Low' group are measured by coefficients T1 to T3. Treatment effects for the 'High' or 'Strong' groups are measured by T1+T1 x High, T2+T2 x High, and T3+T3 x High.

Table 4 examines the moderation effects on the main outcomes, as in **Table 2**.

Life Satisfaction We observe that respondents with High Life Satisfaction also score higher on the Policy Index (0.663, ***p<0.01), Index for Lifestyle Changes in General (0.441, ***p<0.01), and Index for Civic Action (0.613, ***p<0.01).

In terms of treatment effects, the policy preferences of respondents with Low Life Satisfaction are more affected: T1 (Science) has a marginally significant positive effect on the Policy Index (0.387, **p<0.05) as well as T2 (Science+Culture) (0.485, ***p<0.01), while T3 (Culture) does not show a significant effect on the Policy Index for this group. As for the High Life Satisfaction responders, there is a significant negative interaction effect between T2 (Science+Culture) and High Life Satisfaction for the Policy Index (-0.805, ***p<0.01). This means that the positive effect of T2 on the Policy Index is *smaller* for respondents with High Life Satisfaction compared to those with Low Life Satisfaction, and overall, possibly negative.

We also find a marginally significant positive effect of T3 (Culture) on the Index for Lifestyle Changes in General for Low-Life Satisfaction responders (0.244, *p<0.10). The effect on High-Life Satisfaction responders is lower (-0.331, *p<0.10) and likely attenuated to zero.

For other outcomes, T1, T2, and T3 or interactions of those do not show significant effects.

Predicted Life Satisfaction in Five Years More optimistic responders score higher on the Policy Index (0.337, *p<0.10), Index for Lifestyle Changes in General (0.456, ***p<0.01), and Index for Civic Action (0.620, ***p<0.01). We also find that

the effect of T2 (Science+Culture) on High-Optimism responders was marginally lower than on Low-Optimism responders (-0.448, *p<0.10).

Climate Change Beliefs Participants with Strong Climate Change Beliefs (relative to Weak) in the control group have significantly higher scores across multiple outcomes: the Policy Index (0.717, ***p<0.01), Index for Lifestyle Changes in General (0.681, ***p<0.01), Index for Lifestyle Changes in Particular (0.611, ***p<0.01), and the Index for Civic Action (0.853, ***p<0.01). There is also a marginally significant positive difference for Intention of Meat Reduction (coefficient 0.309, *p<0.1). We detect no significant relationship with the Likelihood of Donation.

We find a marginally significant *negative* effect of T3 (Culture) on the Policy Index for Weak Climate Beliefs responders (-0.458, *p<0.10). This indicates that, for participants who initially held Weak Climate Change Beliefs, receiving the Culture treatment (T3) was associated with a marginally significant decrease in their stated support for political action aimed at mitigating climate change, relative to the control group. One possible explanation is that for this group, a message focused *only* on cultural narratives, without a strong scientific basis or clear link to the *need* for action, might not be persuasive. If the cultural narrative feels disconnected from the core issue of climate change itself (which they are sceptical about), or if it is perceived as using cultural elements to push an agenda they do not accept, it could potentially trigger a negative reaction or reactance, leading to reduced intentions for changes. The effect on Strong Climate Beliefs responders is higher (0.574, *p<0.10) and likely attenuated to zero overall.

In essence, the cultural message (T3) appears to have a counter-productive effect on those least convinced about climate change (Weak Beliefs), perhaps due to lack of perceived relevance. For those already convinced (Strong Beliefs), the cultural message is not counter-productive (the negative effect is overcome, resulting in a non-significant small positive shift), but it doesn't seem to significantly *increase* their already higher propensity for policital support.

Political Interest Control group respondents with Strong Political Interest score higher than their counterparts on all outcomes apart from the Likelihood of Donation.

Strong Political interest emerges as a powerful moderator for the effect of treatments on the Policy Index. The results in Table 4, Panel D, Column 1 suggest that all three treatments (Science, Science+Culture, and Culture) were effective in increasing support for climate change policies among individuals who are less interested in politics. However, individuals who are more interested in politics already have a significantly higher baseline level of support for these policies. Furthermore, the positive effects of all three treatments on policy support are significantly reduced for this group relative to the less politically interested group.

This implies that, while these narratives can effectively shift policy preferences among the less politically engaged, they are considerably less impactful, or potentially not impactful at all, for those already highly engaged in politics. The messages seem to have a stronger 'mobilising' effect on those less involved politically, potentially bringing their policy support closer to the higher baseline level already held by the more politically interested.

4. Discussion and Conclusion

This study aimed to investigate the effectiveness of different climate change news narratives – specifically Science, Science+Culture, and Culture frames – on shaping the attitudes, behavioural intentions, and actual behavioural outcomes of South African participants. The research employed an experimental design, randomly exposing participants to one of three treatment narratives or a control condition, and subsequently measuring various outcomes, potential mediators, and pre-existing moderators. The structured analysis plan involved assessing average treatment effects, exploring mediation pathways, and examining moderation effects based on individual characteristics.

