



Co-created Future Scenarios as a Tool to Communicate Sustainable Development in Coastal Communities in Palawan, Philippines

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Scenarios can be used to communicate potential future changes and engage and connect different audiences in exploring sustainable solutions. Communicating scenarios using creative visualisation, co-creation and a focus on local contexts are especially promising. This research is conducted on the island of Palawan in the Philippines as part of the GCRF Blue Communities project. With a quasi-experimental design, we investigate the psychological and emotional effects of the engagement with future scenarios as a tool for communicating sustainability. Together with local stakeholders and community members, three distinct, locally relevant scenario narratives (Business as Usual, Best Case, and Worst Case) have been co-created. Subsequently, a sample of $N = 109$ local high school students was asked to creatively engage with these scenario narratives. Intentions to engage in sustainable behaviour, perceived behavioural control, ascription of responsibility, consideration of future consequences, six basic emotions and connectedness to place were assessed before and after the activity via paper-pencil administered questionnaires. A mixed-model analysis showed significant increases in intentions to engage in sustainable behaviour, however, this increase disappeared when consideration of future consequences was added as a covariate, suggesting a mediating effect. The level of consideration of future consequences also increased significantly after engaging with any of the future scenarios, which questions the common interpretation of consideration of future consequences as a trait variable. Perceived behavioural control significantly increased following the engagement with each of the scenarios whereas ascription of responsibility and connectedness to place did not show any changes. Overall, the two most emotion-evoking scenarios, Best Case Scenario and Worst Case Scenario, turn out as superior over the Business as Usual Scenario, which points to the relevance of emotional framing for effective messaging in our sample. This is the first systematic, quantitative assessment of the effects of future scenarios as a communication tool.

Keywords: future scenarios, intentions, consideration of future consequences, coastal communities, co-creation

INTRODUCTION

The importance of achieving the 2030 Agenda of Sustainable Development is globally recognised and 17 goals (SEGs) have been formulated, representing 17 areas of importance. What has been discussed less so far is how these 17 global goals are to be translated and communicated on a local scale; ideally by developing and evaluating tailor-made strategies for different locations and challenges.

Facing social and economic struggles, many communities around the world are balancing the conflict between their everyday needs and the needs of future generations, possibly compromising environmental sustainability. This is because making sustainable choices might result in immediate economic disadvantages, which can have particularly severe consequences in the Global South. Most subsistence communities are forced to prioritise day-to-day adaptation to an ever-changing environment, which they closely depend on for food, health and livelihood over long term strategies for sustainable development (Kroll et al., 2019; Scharlemann et al., 2020). Research on human perceptions and behaviour systematically over-represents university samples from industrialised Western countries, leading to an information deficit around decisions, behaviour and communication strategies of people who live in developing regions and are directly affected by the conflict between everyday subsistence and sustainable development.

Future scenarios are a popular means to communicate the potential prospects of climate change (for example see IPCC, 2021) and might be a means to engage communities and policy makers around the world in sustainable development. The psychological and emotional effects of scenarios as communication tool, especially on lay audiences, are still under researched and direct links between future scenario communication and sustainable action are questionable (Dieckmann et al., 2017; Guilbeault et al., 2018; Xexakis and Trutnevyte, 2021). Very complex graphs or tables can even lead to confusion and reactance (McMahon et al., 2015). It is therefore recommended to customise formats of future scenarios to the audience (Corner et al., 2018; Xexakis and Trutnevyte, 2021), for example with the use of non-technical solutions such as narratives or visuals. These formats, however, still lack thorough evaluation for their effects. In this work, we aim to evaluate the psychological and emotional effects of engaging with future scenario narratives and the co-creation of future scenario visuals. To increase the significance of this technique beyond the Western context, this study has been conducted in Palawan, the Philippines, an area that does not only represent a region of particular ecological vulnerability, but also provides insights into understudied communities (Henrich et al., 2010a,b). This research is part of the GCRF Blue Communities project¹ which aims to support sustainable co-management of marine resources whilst protecting marine ecosystems and enabling alternative livelihoods via capacity building as a collaborative

approach between the United Kingdom and South-East Asian countries.

This is the first systematic assessment of the psychological and emotional effects of differently framed scenarios.

FUTURE SCENARIOS: FORMS AND APPLICATION

Developing alternative scenarios to depict different variations of how the future might look like is not new (Fontela and Hingel, 1993) and is used in scientific-, socio- political-, business-, and communication contexts. As Schoemaker (1995) points out in his book, scenarios can be both an outcome of traditional, numeric data simulation or of “soft” data, like cultural frameworks, community structures, political regulations, values and human behaviour, integrating quantitative and qualitative methodologies. The scenarios themselves can take different forms: They can be presented traditionally in the form of graphs or tables, but also as narratives (Steenberg et al., 2019), drawings (Löfström and Klöckner, 2019), infographics, (augmented) photographs (see Tress and Tress, 2003; Sheppard, 2012), GIS-maps (Dockerty et al., 2005) or in virtual reality (Lovett et al., 2002).

Natural scientists develop precise prospects on a variety of dimensions such as levels of carbon emissions, nitrogen in the atmosphere, or fish stocks (Fernandes et al., 2015; Queirós et al., 2016). Another form of future scenario is developed by the International Panel for Climate Change (IPCC). The IPCC's end-of-century emission scenarios depict what the world would look like under different, almost antithetic regimes (globalisation vs. regionalisation; conservation vs. economy) (IPCC, 2021). These scientific scenarios are used within scientific frameworks but also consulting socio-political decision making (Sala et al., 2000; Merrie et al., 2018). Businesses including large commercial companies have a history to develop future scenarios to gain economic advantages and enhance their resilience (Schoemaker, 1991, 1995). In participatory workshops around the world, scenarios have been co- developed and used as a communication tool to enrich dialogues or inform local policy making (for examples see Berkhout et al., 2002; Kok et al., 2007, 2015; Kok and van Vliet, 2011; Varela-Ortega et al., 2013; Intergovernmental Panel on Climate Change, 2014). According to anecdotal remarks during these workshops, alternative scenarios might have the potential to engage people with the relationship between the current situation and potential futures (Amer et al., 2013), evoke higher levels of problem awareness and encourage community members and policymakers in solution development (Johnson et al., 2012; Sheppard, 2012) and support the identification of obstacles for change processes, such as finances, governance structures (Kok et al., 2011) or a lack of trust (Tress and Tress, 2003). Scenarios might even contribute to larger scale system change (Moss et al., 2010; Darbas et al., 2011). Systematic, empirical evaluation of potential psychological and emotional effects as well as whether any subsequent behavioural changes are attributable to the scenario work are so far lacking (O’Riordan et al., 2008; Measham et al., 2012).

