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The effect of Indonesian local culture integrated students' environmental awareness on SDGs: pls-sem approach

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ABSTRACT

Various ways have been carried out in the world of education to raise environmental awareness for students, but the efforts so far have not had a significant impact on sustainable development. Students have not fully demonstrated awareness of the environment. Therefore, this research was conducted with the aim of measuring student environmental awareness (EA) which integrates Indonesian local culture towards the Sustainable Development Goals (SDGs). This research design uses survey research. The method used in this study is a quantitative method with purposive sampling technique with a sample of 362 Biology Education students spread throughout Indonesia. This research questionnaire uses a Likert scale of 1-5. Data collection used a questionnaire containing statements totaling 17 items. All indicators as exogenous variables except SDGs as endogenous variables. This study used Structural Equation Modeling (SEM) analysis through the SmartPLS application. The research results show that there is an influence between culturally integrated environmental awareness, awareness of responsibility, and finding solutions to environmental problems against the SDGs. However, the indicator of realizing its role in the environment has no effect on the SDGs, even though the simultaneous influence of all exogenous variables is in the moderate category on the SDGs. The conclusion from this study is that there is a positive influence between culturally integrated environmental awareness, student awareness of responsibility for the environment, and awareness in finding solutions to environmental problems towards the SDGs, but still needs to be improved. Strengthening Indonesian local culture rooted in local wisdom in growing environmental awareness is urgently needed to achieve sustainable development goals. The recommendation in this study is that the use of an active learning approach, for example STEAM, which can stimulate creative problem-solving skills for environmental problems, can be a solution in developing students' environmental awareness.



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INTRODUCTION

Cultural values have an important role in education. Cultural recognition lies in valuing students who have different backgrounds and diverse cultures. This cultural background causes differences in learning experiences that affect or are influenced by the education of each student. Therefore, education must take into account and respect the local culture of students (Simamora & Saragih, 2019). In the context of education, the concept of culture also includes how education is implemented and developed, including learning approaches and strategies, curricula, evaluation methods, and so on. A culturally oriented education can help students feel valued, accepted, and motivated to learn. The concept of local culture in education can also help develop a deeper understanding of cultural diversity and can support the educational process (Kaso et al., 2019).

Paradoxes in education can be a challenge for educators and policy makers, as they must find ways to balance societal expectations with practical realities on the ground. However, with hard work and cooperation, there may be a solution that satisfies all parties. The concept of local culture in education is an integral part of an effective and inclusive learning process. This includes recognizing and respecting diverse cultural values, as well as learning and development strategies that are appropriate to the needs and characteristics of students. By taking student culture into account, education can be a more effective means of helping students reach their full potential (Fuller & Clarke, 1994; Masemann, 2003). Local culture provides color in growing students' environmental awareness.

Environmental awareness (EA) of the ecological problems caused by the climate crisis and its impact on global health has grown globally (Luque-Alcaraz et al., 2022). However, the fact is that there are still a few students who have EA by participating in environmental care activities (Oğuz et al., 2010), and educators also continue to discuss this (Hadzigeorgiou & Skoumios, 2013). In addition, the EA of students is still low (Amin et al., 2022; Lepiyanto & Pratiwi, 2015; Muthmainah et al., 2016). So far, there have been many studies on EA. EA studies have become the main focus in education and non-education in order to achieve the SDGs (Sustainable Development Goals) goals. However, growing EA based on local culture is still minimal, especially local culture in Indonesia. Indonesian culture based on local wisdom in Indonesia can become a new force for achieving the SDGs goals (Humaida et al., 2018). In fact, the importance of EA is for students to use local cultural values that are closely related to their lives. The SDGs are built using three main pillars, namely environment, social and economy (Dalampira & Nastis, 2020).