The results for the main outcome indices generally show limited statistically significant average treatment effects.

The analysis of average treatment effects on potential mediators indicates that the different narratives had varying impacts on participants' cognitive and affective processing of the information. For example, though the Science treatment (T1), the Science+Culture treatment (T2), and the Culture treatment (T3) all significantly increased negative emotional responses relative to the control group, T3 shows the lowest increase. T1 and T2 significantly increased positive article evaluation, narrative engagement, and psychological closeness, whereas T3 showed significant effects on psychological closeness and perceived agency.

Beyond average effects, the study investigated whether the impact of the narratives varied depending on participants' pre-existing characteristics, namely Life Satisfaction, Predicted Life Satisfaction in Five Years, Climate Change Beliefs, and Political Interest. These variables were tested as moderators to determine *for whom* certain narratives were more or less effective. The moderation analysis provides crucial insights into the boundary conditions of narrative effectiveness. Different narrative frames may not be universally persuasive; their impact can be conditional on audience characteristics such as their level of political engagement. Understanding these interactions is vital for tailoring climate communication strategies to specific audiences to maximize their impact.

Potential limitations of the study include the cross-sectional design measuring outcomes immediately after exposure, which limits the ability to assess the long-term persistence of the effects. The sample, recruited via Prolific, might not be fully representative of the broader South African population. The reliance on self-reported attitudes and intentions also means the study captures intended behaviour rather than actual behaviour, except for the donation outcome. Moreover, we find that study participants generally already show high baseline levels across our outcomes, suggesting that scaling effects, to some extent, could explain why we do not detect significant average treatment effects for more outcomes.

In conclusion, this study demonstrates that climate change narratives have the potential to influence psychological mediators and outcomes, but their effects are not uniform. The significant moderation by political interest suggests that tailoring narratives to the prior characteristics of the audience is a critical factor in determining their effectiveness, particularly concerning policy attitudes. This underscores the need for nuanced, audience-aware approaches in climate change communication to resonate effectively across diverse populations.

Tables

Table 1A:
Summary Statistics and Balancing Properties – Demographics

	C	T1		T2		T3	
Variable	**Mean**	**Mean**	**Difference C-T1**	**Mean**	**Difference C-T2**	**Mean**	**Difference C-T3**
Age: 16 to 24	0.244	0.278	-0.033	0.255	-0.011	0.270	-0.026
25 to 34	0.477	0.407	0.070	0.420	0.057	0.521	-0.044
35 to 44	0.187	0.163	0.024	0.175	0.012	0.118	0.069**
45 to 54	0.053	0.080	-0.026	0.073	-0.020	0.057	-0.004
55 to 64	0.027	0.049	-0.023	0.058	-0.032*	0.030	-0.004
65 to 74	0.008	0.019	-0.011	0.015	-0.007	0.004	0.004
75 to 84	0.004	0.004	0.000	0.004	0.000	0.000	0.004
Gender Identity: Female	0.660	0.654	0.006	0.631	0.029	0.643	0.018
Male	0.332	0.346	-0.014	0.358	-0.026	0.346	-0.014
Non-Binary	0.000	0.000	0.000	0.004	-0.004	0.000	0.000
Prefer Not to Say	0.000	0.000	0.000	0.000	0.000	0.004	-0.004
Other	0.008	0.000	0.008	0.007	0.000	0.008	0.000
Marital Status: Single	0.458	0.449	0.009	0.420	0.038	0.517	-0.059
Married	0.508	0.490	0.017	0.533	-0.025	0.437	0.070
Separated	0.004	0.011	-0.008	0.007	-0.003	0.008	-0.004
Divorced	0.015	0.015	0.000	0.011	0.004	0.023	-0.008
Widowed	0.004	0.027	-0.023**	0.004	0.000	0.004	0.000
Prefer Not to Say	0.011	0.008	0.004	0.026	-0.014	0.011	0.000
Number of Children: 0	0.164	0.175	-0.011	0.172	-0.007	0.247	-0.083**
1	0.294	0.270	0.024	0.270	0.024	0.224	0.070*
2	0.370	0.342	0.028	0.325	0.045	0.376	-0.006
3	0.115	0.144	-0.030	0.146	-0.031	0.110	0.004
4	0.027	0.046	-0.019	0.055	-0.028	0.027	0.000
5	0.008	0.008	0.000	0.007	0.000	0.004	0.004
6	0.008	0.011	-0.004	0.004	0.004	0.000	0.008
More Than 6	0.008	0.004	0.004	0.000	0.008	0.004	0.004
Prefer Not to Say	0.008	0.000	0.008	0.022	-0.014	0.008	0.000
Ethnicity: Black	0.908	0.916	-0.008	0.898	0.011	0.867	0.041
Coloured	0.042	0.034	0.008	0.058	-0.016	0.057	-0.015
Indian / Asian	0.011	0.015	-0.004	0.022	-0.010	0.023	-0.011
White	0.031	0.030	0.000	0.011	0.020	0.034	-0.004
Other	0.000	0.004	-0.004	0.007	-0.007	0.000	0.000
Prefer Not to Say	0.008	0.000	0.008	0.004	0.004	0.019	-0.011
Religious: Yes	0.878	0.894	-0.016	0.901	-0.024	0.897	-0.019
No	0.088	0.087	0.000	0.080	0.007	0.072	0.016
Prefer Not to Say	0.034	0.019	0.015	0.018	0.016	0.030	0.004
Education: Some Secondary	0.000	0.004	-0.004	0.077	-0.004	0.000	0.000
Matric	0.073	0.065	0.008	0.157	-0.016	0.091	-0.019