¹www.bluecommunities.org

PSYCHOLOGICAL PRINCIPLES AND BIASES DRIVING SUSTAINABLE BEHAVIOUR CHANGE

There are numerous barriers for climate action (for an overview see Gifford, 2011). The ones that can potentially be addressed with the help of co-created future scenarios include non-accessible, specialist information, ignorance and numbness, psychological distance, and temporal discounting.

Tailored Communication

Lack of environmental action on individual and communal level is commonly interpreted as the result of an information deficit (Lorenzoni et al., 2007); however, increasing the availability of natural science evidence *per se* (e.g., evidence on climate change effects) has not been found to be a strong, direct trigger of sustainable behaviour change (Whitmarsh, 2011). A range of principles have been discussed to improve the accessibility of communication about sustainability which are based on knowledge about fundamental abilities and constraints of the human brain to perceive time and the future (for an overview see Klöckner, 2015). One of the key recommendations is audience-tailored communication which has the potential to spark environmental action (Moser, 2010, 2014; Mycoo, 2015; Harold et al., 2020). Further, messages are processed more successfully when they are made easy to understand for lay people and experts alike (Behavioural Insights Team, 2010; Center for Research on Environmental Decisions, 2014), emphasise a social dimension (Zlatev et al., 2010; Bain et al., 2012) tell a story or refer to a well-known narrative (Garb et al., 2008; Pahl and Bauer, 2013; Nabi and Green, 2015) and consider the human preference of visual information processing (Nicholson-Cole, 2005; Sheppard, 2012; Corner et al., 2015). As an example, Sheppard (2005, 2008) and Sheppard et al. (2011) created realistic imagery depicting the future of local landscapes as a means of engaging community members with climate change to support sustainable regional development. The researchers report that community members responded with increased engagement, understanding and joint environmental decision making, however, they point out that systematic evidence on psychological and emotional effects is needed to understand these processes better.

Emotional Engagement

Ignorance and numbness are common barriers of climate action. Communication is considered impactful, persuasive and lead to action if it evokes emotions (Pooley and O'Connor, 2000; Slovic et al., 2002). This holds for both positive and negative emotions (O'Keefe and Jensen, 2009; Nabi and Myrick, 2019), discrete emotions and transforming emotions [emotional flow, Nabi and Green (2015) and Nabi et al. (2018)]. Positive emotions such as hope have been found to encourage pro-environmental behaviour (Ojala, 2012), but only if specific actions are included in the message (Hornsey and Fielding, 2016). Negative emotions such as fear or anger as reactions to a story or visual usually evoke strong responses which could be used as catalyst (Pestridge, 2017; Hornsey and Fielding, 2020).

In both cases, it is vital to combine the (positive or negative) message with action information to facilitate the feeling of self-efficacy (Tannenbaum et al., 2015) and thereby prevent unwanted responses such as ignorance or rejection. Previous studies provide contradicting evidence regarding emotional framing and behaviour change. Feinberg and Willer (2011) found reactance effects caused by (negative) emotional scenario framing whereas Nabi et al. (2018) claims that positive and negative framing of climate change messages leads to attitude and behaviour change, mediated by emotions like hope and fear. According to the Extended Dual Process Model, individuals only take emotionally motivated action if they feel able to undertake the necessary action that can avoid the threat (Witte, 1992). For scenarios, this implies that positively or negatively framed future visions such as Best- or Worst-Case Scenarios might have stronger effects on motivation and behaviour compared to an emotionally neutral prospect if combined with specific action advice.

Consideration of Future Consequences

One core psychological mechanism impeding sustainable engagement is that the impacts of many pressing environmental problems, such as climate change and sea-level rise, have been found to be perceived as “psychologically distant.” This means that these threats are seen as geographically distant (Lorenzoni et al., 2006, 2007), happening at a point in time that is too far away to relate to Pahl et al. (2014), and happening to others rather than to ourselves (Spence et al., 2012; Myers et al., 2013). Researchers are exploring ways to overcome this psychological distance to encourage sustainable behaviour change, for example, through proximation of climate change by presenting people with information about local climate change effects (Spence and Pidgeon, 2010; Brügger et al., 2015), by using tangible time horizons (Tonn et al., 2006) and by communicating via common narratives or experiential visualisation, such as the Future Delta 2 video game (Dulic et al., 2016; Breves and Schramm, 2021) or the ecosystem simulation game ECO (Fjællingsdal and Klöckner, 2019). These recommendations could be combined in co-created future scenarios. As one core characteristic of future scenarios is the temporal dimension, they might have the potential to help people overcome the temporal discounting bias (assuming that environmental problems will only take place in the far future) and to start taking more responsibility for their current actions. In a meta-analysis, Milfont et al. (2012) show that people considering the future outcomes of their actions more, behave more environmentally friendly. Stable interindividual as well as intercultural differences in the level of how much people consider the future consequences can explain variance in actual environmental engagement (Bain et al., 2015). This concept has been conceptualised as a trait measure, called consideration of future consequences (CFC; Strathman et al., 1994; Joireman et al., 2012; Arnocky et al., 2014). It represents the level of how much people think in long- or short time horizons and consequently adapt their actions. So far, no research is available demonstrating if or how CFC could be strengthened to benefit sustainable development.

CURRENT STUDY

In the current research, we sought to explore the effects of co-created future scenarios as a communication tool. More precisely, we assess changes in a selection of psychological and emotional variables as a consequence of engaging creatively with a future scenario that was either emotionally framed (Best Case Scenario and Worst Case Scenario) or neutrally framed (Business as Usual Scenario).

The study sample falls into the category of non-WEIRD societies, which have been found to differ from WEIRD samples in several characteristics like risk perception, decision making or moral reasoning (Henrich et al., 2010a,b; Arnett, 2016), requiring suitable measures and methods. The study design as well as the survey questionnaire were co-created by resident and international researchers and adapted to local circumstances, resulting in a unique set of variables. The commitment of the Blue Communities project to deliver capacity-building points toward a special interest in variables that represent agency and means to drive and manage sustainable development on the community level.

Selected Constructs and Measures

The variables we identified during stakeholder consultations ahead of this study as well as borrowed from popular theories from environmental psychology such as the Theory of Planned Behaviour and the Norm Activation Model (Schwartz, 1977; Ajzen, 1991). Intentions to engage in sustainable behaviour (Int_sust), consideration of future consequences (CFC), perceived behavioural control (PBC), ascription of responsibility (ASC), connectedness to place and emotions (worry, hope, fear, anger, curiosity, and empowerment) have been included.