Through EA, environmental and social development that is closely related to local wisdom can strengthen the realization of the SDGs (Humaida et al., 2018; Sandoval-Rivera, 2020). Environmental awareness becomes green morals in facing the challenges of the character that inhibits the SDGs (Praja, 2021). The challenges of environmental development that can be built through EA are on SDGs 6 (clean water and proper sanitation), 11 (sustainable cities and settlements), 12 (responsible consumption and production), 13 (climate change management), 14 (marine ecosystems), and 15 (terrestrial ecosystem) (Bappenas, n.d.). One of the worrying data is Nearly 70 per cent of household drinking water sources contaminated by faecal waste (UNICEF, 2022).

There is a touch of education so that every human being is responsible for the environment that departs from culture. Although cultural differences can hinder globalization in expressing its nationalist attitudes (Sivamoorthy et al., n.d.), culture can increase environmental awareness activities and foster peace and tolerance, especially in education (Thor & Karlsudd, 2020). Culture-based learning is a learning strategy that emphasizes the achievement of an integrated understanding rather than just an inert understanding (Tanu, 2016).

The purpose of this study was to determine the effect of student environmental awareness integrated with local culture in Indonesia on the achievement of the SDGs. The research objectives are broken down into 4 namely to find out: (1) the influence of culture in environmental awareness of the SDGs; (2) the influence between responsibility for the environment and the SDGs; (3) the influence between the role of students on the environment and the SDGs; and (4) the influence between the solutions formed on environmental problems and the SDGs. The local culture of each region has wisdom in protecting and preserving the environment, for example the culture of planting an environmentally friendly *tugal* system, the culture of preserving national parks as a source of world oxygen, the '*repong damar*' culture of preserving damar as a typical plant on the West Coast of Lampung as part of community pride, the culture of preserving ironwood in Kalimantan, and other environmental

preservation cultures that characterize Indonesia, so they need to be instilled in students. This local culture combined with an active learning approach that can stimulate creative problem solving skills on environmental problems can be a solution in developing students' environmental awareness. This solution can be a hope that students can grow their environmental awareness with a cultural touch as an effort to realize the goals of the SDGs. Environmental awareness can be developed by adopting and appreciating local cultural arts (Alawi et al., 2022). Thus it is necessary to examine the effect of local culture-based student environmental awareness on the achievement of the SDGs goals.

The hypotheses formed in this study consist of 4 hypotheses namely: (1) there is a positive cultural influence on environmental awareness of the SDGs; (2) there is a positive influence between responsibility for the environment and the SDGs; (3) there is a positive influence between the role of students on the environment and the SDGs; and (4) there is a positive influence between the solutions formed on environmental problems and the SDGs. These four hypotheses form the structure of the model (figure_1) which are then tested in the presentation of the research results.

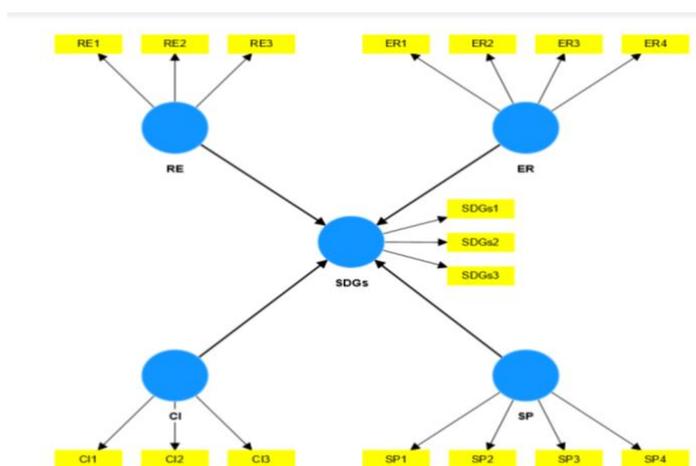


Figure 1. Model structure formed

METHODS

This research design uses survey research. The method used in this study is a quantitative method with purposive sampling technique. This research questionnaire uses a Likert scale of 1-5. Questionnaires were distributed in March 2023 in the form of a structured questionnaire to 417 Biology Education students in Indonesia. Respondents were students spread from the first year to the fifth year of college. After collecting responses from respondents, then the data is filtered based on the eligibility of the respondents and other errors. A total of 55 respondents were eliminated so that the total number of respondents became 362 who matched and met the criteria (Hair Jr et al., 2017). The number of samples is above 200 respondents so that it can be continued with statistical analysis (Bagozzi & Yi, 2012).