Table 1A: (continued)
Summary Statistics and Balancing Properties – Demographics

	C	T1		T2		T3	
Variable	**Mean**	**Mean**	**Difference C-T1**	**Mean**	**Difference C-T2**	**Mean**	**Difference C-T3**
Certificate / Diploma	0.141	0.122	0.020	0.752	0.031	0.152	-0.011
Bachelor's or Above	0.782	0.810	-0.027	0.015	-0.011	0.753	0.030
Prefer Not to Say	0.004	0.000	0.004	0.745	0.034	0.004	0.000
Employment Status: Full-Time	0.779	0.741	0.037	0.069	-0.004	0.719	0.060
Part-Time	0.065	0.072	-0.007	0.044	-0.009	0.103	-0.038
Self-Employed	0.034	0.053	-0.019	0.029	0.020	0.053	-0.019
Unemployed and Looking	0.050	0.042	0.008	0.000	0.004	0.046	0.004
Unemployed and Not Looking	0.004	0.004	0.000	0.088	-0.030	0.000	0.004
Student	0.057	0.072	-0.015	0.004	-0.004	0.068	-0.011
Retired	0.000	0.011	-0.011*	0.011	-0.011*	0.004	-0.004
Other	0.011	0.004	0.008	0.011	0.001	0.008	0.004
Location: Urban	0.492	0.551	-0.059	0.566	-0.073*	0.521	-0.029
Suburbs	0.340	0.304	0.036	0.255	0.084**	0.327	0.013
Township or Informal	0.126	0.091	0.035	0.113	0.013	0.103	0.023
Rural	0.038	0.053	-0.015	0.051	-0.013	0.046	-0.007
Prefer Not to Say	0.004	0.000	0.004	0.015	-0.011	0.004	0.000
Income: None	0.011	0.011	0.000	0.015	-0.003	0.023	-0.011
Under R25,000	0.233	0.247	-0.014	0.274	-0.041	0.278	-0.045
R25,00 – R50,000	0.347	0.304	0.043	0.285	0.063	0.399	-0.052
R50,001 – R100,000	0.214	0.251	-0.037	0.241	-0.027	0.171	0.043
R100,001 – R150,000	0.061	0.076	-0.015	0.058	0.003	0.042	0.019
R150,001 – R200,000	0.031	0.023	0.008	0.047	-0.017	0.034	-0.004
R200,001 – R250,000	0.042	0.027	0.015	0.011	0.031**	0.011	0.031**
Above R250,000	0.034	0.046	-0.011	0.040	-0.006	0.023	0.012
Prefer Not to Say	0.027	0.015	0.012	0.029	-0.002	0.019	0.008
N	**262**	**263**		**274**		**263**	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 1B:
Summary Statistics and Balancing Properties – Outcome