As a key determinant of pro-environmental behaviour, an adapted measure for behavioural intentions has been included with one item (*In the near future, I want to engage in more work that helps my community to be sustainable*) (Ajzen, 1991). As behaviour change for sustainable development in our study site encompasses a large variety of actions (e.g., selective fishing methods or uptake of alternative livelihoods), we opted for a more general term. It is to note that this stands in contrast with the recommendation by Kaiser and Gutscher (2003) to adapt the specific level of the behavioural intention measure with the behaviour in question. In our case, we decided to opt for the general measure to allow individual interpretation of the item and keep the survey short.

Judgements of how easy behavioural performance is perceived are reflected in *perceived behavioural control* (PBC). We included one item for this construct (*I think it is difficult to do something for my community as an individual*, reversed) adapted from Ajzen (1991). Especially in the context of sustainable practices, behaviours might seem complicated or unfamiliar, leaving people with low confidence to engage in them (Armitage and Conner, 2001; Lorenzoni et al., 2007; Simmons and Fielding, 2019). According to our consultations, local stakeholders and communities often struggle with a

sense of disempowerment and helplessness, making PBC a key construct to include.

The feeling of being responsible for negative consequences if not acting pro-socially is represented by the psychological construct *ascription of responsibility* (ASC) (De Groot and Steg, 2009). Traditionally part of the Norm Activation Model (Schwartz, 1977), ASC is known as an indirect predictor of intentions for pro-environmental behaviour (Bamberg and Möser, 2007; Klöckner, 2013; Han, 2014). Feeling responsible for the sustainable development of the community has turned out to be a key theme that can spark sustainable behaviour change (Kaiser and Shimoda, 1999), especially in small communities in low-income countries (Simmons and Fielding, 2019). We included one item (*I don't feel responsible for the problems of my community*) adapted from Doran and Larsen (2016).

When it comes to sustainable change-making, considering the future consequences of our actions today is of key relevance. The trait measure "*Consideration of Future Consequences*" (CFC) can explain inter-individual differences in future-oriented behaviour and reflects the extent to which people consider the distant and imminent consequences of their behaviour (Arnocky et al., 2014; Murphy and Dockray, 2018). This concept is related to the expression of pro-environmental, -social and -health related intentions and involvement (Joireman et al., 2001, 2012). We included a shortened, five-item CFC scale suggested by Joireman et al. (2012) measuring the Future dimension of CFC (example item: *In the near future, I want to engage in more work that helps my community*).

Feeling connected to a particular place or region has been found to drive pro-environmental behaviours such as sustainable land management, clean-ups, recycling or water conservation (Vaske and Kobrin, 2001; Scannell and Gifford, 2010). The nature and size of this place can vary, which means that for some people it might be the own property (Stedman, 2002), for some it is a national park (Halpenny, 2006), for some it is their country (Laczko, 2005; Bonaiuto et al., 2006; Gustafson, 2009) and for some an even wider area such as the planet as a whole, which is reflected in our measurement levels. To assess on what level of abstraction our participants experience place connectedness, we asked them how connected they feel to their city, region, country and the world as a whole (adapted from Williams and Vaske, 2003).

All above-mentioned constructs were measured on a 1 (*Strongly disagree*) – 5 (*Strongly agree*) Likert scale.

People's decision making is also influenced by their *emotions*, which is known as affect heuristic (Slovic et al., 2002). According to Sheppard (2005), being exposed to scenarios leads to affective responses and the urge to adapt and prepare for the future, however, the author is not specific on the type of emotions. As we expect a range of different emotions to be evoked, also depending on the type of scenario developed, we included six basic emotions, worry, hope, fear, anger, curiosity and empowerment, measured via the Positive and Negative Affect Schedule (PANAS, *Thinking about the future makes me feel...*) (Watson et al., 1988). The selection of emotions was based on literature documenting the effects of climate change

scenario communication (Nicholson-Cole, 2005; Sheppard, 2005; Healey and Hodgkinson, 2008).

RESEARCH QUESTIONS

RQ1: How does engaging with future scenarios affect Int_sust, CFC, PBC, ASC, Con_place, and emotions?

RQ2: Does engaging with emotionally framed scenarios affect Int_sust, CFC, PBC, ASC, Con_place, and emotions differently as compared to the non-emotionally framed scenario?

RQ3: Does the initial level of CFC influence the effect that future scenarios have on Int_sust, PBC, and ASC?

MATERIALS AND METHODS

Scenario Development

The Blue Communities project engages with communities from three regions across Palawan (Puerto Princesa, Aborlan, and Taytay) of which one (Taytay) was selected as a focus area for this study. In collaboration with 23 local stakeholders from various sectors such as the local government, NGOs, representatives of fisheries, aquaculture and tourism, three scenarios were developed (see Table 1 in **Supplementary Document 4** for list of attendees; see **Supplementary Document 4** for more details on this process). The first scenario, Business as Usual (BAU), represents the continuation of the current situation and its developments into the future (see **Supplementary Document 1**). Under this scenario, the current local problems of the local community such as illegal fishing, mangrove cutting and commercial fishing vessel intrusion were narrated and the most likely future outcomes in the next 15 years were depicted. The second scenario, termed here as Worst Case Scenario (WCS), represents the communities' least desirable future (see **Supplementary Document 2**). In this scenario, current developments have been driven toward a negative extreme through the narrative: steeply declining fish stocks and dead coral reefs, malnourished children, epidemic diseases and ubiquitous pollution. The third scenario is a depiction of the communities' most desirable future, the Best Case Scenario (BCS) (see **Supplementary Document 3**). This scenario narrates how through management interventions, a sustainable future was achieved including for example well performing officials, successful mangrove restoration, coral reef protection and sustainable fishing practices. All three scenarios depicted a version of the future in 15 years' time, following the recommendations to use a human time horizon (Pahl, 2010; Pahl et al., 2014). The development of the scenarios followed the principle of participatory research by Green et al. (2003), according to which the research process is gradually co-shaped by researchers and participants, and scenarios were elicited with group work manuals adapted from Mansfield (2018) (exact task instructions in the Appendix).

The rich volume of information provided by the stakeholders was collaboratively synthesised by the research team and turned into three coherent narratives (see **Supplementary Documents 1–3**). As a common element, all three narratives revolved around one protagonist, representing a stereotypical local family.

Design and Procedure

The study design was a 2 (time: pre, post) \times 3 (scenarios: BC, BAU, WC) mixed-design (see **Figure 1**). The study took place in September 2019 over the course of 1 day, starting in the morning with the general registration as well as explanations on the general nature and ethics of the study given by the local head researcher (AA). Subsequently, the first part of the survey (please see **Supplementary Document 5**, Part 1) was administered in form of a paper and pencil survey, which they had to fill out quietly and seated separately from each other. In case of difficulties with filling out the survey, trained local facilitators supported the participants without influencing their answers. Subsequently, the students were divided into three groups and instructed to move to the designated separate classroom. Each group was accompanied by two researchers, one of which was responsible for reading out and discussing one of the scenario narratives, while the second researcher had a supervisory role. After the three scenario narratives were read out to the respective groups, the students were provided with drawing equipment and instructed to use the following 2 h to discuss and illustrate the narrative they just heard in small groups of 3–5. Examples of the scenario drawings are shown in **Figures 2–4**. After 2 h spent drawing within their groups the second part of the survey was administered (please refer to **Supplementary Document 5**, Part 2).