Data Analysis

Demographic Distribution of Respondents

Analysis of the description of the respondents consisted of 8.56% male and 91.44% female (Table 1) with a distribution dominated by students studying in the first year (32.04%), and most of them came from districts (82.04%). In addition to student characteristics, this data obtained information related to student family backgrounds such as the father's occupation was dominated as a farmer/breeder (36.19%), and parents' income was dominated by low income (49.17%).

Table 1

Demographic Distribution of Respondents (n=362)

No.	Demographic	Items	Frequency (Percentage /%)
1	Gender	Male	31 (8,56)
		Female	331 (91,44)
2	College year	First	116 (32,04)
		Second	80 (22,1)
		Third	112 (30,94)
		Fourth	46 (12,71)
		Fifth	8 (2,21)
3	From	City	65 (17,96)
		District	297 (82,04)
4	father's profession	Farmers/breeders	131 (36,19)
		Civil servants/ teachers/TNI/POLRI	53 (14,64)
		Entrepreneur	64 (17,68)
		Others	114 (31,49)
		Low	178 (49,17)
5	Parental income	Moderate	97 (26,80)
		High	87 (24,03)

Partial Least Squares (PLS)

This study uses Partial Least Squares (PLS) because PLS does not require normal data and the sample size does not have to be large (F. Hair Jr et al., 2014). The reason for choosing PLS refers to sample size, although the minimum number varies, for example 200 respondents (Hoelter, 1983), at least 100-150 respondents (Hair, 1995), between 200 and 800 respondents (Chin, 2000). Analysis using PLS was carried out through 2 stages, namely measurement and structural model construction. At the measurement stage carried out to obtain latent validity and reliability construct data. Reliability becomes strong as seen from the value of Cronbach's Alpha and composite reliability to determine the internal consistency of data.

The distribution of questionnaires used comes from the adaptation and modification of various instruments that have been compiled in previous studies. The following is a questionnaire distributed to students (Table 2). There are 6 indicators in the questionnaire that has been prepared, indicators of environmental awareness in realizing the SDGs are endogenous variables and other indicators are hexogenous variables. Exogenous variables consist of in this study there are 4 indicators, namely awareness of responsibility for the environment, awareness of its role in the environment, awareness of the environment with a cultural touch, and awareness in thinking about solutions to environmental problems. While the endogenous variable is the SDGs. Each indicator is measured using a questionnaire statement with 3-4 questionnaire questions. The EA questionnaire indicators are in Table 2.

Table 2

Environmental Awareness Questionnaire Indicators

No	Indicator	Variable	Code	Questionnaire Reference
1	Role in the environment (RE)	Exogenous	RE1; RE2; RE3	(Kim & Choi, 2005; TtLIKIDOU et al., 2002)
2	Environmental responsibility (ER)	Exogenous	ER1; ER2; ER3; ER4	(Chen & Tung, 2014; Kim & Choi, 2005; TtLIKIDOU et al., 2002); Ad Hoc Questioner
3	Cultural influences (CI)	Exogenous	CI1; CI2; CI3;	(TtLIKIDOU et al., 2002); Ad Hoc Questioner
4	Solutions to environmental problems (SP)	Exogenous	SP1; SP2; SP3; SP4;	(TtLIKIDOU et al., 2002); Ad Hoc Questioner