	C	T1		T2		T3	
Variable	**Mean**	**Mean**	**Difference C-T1**	**Mean**	**Difference C-T2**	**Mean**	**Difference C-T3**
Policy: Regulation	5.790	5.920	-0.130	5.825	-0.035	5.658	0.132
Policy: Taxation	4.947	5.217	-0.270*	4.971	-0.024	5.023	-0.076
Lifestyle Changes in General: Reduce Electricity	5.588	5.445	0.143	5.464	0.124	5.570	0.017
Lifestyle Changes in General: Reduce Meat	4.981	4.768	0.213	4.974	0.006	5.015	-0.034
Lifestyle Changes in General: Buy Local	6.118	6.095	0.023	6.252	-0.134	6.084	0.035
Lifestyle Changes in General: Reduce Plastic	5.729	5.806	-0.077	5.734	-0.005	5.829	-0.100
Lifestyle Changes in Particular: Meat-Free Day	5.363	5.513	-0.151	5.405	-0.043	5.483	-0.120
Lifestyle Changes in Particular: New Meat-Free Recipe	5.504	5.586	-0.082	5.500	0.004	5.612	-0.108
Lifestyle Changes in Particular: Traditional Meat-Free Dish	5.145	5.388	-0.243	5.321	-0.176	5.357	-0.212
Lifestyle Changes in Particular: Plant-Based Restaurant	4.901	4.658	0.243	4.869	0.032	4.806	0.095
Lifestyle Changes in Particular: Ask Elderly	5.038	5.118	-0.080	5.073	-0.035	4.943	0.095
Reduce Meat Consumption	3.649	3.601	0.048	3.657	-0.008	3.692	-0.043
Civic Action: Ask Vendor	5.050	5.049	0.000	5.026	0.024	4.897	0.152
Civic Action: Check Bank	4.069	4.259	-0.190	4.266	-0.198	4.015	0.053
Civic Action: Identify Practice	5.634	5.650	-0.017	5.745	-0.111	5.559	0.075
Civic Action: Check Action	5.218	5.259	-0.041	5.219	-0.001	4.996	0.221
Donation	0.668	0.635	0.033	0.708	-0.040	0.639	0.029
Index Policy	5.368	5.568	-0.200*	5.398	-0.029	5.340	0.028
Alternative Index Policy	1.466	1.551	-0.086	1.493	-0.027	1.441	0.025
Index Lifestyle Changes in General	5.604	5.529	0.075	5.606	-0.002	5.625	-0.021
Alternative Index Lifestyle Changes in General	3.137	3.106	0.031	3.120	0.017	3.171	-0.034
Index Lifestyle Changes in Particular	5.190	5.252	-0.062	5.234	-0.044	5.240	-0.050
Alternative Index Lifestyle Changes in Particular	3.519	3.582	-0.063	3.555	-0.036	3.635	-0.116
Index Civic Action	4.992	5.054	-0.062	5.064	-0.072	4.867	0.125
Alternative Index Civic Action	2.683	2.684	-0.001	2.741	-0.058	2.605	0.079
N	**262**	**263**		**274**		**263**	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 1C:
Summary Statistics and Balancing Properties – Mediators

	C	T1		T2		T3	
Variable	**Mean**	**Mean**	**Difference C-T1**	**Mean**	**Difference C-T2**	**Mean**	**Difference C-T3**
Article Evaluation: Convincing	4.08	4.46	-0.380***	4.387	-0.307***	4.095	-0.015
Article Evaluation: Reliable	3.866	4.308	-0.442***	4.318	-0.451***	3.989	-0.122
Narrative Engagement: Engaged	4.481	4.445	0.036	4.38	0.101	4.456	0.025
Narrative Engagement: Emotion	2.725	3.643	-0.917***	3.544	-0.819***	3.08	-0.355***
Narrative Engagement: Familiarity	2.916	3.354	-0.438***	3.354	-0.438***	2.783	0.133
Emotional Response: Outraged	2.05	2.894	-0.844***	2.763	-0.713***	2.198	-0.148
Emotional Response: Moved	3.355	3.996	-0.641***	3.978	-0.623***	3.414	-0.059
Emotional Response: Sad	1.656	3.475	-1.819***	3.237	-1.581***	2.563	-0.906***
Emotional Response: Fearful	1.786	3.433	-1.647***	3.135	-1.349***	2.612	-0.826***
Emotional Response: Responsible	2.836	3.711	-0.875***	3.577	-0.741***	3.376	-0.541***
Emotional Response: Hopeful / Optimistic	3.588	3.567	0.021	3.507	0.08	3.506	0.082
Emotional Response: Empowered	3.756	3.567	0.189*	3.526	0.230**	3.376	0.379***
Psychological Closeness	5.179	5.924	-0.745***	5.931	-0.751***	5.791	-0.611***
Cultural Resonance	5.427	5.654	-0.227*	5.657	-0.229*	5.57	-0.143
Perceived Agency	4.626	5.624	-0.998***	5.566	-0.940***	5.433	-0.808***
Knowledge Gain	6.023	5.745	0.278**	5.872	0.151	5.62	0.403***
Social Contagion	5.905	6.091	-0.187	6.069	-0.165	5.935	-0.031
Value Orientation	6.172	6.259	-0.087	6.175	-0.003	6.091	0.081
Index Article Evaluation	3.973	4.384	-0.411***	4.352	-0.379***	4.042	-0.069
Index Narrative Engagement	3.374	3.814	-0.440***	3.759	-0.385***	3.44	-0.066
Index Positive Emotions	3.566	3.71	-0.144*	3.67	-0.104	3.432	0.134
Index Negative Emotions	1.831	3.267	-1.437***	3.045	-1.214***	2.458	-0.627***
N	**262**	**263**		**274**		**263**	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 1D:
Summary Statistics and Balancing Properties – Moderators