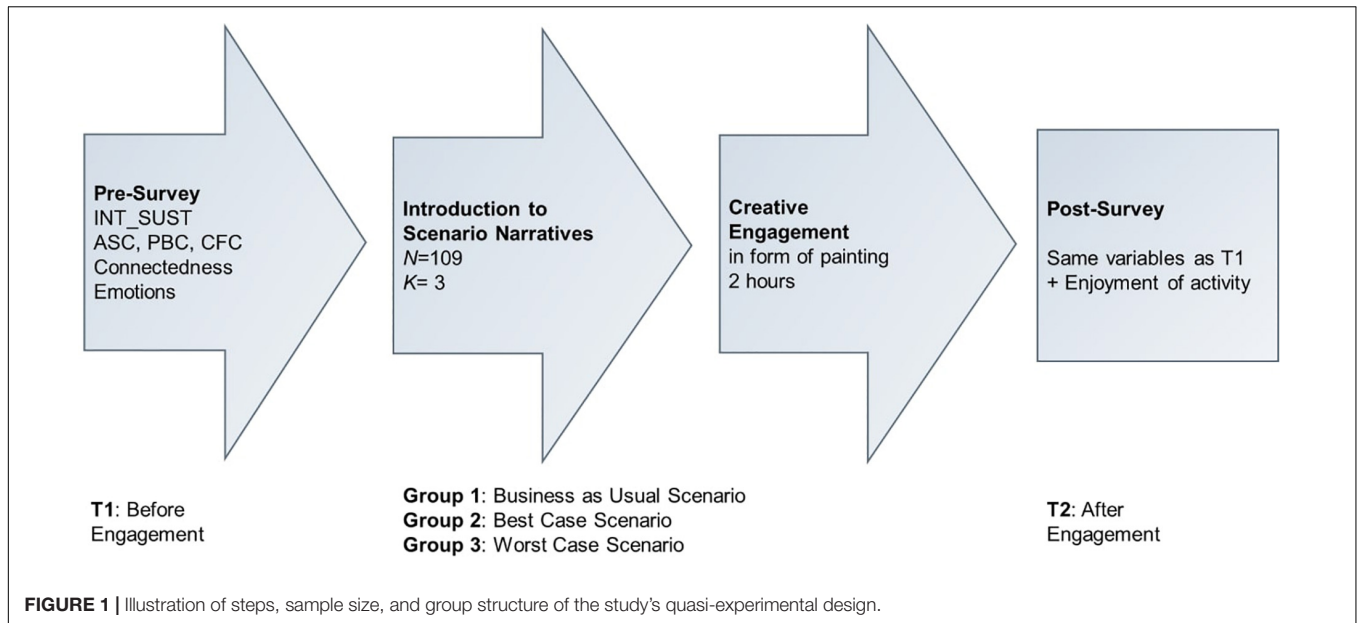
Sample

The participants ($N_1 = 109$) were recruited via their teachers from Central Taytay National High School in the municipality of Taytay and the study took place during normal school hours. Slightly more girls (52.3%) than boys (44.7%) participated and all of them came from the Philippines (of which 98% grew up in the study area) originally. Their age ranged between 12 and 18 ($M = 16.37$) and they visited 7th to 12th grade.

Data Analysis

For the data analysis, initial checks were carried out for all analyses in terms of outlier analysis, checks for normality, homogeneity of variance, multicollinearity and independent observations. Cronbach's Alpha across the five CFC items has been calculated and can be regarded as questionable with $\alpha = 0.64$. However, Nunnally (1978) states that Alphas slightly lower than $\alpha = 0.70$ can be accepted when a small number of items is used or if the research is using under-researched samples or measurements, which is the case here. Therefore, we proceeded to calculate one mean score across the five CFC items for each participant. We also report effect sizes, using (Cohen, 2013) conventions of $\eta^2 = 0.01$ as small, $\eta^2 = 0.06$ as medium and $\eta^2 = 0.14$ as large.

A Mixed Model analysis was conducted for behavioural Int_sust, CFC, PBC, ASC as well as aggregated emotions with the different scenarios as between-group variable and controlling



for the level of enjoyment of activity², gender and age. To investigate the initial level of CFC or emotions affects the

²The pattern of results and significance levels remain the same if the variables enjoyment of activity, gender and age are added or removed. This rules out that our effects are based on the participants' enjoying of the group work rather than on the engagement with the scenario content.

reaction to the scenario intervention, CFC was added as a covariate into the Mixed Model investigating Int_sust, PBC, and ASC. To receive a more detailed picture on emotional reactions, single mixed model analyses were performed on each emotion (hope, curiosity, empowerment, anger, worry, and fear) separately.



FIGURE 3 | Example of the Worst Case Scenario drawing, converted into a mural painting in Taytay town after the study was conducted.

RESULTS

Intentions to Engage in Sustainable Behaviour

There was a significant main effect of *Int_sust* across the two time points, $F(1,97) = 21.79, p < 0.001, \eta^2 = 0.18$ ($M_{before} = 4.21; SE_{before} = 0.06$; to $M_{after} = 4.53, SE_{after} = 0.06$). In addition, we also found a significant interaction between time and scenarios $F(2,97) = 10.98, p < 0.001; \eta^2 = 0.19$. Following up this interaction, there was no significant change in the Business as Usual Scenario group from time 1 to time 2. However, the mean scores for both, the Worst Case Scenario group and the Best Case Scenarios group increased significantly over time. Visual inspection of the estimated marginal means revealed that the biggest changes could be recorded for the Best Case Scenario group, however, the increase was not significantly larger than the increase for the Worst Case Scenario group (see **Figure 5**).

Consideration of Future Consequences

We observed a slightly different pattern for CFC as there was a significant main effect across the two time points, $F(1,93) = 30.04, p < 0.001, \eta^2 = 0.24, (M_{before} = 3.72; SE_{before} = 0.45; M_{after} = 3.95, SE_{after} = 0.47)$ but no significant interaction between time points and activity (see **Figure 6**).

This indicates that all types of scenarios lead to a greater level of CFC with the Worst Case Scenario recording the strongest change upon visual inspection, however, not significantly stronger than the other two scenarios (see **Figure 6**).