5	Sustainable development goals (SDGs)	Endogenous	SDGs1; SDGs2; SDGs3	(Chen & Tung, 2014)
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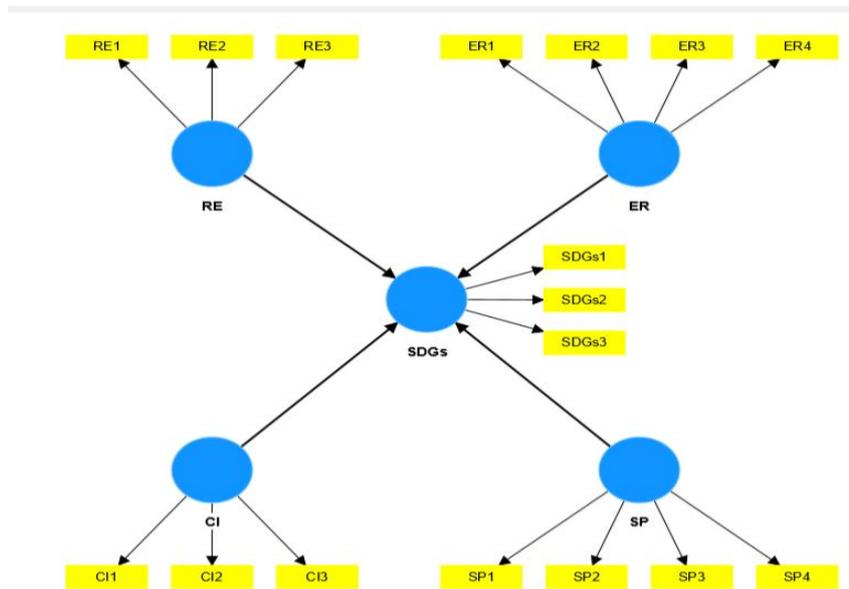


Figure 2. Model structure formed

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The validity test in Table 3 shows that all items are classified as valid, as can be seen from the value of outer loadings > 0.70. The Cronbach's alpha value for most of the exogenous variables was obtained, namely > 0.70, indicating that this instrument was reliable. Whereas for student response items to the environment < 0.70 were stated to be quite reliable. However, this item is supported by the Average Variance Extracted (AVE) value > 0.50 (Fornell & Larcker, 1981) so that convergent validity is good, meaning that all latent variables can describe 50% of the variance of each indicator (Götz et al., 2009). In addition, AVE is also to explain minimal errors. So that none of the questionnaire instruments is discarded.

Table 3
Construct Reliability and Validity

Item	Outer loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
The influence of culture in shaping environmental awareness					
CI1	0.847				
CI2	0.896				
CI3	0.815	0.814	0.83	0.889	0.728
Student responsibility towards the environment					
ER1	0.704				
ER2	0.751				
ER3	0.779	0.751	0.76	0.842	0.571

ER4	0.785				
The role of students towards the environment					
RE1	0.807				
RE2	0.786				
RE3	0.768	0.695	0.697	0.83	0.619
Environmental awareness as an effort to achieve sustainable development goals					
SDGs1	0.843				
SDGs2	0.849				
SDGs3	0.803	0.777	0.777	0.871	0.692
Extracted solutions to environmental problems					
SP1	0.739				
SP2	0.783				
SP3	0.744				
SP4	0.725	0.738	0.745	0.835	0.559

RESULT AND DISCUSSION

To realize the SDGs, adequate environmental awareness is needed. Every student has a varied awareness. This can be seen from the description of the respondent's data about the state of student demographics (Table 1). Student EA varies depending on various factors such as year of study, student origin, and other social aspects. However, it is also possible that students' environmental awareness can be influenced by other factors and can be seen from the emergence of three aspects, namely knowledge, attitudes, and behavior (Ahmad et al., 2015; Aminrad et al., 2013; Kanada et al., 2022; Zsóka et al., 2013)

Table 4

Significance of the Relationship in the Structural Model (Hypothetical testing with bootstrapped t value)

Hypothesized paths	T statistics	P values	Interpretation
CI -> SDGs	4.552	0	Positive Influence
ER -> SDGs	2.058	0.04	Positive Influence
RE -> SDGs	1.182	0.237	No effect
SP -> SDGs	6.208	0	Positive Influence