	C	T1		T2		T3	
Variable	**Mean**	**Mean**	**Difference C-T1**	**Mean**	**Difference C-T2**	**Mean**	**Difference C-T3**
Life Satisfaction	6.615	6.894	-0.279	6.675	-0.061	6.437	0.177
Life Satisfaction in 5 Years	8.237	8.525	-0.288*	8.347	-0.11	8.262	-0.026
Climate Beliefs: Daily Habits	4.275	4.194	0.081	4.336	-0.061	4.27	0.005
Climate Beliefs: Lifestyle Choices	4.286	4.46	-0.174**	4.361	-0.075	4.27	0.016
Climate Beliefs: Free Trade	4.107	4.137	-0.03	4.161	-0.054	4.118	-0.011
Climate Beliefs: Human Activities	4.336	4.422	-0.086	4.274	0.062	4.369	-0.033
Climate Beliefs: Scientific Research	4.275	4.335	-0.06	4.296	-0.021	4.278	-0.003
Climate Beliefs: Urgent Action	4.618	4.658	-0.039	4.456	0.162**	4.521	0.097
Climate Beliefs: Work Remotely	4.767	4.741	0.026	4.715	0.052	4.726	0.041
Climate Beliefs: Labour Unions	4.607	4.586	0.021	4.65	-0.043	4.597	0.01
Political Interest	3.844	3.882	-0.039	3.799	0.044	3.707	0.136
N	**262**	**263**		**274**		**263**	

Table 2:
Average Treatment Effects on Outcomes (Indices and Natural Units)

	Index Policy	Index Lifestyle Changes in General	Index Lifestyle Changes in Particular	Intention Meat Reduction	Index Civic Action	Likelihood Donation
	(1)	(2)	(3)	(4)	(5)	(6)
T1 (Science)	0.193*	-0.071	0.071	-0.052	0.079	-0.040
	(0.114)	(0.103)	(0.136)	(0.100)	(0.129)	(0.042)
T2 (Science+Culture)	0.040	0.013	0.049	0.006	0.080	0.026
	(0.118)	(0.096)	(0.132)	(0.096)	(0.123)	(0.041)
T3 (Culture)	0.025	0.068	0.128	0.072	-0.034	-0.028
	(0.122)	(0.100)	(0.134)	(0.097)	(0.131)	(0.042)
Adjusted P-Value (T1)	0.359	0.890	0.890	0.890	0.890	0.802
Adjusted P-Value (T2)	0.991	0.991	0.991	0.991	0.974	0.974
Adjusted P-Value (T3)	0.944	0.927	0.861	0.927	0.944	0.927
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Scaling	1-to-7 Scale	1-to-7 Scale	1-to-7 Scale	1-to-5 Scale	1-to-7 Scale	0-to-1 Scale
Mean	5.419	5.591	5.229	3.650	4.995	0.663
σ	1.333	1.140	1.560	1.136	1.516	0.473
N of Observations	1,062	1,062	1,062	1,062	1,062	1,062
N of Treated 1	263	263	263	263	263	263
N of Treated 2	274	274	274	274	274	274
N of Treated 3	263	263	263	263	263	263
N of Controlled	262	262	262	262	262	262
R Squared	0.079	0.078	0.130	0.099	0.162	0.071

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3:
Impacts on Mediators (Indices and Natural Units)

	Index Article Evaluation	Index Narrative Engagement	Index Positive Emotions	Index Negative Emotions	Psycho-logical Closeness	Cultural Resonance	Perceived Agency	Knowledge Gain	Social Contagion	Value Orientation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
T1	0.402***	0.430***	0.129	1.457***	0.745***	0.192	0.978***	-0.316***	0.169	0.089
(Science)	(0.066)	(0.068)	(0.083)	(0.088)	(0.129)	(0.132)	(0.140)	(0.114)	(0.117)	(0.095)
T2	0.381***	0.368***	0.101	1.237***	0.775***	0.239*	0.893***	-0.158	0.124	0.006
(Science+Culture)	(0.066)	(0.069)	(0.081)	(0.087)	(0.132)	(0.134)	(0.146)	(0.110)	(0.118)	(0.096)
T3	0.093	0.080	-0.082	0.630***	0.648***	0.202	0.851***	-0.406***	0.059	-0.063
(Culture)	(0.074)	(0.071)	(0.083)	(0.089)	(0.127)	(0.135)	(0.141)	(0.114)	(0.123)	(0.099)
Adj. P-Value (T1)	0.001	0.001	0.347	0.001	0.001	0.347	0.001	0.032	0.347	0.347
Adj. P-Value (T2)	0.001	0.001	0.465	0.001	0.001	0.265	0.001	0.437	0.471	0.931
Adj. P-Value (T3)	0.619	0.640	0.640	0.001	0.001	0.481	0.001	0.004	0.752	0.752
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Scaling	1-to-5 Scale	1-to-5 Scale	1-to-5 Scale	1-to-5 Scale	1-to-7 Scale	1-to-7 Scale	1-to-7 Scale	1-to-7 Scale	1-to-7 Scale	1-to-7 Scale
Mean	4.190	3.599	3.595	2.655	5.709	5.578	5.315	5.815	6.001	6.174
σ	0.771	0.784	0.957	1.158	1.419	1.543	1.621	1.312	1.366	1.090
N of Observations	1,062	1,062	1,062	1,062	1,062	1,062	1,062	1,062	1,062	1,062
N of Treated 1	263	263	263	263	263	263	263	263	263	263
N of Treated 2	274	274	274	274	274	274	274	274	274	274
N of Treated 3	263	263	263	263	263	263	263	263	263	263
N of Controlled	262	262	262	262	262	262	262	262	262	262
R Squared	0.149	0.113	0.158	0.269	0.142	0.136	0.203	0.100	0.122	0.074