Consideration of Future Consequences as Covariate

If we control for the initial level of CFC, the significant main effect of *Int_sust* disappears, indicating that the change that we observed before and after engaging with the scenarios depends more on the initial level of CFC than the type of scenario. The crossover interaction between time and activity remains significant $F(2,92) = 9.51, p < 0.001; \eta^2 = 0.17$, indicating that *Int_sust* is increasing in the Best- and Worst Case Scenario whereas it remains relatively stable in the Business as Usual Scenario as visualised in **Figure 7**.

Perceived Behavioural Control

Perceived behavioural control increased over time $F(1,98) = 3.96, p < 0.05, \eta^2 = 0.04, (M_{before} = 3.04; SE_{before} = 1.19; M_{after} = 3.30, SE_{after} = 1.27)$, but similar to CFC, no interaction between the type of scenario and the increase of PBC was observed. Due to the non-normality of the perceived behavioural control variable, we



FIGURE 4 | Example of the Best Case Scenario drawing, converted into a mural painting in Taytay town after the study was conducted.

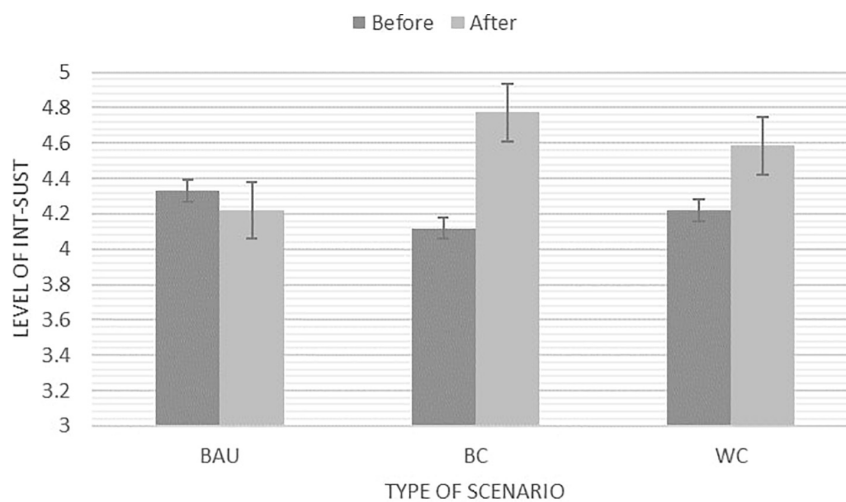


FIGURE 5 | Estimated marginal means for Int_sust before and after the creative engagement with three different types of scenarios: BAU, Business as Usual; BC, Best Case Scenario; and WC, Worst Case Scenario. NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (Strongly disagree) – 5 (Strongly agree).

suggest applying a more conservative p -value of $p = 0.01$ which indicates treating this effect with caution.

Emotions

Aggregated Positive Emotions

There was a significant main effect of positive emotions across the two time points, $F(1,96) = 12.43$, $p = 0.001$, $\eta^2 = 0.15$ indicating stronger positive emotions (on aggregated level) after

the scenario engagement $M_{before} = 3.02$; $SE_{before} = 0.04$; to $M_{after} = 3.17$, $SE_{after} = 0.04$. In addition, we also found a significant interaction between time and scenarios $F(2,96) = 4.03$, $p = 0.021$; $\eta^2 = 0.08$. Following up this interaction indicated that there was no significant change in the Business as Usual Scenario group from time 1 to time 2, whereas the Best Case Scenario and the Worst Case Scenario lead to significant increases in positive emotions with the Best

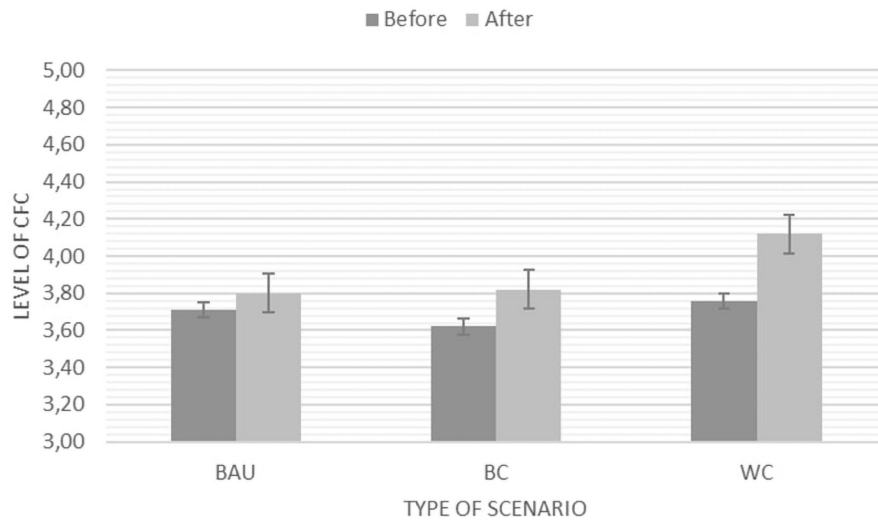


FIGURE 6 | Estimated marginal means for CFC before and after the creative engagement with three different types of scenarios: BAU, Business as Usual; BC, Best Case Scenario; and WC, Worst Case Scenario. NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (*Strongly disagree*) – 5 (*Strongly agree*).

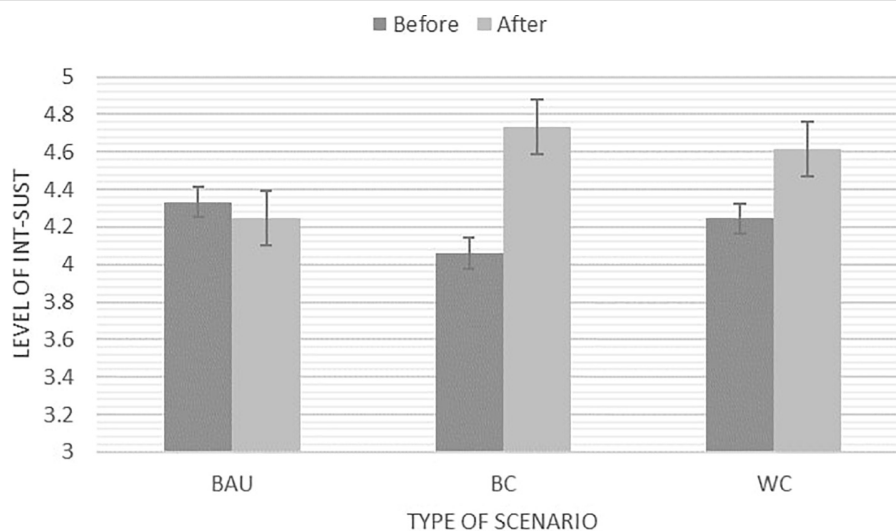


FIGURE 7 | Significant interaction between scenarios after adding CFC as covariate. NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (*Strongly disagree*) – 5 (*Strongly agree*).