* Statistically significant at $p < 0.05$ (t-value > 1.960)

The hypotheses formed in the research are answered in Table 4. The results of the analysis show that hypotheses 1, 2, and 4 have a positive effect on the SDGs, while hypothesis 3 is rejected. In developing EA, cultural factors, having responsibility, and being able to produce solutions to environmental problems are needed. In Table 4, indicators of responsibility and generating solutions for the environment have a relatively small effect on efforts to realize the SDGs. This means that students realize that we have a responsibility towards the environment so that the carrying capacity of the environment can be increased. Armed with environmental knowledge, students can think of solutions to environmental problems to support the SDGs.

Indicators of realizing the role of students as a form of EA have no effect on SDGs support. This is a paradox, if students are aware of their responsibilities then they have the opportunity to take a role in protecting the environment (Iizuka, 2016; Situmorang & Tarigan, 2018). After the descriptive analysis was carried out, students were still confused about taking a role in overcoming environmental problems. At the level of providing solutions, students are reliable in providing ideas in solving environmental problems. However, further training is needed in playing an active role in managing the surrounding waste into environmentally friendly resources that are useful for human life and minimize the side effects of waste processing results. To further convince us about the influence of all exogenous variables on endogenous variables, it is necessary to look at the magnitude of the influence of each indicator, which can be seen using the effect size. The effect size of each indicator is described in Table 5.

Table 5

The effect size uses f-square

Indicator	SDGs
CI	0.094
ER	0.02
RE	0.005
SDGs	
SP	0.131

F-square is used to measure the effect size of exogenous variables on endogenous (Wong, 2003) CI and ER, SP has a small effect size on SDGs, namely between 0.02-0.15, but RE is considered to have no effect because the size value effect less than 0.02 (Sarstedt et al., 2021). To strengthen the analysis of the magnitude of influence, interviews were conducted with 20 students (10 men and 10 women. The result was that the low score was dominated by female students as an indicator of their awareness of their role in the environment. However, this interpretation needs further verification considering that respondents who in this study was disproportionate between male and female students. Although it has not been specifically explained the effect of gender on EA, according to the results of research (Ningrum & Herdiansyah, 2018; Sivamoorthy et al., 2013). There is a striking difference between male students and women, that is, male students in practice have more awareness than women.

Even though the effect size of cultural influence on environmental awareness is in the small category (Table 5), culture in Indonesia has become a new hope for the world of education to take a role in realizing the goals of the SDGs. The local culture that develops in every region in Indonesia really supports SDGs efforts. The carrying capacity of the environment will decrease if students as part of society do not care about environmental problems. The distribution of education levels and income plays an important role in EA (Strieder Philippssen et al., 2017). Referring to Table 1, the condition of the education level is dominated by education and low income. High EA is influenced by the learning background of the respondent's family (Aminrad et al., 2013; de la Vega, 2004; Özden, 2008). Cultivating environmental knowledge and facilitating it with a cultural approach to environmental issues can be an early indicator of students' level of environmental awareness. Students who have good knowledge about environmental issues and their impact on human life and the planet tend to be more aware of the importance of protecting the environment and play an active role in its preservation (Aminrad et al., 2013; Erhabor & Don, 2016).

In order for this research to be more meaningful, the gain of the construct influence of the hexogen variables jointly affects the endogenous variables, namely the SDGs, the value obtained is as shown in Table 6. The effect of the construct becomes important in determining the magnitude of the influence of the influencing variables (exogenous variables) on the affected variables (endogenous variables).

Table 6

Research adjusted R-square and R-square values

	R-square	R-square adjusted
SDGs	0.567	0.562

Adjusted R-Square is the corrected R-Square value based on the standard error value. Adjusted R Square value provides a stronger picture than R Square in assessing the ability of an exogenous construct to explain an endogenous construct. The obtained R-square value shows that the effect of the construct simultaneously affects the SDGs by 56.2% and according to (Chin, 2000; Sarstedt et al., 2021) This influence is categorized as moderate.