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4:
Average Treatment Effects by Moderator

	Index Policy	Index Lifestyle Changes in General	Index Lifestyle Changes in Particular	Intention Meat Reduction	Index Civic Action	Likelihood Donation
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: High Life Satisfaction						
T1 (Science)	0.387**	0.009	-0.087	-0.089	-0.091	-0.025
	(0.182)	(0.164)	(0.220)	(0.155)	(0.208)	(0.067)
T2 (Science+Culture)	0.485***	0.088	-0.110	-0.056	0.153	0.024
	(0.178)	(0.141)	(0.200)	(0.142)	(0.190)	(0.063)
T3 (Culture)	0.241	0.244*	0.049	0.052	0.076	-0.028
	(0.182)	(0.145)	(0.206)	(0.145)	(0.190)	(0.063)
High	0.663***	0.441***	0.243	0.195	0.613***	0.098
	(0.176)	(0.143)	(0.199)	(0.138)	(0.182)	(0.060)
T1 (Science) x High	-0.365	-0.167	0.235	0.043	0.227	-0.034
	(0.230)	(0.213)	(0.281)	(0.201)	(0.261)	(0.086)
T2 (Science+Culture) x High	-0.805***	-0.123	0.304	0.124	-0.117	0.007
	(0.239)	(0.195)	(0.265)	(0.192)	(0.245)	(0.083)
T3 (Culture) x High	-0.395	-0.331*	0.134	0.032	-0.220	-0.001
	(0.242)	(0.200)	(0.270)	(0.197)	(0.259)	(0.084)
Panel B: High Life Satisfaction in Five Years						
T1 (Science)	0.181	0.005	-0.110	-0.186	-0.108	-0.001
	(0.170)	(0.150)	(0.206)	(0.150)	(0.202)	(0.064)
T2 (Science+Culture)	0.273	0.061	-0.035	-0.138	0.057	0.071
	(0.170)	(0.142)	(0.195)	(0.139)	(0.183)	(0.059)
T3 (Culture)	-0.116	0.136	-0.018	-0.100	-0.062	-0.014
	(0.179)	(0.141)	(0.196)	(0.139)	(0.188)	(0.060)
High	0.337*	0.456***	0.261	-0.012	0.620***	0.037
	(0.174)	(0.142)	(0.196)	(0.138)	(0.178)	(0.058)
T1 (Science) x High	-0.012	-0.185	0.275	0.227	0.240	-0.070
	(0.230)	(0.207)	(0.274)	(0.203)	(0.256)	(0.086)
T2 (Science+Culture) x High	-0.448*	-0.111	0.146	0.271	0.014	-0.086
	(0.239)	(0.195)	(0.267)	(0.194)	(0.241)	(0.082)
T3 (Culture) x High	0.246	-0.157	0.249	0.316	0.003	-0.028
	(0.239)	(0.199)	(0.269)	(0.196)	(0.256)	(0.083)

Table contines on next page...

Table 4:
Average Treatment Effects by Moderator (continued)

	Index Policy	Index Lifestyle Changes in General	Index Lifestyle Changes in Particular	Intention Meat Reduction	Index Civic Action	Likelihood Donation
	(1)	(2)	(3)	(4)	(5)	(6)
Panel C: Strong Climate Change Beliefs						
T1 (Science)	0.305	-0.384	0.441	-0.158	0.114	-0.013
	(0.270)	(0.247)	(0.286)	(0.224)	(0.307)	(0.102)
T2 (Science+Culture)	0.028	-0.111	-0.055	-0.137	0.152	0.050
	(0.242)	(0.192)	(0.248)	(0.187)	(0.250)	(0.086)
T3 (Culture)	-0.458*	-0.122	-0.029	-0.047	-0.151	0.009
	(0.241)	(0.187)	(0.255)	(0.198)	(0.275)	(0.088)
Strong	0.717***	0.681***	0.611***	0.309*	0.853***	0.102
	(0.220)	(0.170)	(0.229)	(0.173)	(0.245)	(0.077)
T1 (Science) x Strong	-0.255	0.258	-0.479	0.168	-0.126	-0.081
	(0.313)	(0.278)	(0.347)	(0.266)	(0.356)	(0.118)
T2 (Science+Culture) x Strong	-0.059	0.041	0.024	0.290	-0.080	-0.018
	(0.306)	(0.236)	(0.331)	(0.244)	(0.311)	(0.106)
T3 (Culture) x Strong	0.574*	0.063	0.106	0.227	0.141	-0.036
	(0.293)	(0.237)	(0.327)	(0.244)	(0.336)	(0.106)
Panel D: Strong Political Interest						
T1 (Science)	0.606***	0.078	0.177	-0.024	0.136	0.001
	(0.210)	(0.183)	(0.237)	(0.181)	(0.223)	(0.073)
T2 (Science+Culture)	0.554***	0.224	0.246	0.073	0.468**	0.086
	(0.209)	(0.164)	(0.226)	(0.180)	(0.213)	(0.072)
T3 (Culture)	0.454**	0.239	0.211	0.113	0.172	-0.019
	(0.216)	(0.173)	(0.239)	(0.181)	(0.222)	(0.073)
Strong	0.966***	0.504***	0.600***	0.299*	0.861***	0.057
	(0.192)	(0.155)	(0.207)	(0.157)	(0.188)	(0.065)
T1 (Science) x Strong	-0.577**	-0.196	-0.121	-0.021	-0.023	-0.061
	(0.248)	(0.223)	(0.290)	(0.218)	(0.266)	(0.090)
T2 (Science+Culture) x Strong	-0.736***	-0.292	-0.260	-0.080	-0.544**	-0.092
	(0.253)	(0.202)	(0.275)	(0.212)	(0.255)	(0.087)
T3 (Culture) x Strong	-0.598**	-0.226	-0.070	-0.033	-0.245	-0.009
	(0.261)	(0.214)	(0.288)	(0.216)	(0.271)	(0.090)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
N of Observations	1,062	1,062	1,062	1,062	1,062	1,062