Case Scenario showing the strongest effects as visualised in **Figure 8**.

Aggregated Negative Emotions

Aggregated negative emotions did not show any significant changes over the course of the engagement with the future scenarios $F(1,97) = 0.05$, $p = 0.953$, $\eta^2 = 0.001$; $M_{before} = 2.24$; $SE_{before} = 0.06$; to $M_{after} = 2.29$, $SE_{after} = 0.06$.

Individual Emotions

The General Linear Model across each of the six measured emotions individually shows that we can identify significant changes in three emotions: hope, empowerment, and anger.

Hope showed a significant main effect $F(1,98) = 12.86$, $p = 0.001$, $\eta^2 = 0.12$ with higher average values of hope after the engagement of the scenario than before ($M_{before} = 3.95$; $SE_{before} = 0.08$; to $M_{after} = 4.27$, $SE_{after} = 0.07$). Visual inspection points toward the Best Case Scenario inducing the strongest increase, albeit not significantly different from the Worst Case Scenario and Business as Usual.

Both a significant main effect $F(1,96) = 15.89$, $p < 0.001$, $\eta^2 = 0.14$ ($M_{before} = 3.85$; $SE_{before} = 0.07$; to $M_{after} = 4.19$, $SE_{after} = 0.07$) and a significant interaction $F(1,98) = 3.25$, $p = 0.04$, $\eta^2 = 0.06$ were found for the feeling of empowerment after the engagement with our three scenarios. We need to be cautious with interpreting this particular interaction, as the

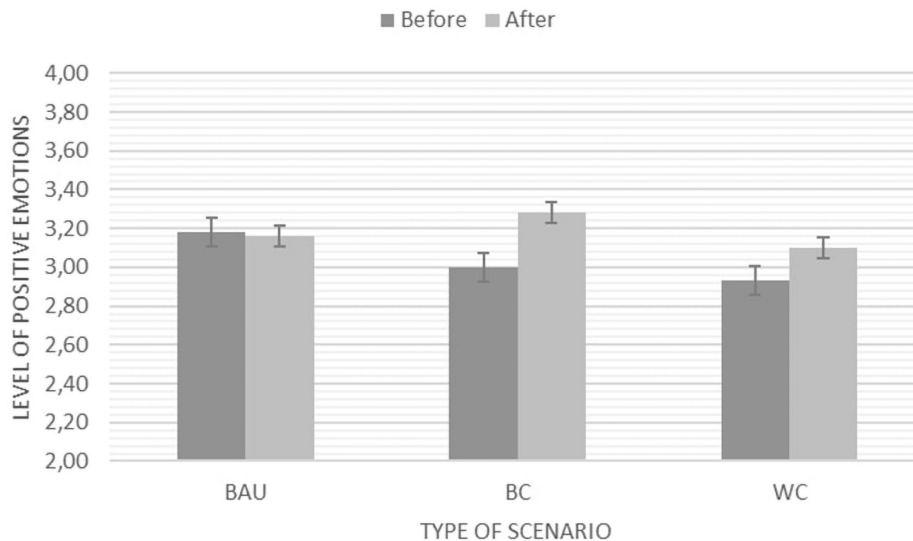


FIGURE 8 | Significant main effect and interaction for positive emotions before and after engaging with one of the three scenarios (BAU, Business as Usual; BC, Best Case Scenario; and WC, Worst Case Scenario). NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (*Strongly disagree*) – 5 (*Strongly agree*).

before-level in the Business as Usual group deviates from the before-level of the other two scenarios as can be seen in **Figure 9**, albeit not significantly.

We found a significant main effect for the feeling of anger after the engagement with the future scenarios. Individual inspection of the values shows that the Worst Case Scenario increased the most, however, not significantly more than the Best case and the Business as Usual Scenario (see **Figure 10**). Overall, we can note that the levels of anger were relatively low compared to other emotions. Curiosity, worry and fear did not significantly change throughout the activity.

Additional Analyses

ASC did not significantly change across time $F(1,98) = 2.73$, $p = 0.102$, $\eta^2 = 0.03$; $M_{before} = 3.79$; $SE_{before} = 0.09$; to $M_{after} = 3.97$, $SE_{after} = 0.10$ and no meaningful differences could be observed between before and after our intervention for connectedness to place, i.e., connectedness to the city $F(1,98) = 2.55$, $p = 0.11$, $\eta^2 = 0.03$; $M_{before} = 3.96$; $SE_{before} = 0.09$; to $M_{after} = 4.08$, $SE_{after} = 0.09$, the region $F(1,98) = 0.108$, $p = 0.30$, $\eta^2 = 0.01$; $M_{before} = 3.83$; $SE_{before} = 0.09$; to $M_{after} = 3.90$, $SE_{after} = 0.09$, the country $F(1,98) = 0.58$, $p = 0.45$, $\eta^2 = 0.006$; $M_{before} = 4.11$, $SE_{before} = 0.09$; to $M_{after} = 4.06$, $SE_{after} = 0.09$ or the world $F(1,98) = 0.10$, $p = 0.75$, $\eta^2 = 0.001$; $M_{before} = 3.69$; $SE_{before} = 0.09$; to $M_{after} = 3.71$, $SE_{after} = 0.10$.

DISCUSSION

We sought to investigate whether engaging with different types of future scenarios affects people's behavioural intentions to engage in sustainable behaviour, consideration of future consequences, perceived behavioural control, ascription of responsibility, connectedness to place and emotions.

Overall, we can summarise that engaging with scenarios, especially the emotionally framed ones (Best Case and Worst Case Scenario), led to significant changes most variables we measured and that the construct consideration of future consequences deserves some special attention.

Responding to RQ1 and RQ2, we find increased levels of intentions to engage in sustainable behaviour after our intervention. However, it appears that the Best- and Worst Case Scenario were mainly responsible for this effect. A similar pattern was found for perceived behavioural control and positive emotions. In all these cases we found significant changes in the Worst- and the Best Case Scenarios but no or significantly lesser changes for the Business as Usual scenario. The Business as Usual Scenario was by definition created surprise-free and as close as possible to the realistic vision the community members of Taytay hold about their future. The instruction for the Best- and Worst Case Scenario, however, was to think out of the box and create future visions that drive the current positive (for the Best Case Scenario) or negative (for the Worst Case Scenario) developments of Taytay to the extreme. A possible explanation for the effects we found is that emotionally stimulating scenario narratives (Best- and Worst Case Scenario) are more impactful than narratives that focus on the most probable future which is in line with evidence showing that emotions are a key ingredient of impactful narratives (Pooley and O'Connor, 2000; Loewenstein et al., 2001; Lecheler et al., 2013; Nabi et al., 2018). This is supported by the theory of affect heuristics in decision making (Finucane et al., 2000; Slovic et al., 2002).