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Test Story 1

WHY IS TABLE MOUNTAIN SHAPED LIKE THAT?

By Felix Dlamini

Spend any time in South Africa's peerlessly scenic western capital and you will have gazed up at its citadel mountain and thought: why does it look that way? Its English name Table Mountain—while apt—doesn't tell the whole story. Here is a remarkable tale of Earth forces, but also of ghosts, giants, gods and dragons. So whether you follow the religion of science or take a more whimsical path, here's the tale of how this beloved peak, World Heritage Site and natural wonder of the world earned its name.

Appendix

Test Story 1

The science bit

Table Mountain is actually just one side of a horseshoe of summits with rather more exciting names: Lion's Head, Signal Hill, and Devil's Peak. From the air, the range as a whole could be mistaken for the sweeping ruins of a volcanic crater; it's actually an extremely old piece of granite and sandstone that forms the western edge of a landscape of rumpled hills and valleys called the Cape Fold Belt. Made by a collision of tectonic plates around 200 million years ago, this series of geological pushes and shoves made the landscape of South Africa resemble a wrinkled carpet. Like many ancient mountain ranges, these wrinkles were once much higher: millions of years of erosion has broken down the landscape into the hard, pointy bits that remain today. These mountains were once so high it is believed the summit of Table Mountain was once the floor of a valley; the flat mountain top was formed by a heavy layer of ice that scraped along it during the last glaciation.

The mythology take

A famous South African story has a different theory. According to legend, Tixo (God of the Sun), and Djobela (Earth Goddess), conceived Qamata, who created the world. When it came to creating land, however, a great sea dragon took objection—fighting with Qamata and gravely injuring him. Horrified, Djobela created giants to guard the four corners of the Earth, one of which stood in what is today Cape Town. These giants battled with the sea dragons and were killed one-by-one—but were turned by Djobela into mountains so they could continue their defence in death. The biggest of all, Umlindi Wemingizimu, became Table Mountain. The mountain is so watchful that even today, its reputed spirits—from a slave who worked herself to death, to a spiteful leper—are used as cautionary tales in the townships below.

What's in a name?

The local Khoekhoe name of the mountain is Huri‡oaxa, which means 'emerging from the sea'. The Afrikaan translation is Tafelberg, but it's the English name that is most used.

The 3km section in the middle of the mountain appears very flat from sea level — and is not just a trick of perspective. The narrow, 1km high plateau of Table Mountain, called mesa in Spanish, led to its English name. And the inevitable nickname for the cloud that forms on the top: the 'table cloth.'

484 words.

Appendix

Test Story 2

RECORD TEMPERATURES MAY HIT LIVESTOCK

By Felix Dlamini

The effects of global heating on South Africa's soils may have devastating implications for future livestock farming, a study has found.

Published in Frontiers in Animal Science, scientists from South Africa's University of Fort Hare and the Bindura University of Science Education in Zimbabwe highlighted that 'drought has been a major climatic shock' to rural farmers across the country. Sheep, goats, pigs and poultry are reared for meat and other supplies and with around 64 million cows, the country is amongst Africa's biggest producers of beef cattle. While most poultry and pork is farmed intensively, around 60% of cattle are farmed in circumstances where the effects of drought, heatwaves and flash flooding have the greatest impact. Rural communities that rely on cattle for subsistence are likely to be most vulnerable.

"[During drought] plant material becomes sparse, and what there is often gets trampled by the hooves of too many livestock," Prof HO de Waal of the University of the Free State's Department of Animal, Wildlife and Grassland Sciences told The Farmer's Weekly in January. "As the drought progresses, livestock increasingly spend energy in search of grazing material. The net effect is... a progressive loss of body condition."