Looking closer at the effects the scenarios had on our participants' emotions, we found that especially positive emotions, hope and empowerment, were affected, but also the feeling of anger increased significantly. Aggregated positive emotions and also the individual measures of hope and empowerment increased after engaging with the Best Case

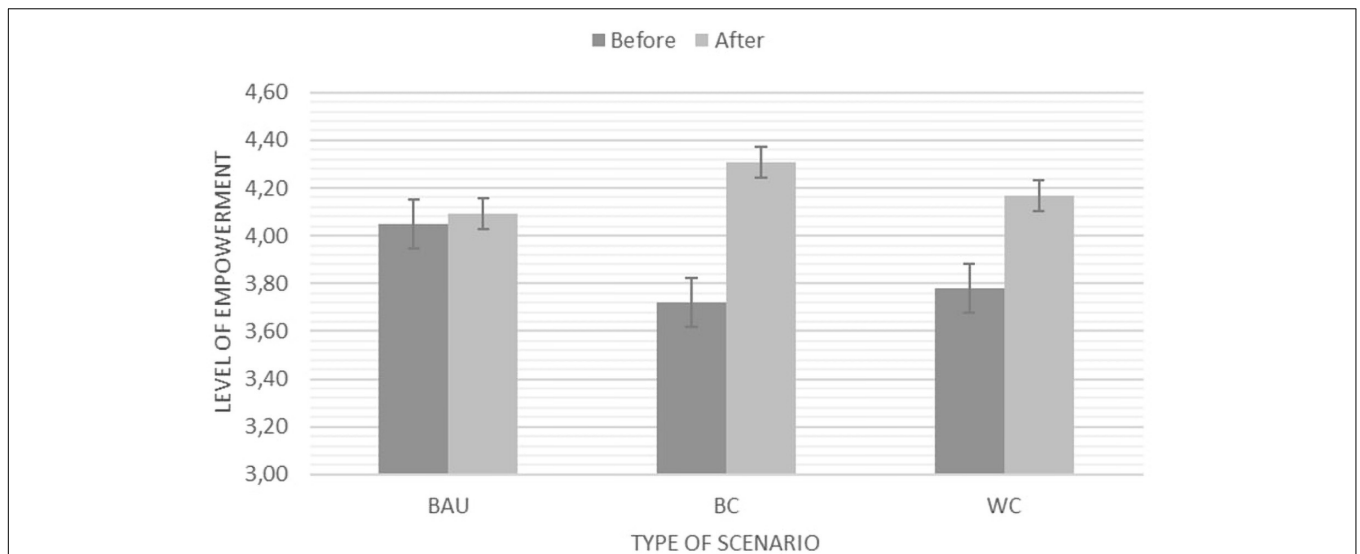


FIGURE 9 | Significant main effect and interaction for the feeling of empowerment before and after engaging with one of the three scenarios (BAU, Business as Usual; BC, Best Case Scenario; and WC, Worst Case Scenario). NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (*Strongly disagree*) – 5 (*Strongly agree*).

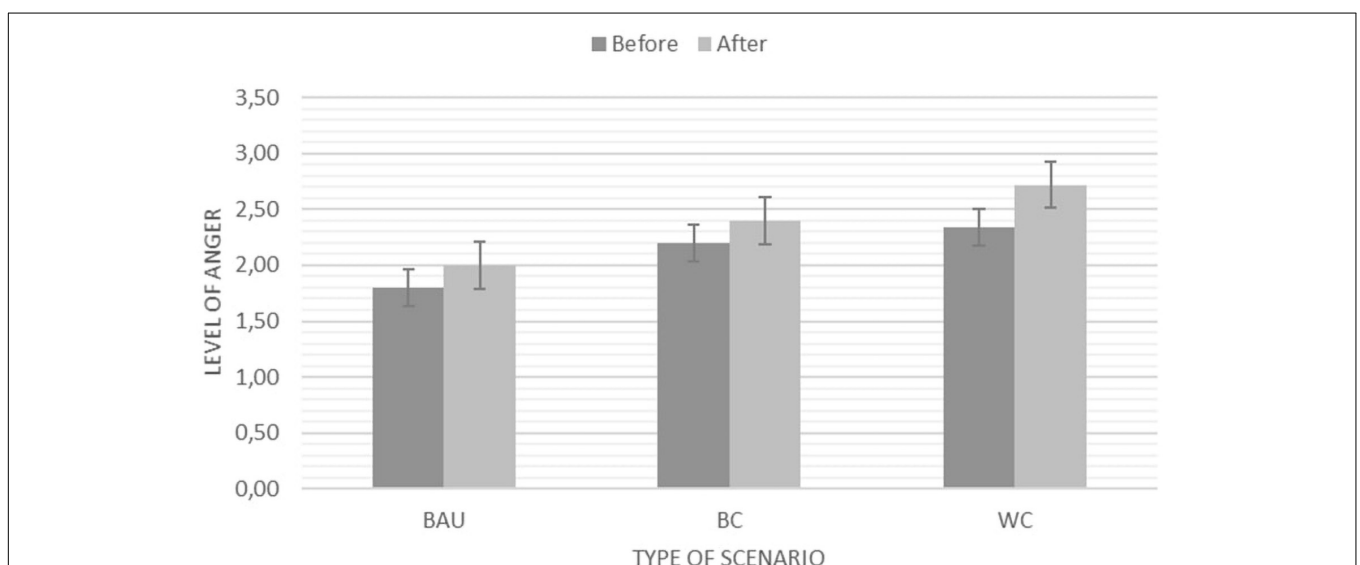


FIGURE 10 | Significant main effect for the feeling of anger before and after engaging with one of the three scenarios (BAU, Business as Usual; BC, Best Case Scenario; and WC, Worst Case Scenario). NB: Y-axis adapted for illustration purposes. The Likert scale ranges from 1 (*Strongly disagree*) – 5 (*Strongly agree*).

Scenario, a narrative that very positively depicted the future of Taytay, expanding on existing sustainable developments in the region including feasible solutions such as pro-environmental programs and investments. Overall, the Best Case Scenario induces the strongest emotional effects compared to the other two scenarios. This underlines how important it is to use positive language, present realistic solutions and thereby spark people's optimism.