Test Story 2

A growing problem

It's a situation that will likely get worse. The World Meteorological Association confirmed 2024 was the hottest in recorded history globally, with South Africa experiencing a record-breaking summer. On the 11 December, Twee Riviere on the Eastern Cape recorded the highest temperature on the planet at 44.5 deg C. The region is nicknamed South Africa's 'livestock capital,' with Free State, KwaZulu-Natal, Limpopo and Western Cape also critical areas of production. With weather conditions becoming ever-more unpredictable, farmers are having a hard time pre-empting any potential looming crisis.

Solutions close to home

Certain animals are perhaps better equipped for drought. While chickens and pigs are less resilient to climate impacts in general, cattle in South Africa are no stranger to harsh conditions, with hardy drought-resistant breeds such as Afrikaner cattle common in the beef industry as well as Bonsmara, a hybrid developed for its adaptability to diverse environments. Some studies suggest 'drought feeding' strategies could help counteract nutritional stress, as well as reducing herd sizes and breeding according to favourable genetics—all of which may help the cattle adapt to ever-increasing temperatures.

Another solution may also tackle both concerns over cattle and their overconsumption as a contribution to climate change: abandoning beef for alternative meat. The Frontiers study found goats to be a potentially climate-resilient alternative to cattle, with a short reproduction cycle "ideal for recovering after a climate disaster shock... and being hardy to extremes of climate change."

438 words

Test Story 3

RECORD TEMPERATURES MAY HIT LIVESTOCK

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Appendix

Test Story 3

South Africa's beef industry, which is valued at R30 billion (around $1.8 billion) and is renowned worldwide for its quality, may be hit. Local dishes such as bobotie use ground beef as a main ingredient, making the grass-chewing ruminant a cultural staple as well as an economic one.

A growing problem

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Another solution may also tackle both concerns over cattle and their overconsumption as a contribution to climate change: abandoning beef for alternative meat. The Frontiers study found goats to be a potentially climate-resilient alternative to cattle, with a short reproduction cycle "ideal for recovering after a climate disaster shock... and being hardy to extremes of climate change."

A beef with beef?

Regardless of the climate benefits, turning vegetarian may not be straightforward for some. A 2023 study published in the journal Appetite found that 'meat in South Africa is seen not only as a status symbol but essential for some forms of socialisation,' with author Nomzano Magano describing meat as an 'integral part of culture.' However, reportedly spurred on by health and climate concerns, plant-based diets are booming in Johannesburg and Cape Town. Climate change and its impact on soil fertility can affect vegetarian diets too, with pulses and grains also sensitive to drought—which could potentially push up costs. But generally it is considered that plant-based diets are less impacted by drought than beef, which has an extremely high water footprint.

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588 words

Appendix

Test Story 4

BYE BYE BRAAI?

By Felix Dlamini

We South Africans love our beef. Whether it's biltong in a bag, braai and a rugby match or bobotie in winter, the cow is a part of our culture. And our beef is legendary: we export 50,000 tonnes every year, making it important to our economy too.

But extended dry spells across South Africa's ranching regions mean our beloved beef may be an endangered species. Scientists from the University of Fort Hare say that without research into ways to keep cattle happy and hydrated during droughts, beef farming may become a casualty of climate change.

So what could take its place? We asked Jordan von Hoost, head chef of Johannesburg's Mauritania restaurant, to suggest alternatives if beef gets a little too rare for our climate.

Appendix

Test Story 4

Go exotic

"Springbok is a delicacy, but it might be time to democratise it," says von Hoost of a national symbol that happens to taste great. "The meat is lean, tender, and has a gamey flavour. And it's very versatile. You can dry it to make biltong, make currys and stews—even steaks.''

Go insect

Wait, come back—we're serious. "Insect-based diets, or entomophagy, are a very sensible answer to food-related climate impacts. Critters can be reared quickly in huge volumes and relatively little space," says von Hoost. The problem is... they're insects. Studies say humans are put off eating this protein-rich food due to it remaining recognisable on the plate. What does von Hoost recommend? "Ground crickets or mealworms added to other ingredients to form patties similar to ground beef. You can even add vegetables, breadcrumbs, and seasonings to make a hearty burger."

Go goat

The humble goat is a resilient contender for a dietary staple, being less prone to drought and less costly to farm. The best dish to try with goat instead of its beefier pal? "Bunny chow or even pap works great with goat, but you can make a delicious bobotie by substituting the beef with finely minced goat meat," says von Hoost. "The spices in bobotie—curry powder, turmeric, and cinnamon—work perfectly with goat."

Go plant

Meat may seem a steadfast staple of South African social culture, but times change—and it might do some good. "Going plant based is becoming very trendy in South Africa," says von Hoost. "It's better for the climate, and while it's not for everyone, I'd recommend everyone give it a shot for a couple of days a week, if only to enjoy the flavours, and the interesting dishes you can create. A good starter? "Moringa is a great, protein rich plant that has similar nutritional value to meat—but requires very little water to cultivate. Mix moringa powder with lentils, chickpeas and aromatic spices and you've got an earthy, textured base for any dish that uses ground beef—from curries to pies."

463 words