The participant's positive emotions also increased after engaging with the Worst Case Scenario, but not with the Business

as Usual Scenario, which seems counterintuitive at first but mirror the findings by Nabi and Prestin (2016). Their study on emotionally consistent narratives shows that stories framed positively and including solutions (hope/high efficacy) equally boosted intentions to engage in protective actions as did stories that were framed negatively and without solutions (fear/low efficacy) as compared to emotionally inconsistent narratives. Our scenario narratives mimicked the same structure. In our case, the positive emotions evoked by the apocalyptic scenario might be related to wishes for rehabilitation and reconstruction and the

possibility of a new start for the community. As the Worst Case Scenario has been depicted overly negative, the positive emotions could also stem from the assumption that reality will most likely be better than the Worst Case Scenario and that there is still time to change course. Further, sustainability is a topic that is now taught in schools in Palawan, potentially leading to a sense of optimism amongst the children.

The rise of anger as a consequence of engaging with all three of the scenarios might be due to negative future prospects on which children in particular do not have a lot of influence as many problems are caused by the generation before them. This is in line with the finding that ascription of responsibility did not change across the activity indicating that the children did not feel more responsible for the state of their local area. A current lack of environmental law enforcement coupled with the limited allocation of resources to sustainable development projects in Palawan may leave children feeling angry. Adding open questions to elaborate more on the reason for and direction of the anger might have provided more insights. Overall, these findings confirm the assumption that emotionally framed scenarios evoke emotions which might work as a catalyst for intentions to engage in sustainable behaviour (Nabi et al., 2018, 2019).

Particular attention should be paid to RQ3, looking at the effects in the consideration of future consequences which is traditionally interpreted as a stable personality trait. One main hurdle for sustainable behaviour change is the lack of an apparent connection between current behaviour and future consequences (Gifford, 2011; Fauré, 2016; Wittmann and Sircova, 2018). We found that engaging with any of the three future scenarios led to a significant increase in consideration of future consequences. Compared to the other effects in which the emotional scenarios were superior, consideration of future consequences significantly increased across all three scenarios. This might indicate that it is the engagement with scenarios of any kind that helps people to establish a closer connection to the future and therefore consider the consequences of their behaviours more. The significant increase of consideration of future consequences across all conditions also indicates that the interpretation of consideration of future consequences as a stable trait might have to be reinterpreted as it can be manipulated by immersing people with future scenarios. Toepoel (2010) argues that consideration of future consequences is subject to slow changes over the course of life, driven by education or significant life events. However, we identified significant changes after only a few hours. We have reason to assume that creative engagement with future scenarios can have similar effects as significant life events. In contrast to significant life events, engagement with future scenarios can be induced in a single experimental setting. This is relevant evidence on the possibility to increase people's level of consideration of future consequences by co-creating future scenarios. This effect has not been discovered before and might, together with the increased level of perceived behavioural control after engaging with all types of scenarios provide some leverage for the development of effective communication strategies and eventually for sustainable behaviour change.

The finding that engaging with the future did not change our participants' connectedness scores shows that this factor remains stable over time and does not interfere with our results or is affected by our intervention. We also found the effects of our scenarios were independent of the demographic characteristics such as gender, age or education of our participants as well as of how much they enjoyed the activity. Especially as our study design was quasi-experimental, it is important to reaffirm in prospective studies that engagement with the scenarios is the reason for the effects we found. Within the GCRF Blue communities project, this experimental setting has been replicated in locally adapted designs in several other study sites. The data collected is currently being analysed and will complement the present study.

LIMITATIONS

From potentially confounding extraneous factors like noises, temperature and weather changes which can affect the participant performance, to variance in interpersonal interactions in the sub-groups the children were working in, there were some factors we could not fully control. This is due to the nature of the study being a field experiment taking place in the ordinary environmental of our participants, on a remote island with limited facilities to conduct controlled research experiments. To limit the impact of interpersonal interactions and conflicts that might have arisen, we controlled for the level of enjoyment of the activity in an additional survey question, which was added as a covariate to the analysis. This variable did not significantly affect any of our analyses, indicating that the activity was perceived as equally enjoyable by all our participants across conditions.

Another limitation is that we did not test several different scenarios of each type (BAU/WC/BC) against each other. Therefore, we cannot clearly say if it was the type of the scenario or the specific narrative leading to our effects. The quasi-experimental design further did not include a control group in which participants did not engage with any future scenario. The question if our effects are merely caused by a creative, social activity can be ruled out by the inter-scenario differences.

Another key limitation is the sample consisting of junior and senior students of the local High School located at the study site, in the city of Taytay. The age cluster between 12 and 18 coincides with puberty and is therefore an emotionally intense and challenging time for most teenagers. Despite the argument that emotion regulation develops across the whole lifespan (Cole, 2014), we are aware of this age cluster being particularly susceptible for emotional triggers (Burnett et al., 2011). Due to this particular age profile of our sample, we advise against generalising this conclusion across all age groups before additional studies have been conducted. Within our sample, we did not find that age differences affected the result patterns. This indicates that at least within the age range covered by our participants, no differences of scenario effects can be observed depending on how old the participants are.

The last limitation concerns the validity of our measurements and responses. To simplify and shorten the survey as much as

possible, we only included one item per psychological construct. Ideally, we would have used multi-scale instruments to average out potential measurement errors (Nunnally, 1978). Weighing up the reliability that can be gained by including more items against a possible response error, especially in a children sample, we decided to stick with one item per measurement. The responses could have been influenced by the wish of the children to reply in a socially desirable manner which we attempted to control as much as possible. To encourage the children to provide authentic answers, the facilitators did not interact with the children while they responded to the survey questions because direct interaction could increase social desirability effects (Miller et al., 2015). Furthermore, all participants were notified that the survey will remain anonymous and individual number codes were allocated to each child instead of their names.

CONCLUSION

Our study shows that scenarios, that were carefully designed according to the criteria of environmental communication, are powerful tools to communicate about sustainable development. Engaging with co-created, and locally relevant future scenarios significantly increased people's intentions to engage in sustainable behaviour, their consideration of future consequences, their perceived behavioural control and their positive and negative emotions. Especially emotionally framed scenarios seemed to have a strong effect on people's motivation to engage in sustainable behaviour change. This underlines the importance to communicate to people not only with factual information but on an emotional level when we want to see change.

Engaging with scenarios also seems to bridge the psychological distance between now and the future and change the individual levels of consideration of future consequences, which is a novel finding that is worth exploring further.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article can be made available on request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Faculty Research Ethics and Integrity

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Committee University of Plymouth. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

IR, JS, AA, and SP developed the study design. IR, SP, and EG-T developed the survey questionnaires. JS and AA were responsible for recruitment and correspondence with stakeholders and schools as well as planning of data collection, location, and infrastructure. IR, JS, AA, and LC collected the data and held the stakeholder meetings. IR coded and analysed the data, and wrote the manuscript. JS, AA, LC, and SP gave feedback to the manuscript. SP and LC supervised the project. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.627972/full#supplementary-material>

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