The results of the hypothesis test regarding the relationship between each hexogenous variable have a positive effect on the SDGs except for the hypothesis of awareness of the role of students towards

the environment in order to realize the SDGs (Table 6). EA can be grown and developed through a local cultural approach. With culture, it is easier for students to translate their attitudes into behavior because they are used to being in the community. Culture has values and if drawn to an ecological approach, then culture becomes the spirit of efforts to preserve the environment to achieve the SDGs goals.

Even though the effect is in the moderate category, this study shows that each exogenous variable has a moderate effect on the endogenous variables (SDGs). This can be interpreted that all exogenous variables contribute to realizing the goals of the SDGs (Feijoo & Moreira, 2020; Galli et al., 2020). The role of culture originating from the noble values of the Indonesian nation is very important in developing student EA. Student EA is seen from attitudes, behaviors, and actions. However, further efforts are still needed in providing training or practice of managing waste in the environment to become a useful resource. Local culture that reflects values and beliefs in peace and justice (SDG 16). Local culture can provide guidance on how humans interact with nature. Traditional patterns of using and protecting natural resources can support sustainability goals such as clean water management (SDG 6), forest and ecosystem management (SDG 15), and clean energy (SDG 7). Local culture often reflects local knowledge and traditions. This can be integrated into formal and informal education to support the goal of increasing literacy (SDG 4) and knowledge related to the environment and sustainability.

Therefore, the model formed through SmartPLS analysis obtained estimated model parameters as shown in Figure 3.

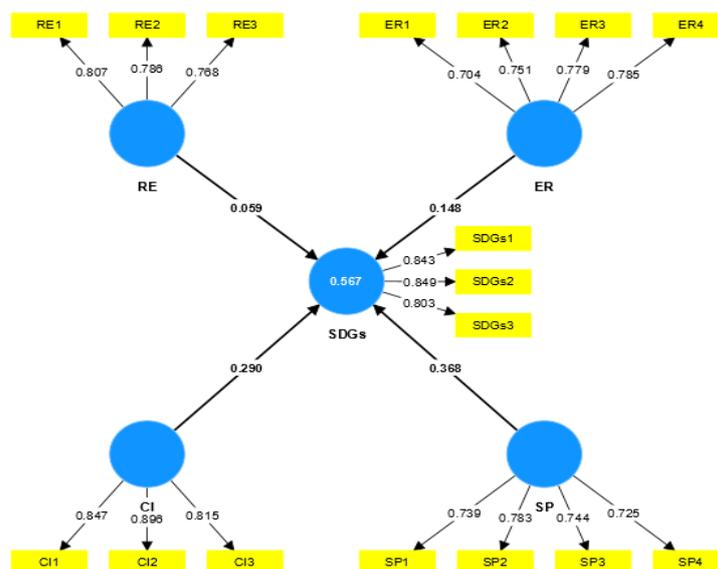


Figure 3. Model Parameter Estimation

The structure of the model formed shows that EA plays an important role towards sustainable development. Even though the influence is in a small category, culture provides a way to strengthen EA (Erol et al., 2022). If this influence is strengthened by the cultural values that develop in Indonesia, Indonesia can make a major contribution to efforts to save the environment. The role of teacher training and education students as part of society and education plays an important role in realizing the SDGs.

The EA of Biology Education students in Indonesia needs to be improved. There is an influence of EA but it is relatively small/low towards the success of the SDGs. EA is urgently needed in facing global environmental challenges today and in the future (Uzzell, 2000). Therefore, there needs to be relevant efforts to maintain the carrying capacity of the environment. As an effort to support SDGs steps, EA is the starting point. Knowledge and attitudes towards the environment in education play an important role in realizing a sustainable way of thinking (Aminrad et al., 2013; Deniz, 2016; Prihatiningsih, 2018).

The importance of growing EA for students as part of society. Increasing student EA through environmental education and environmental programs that are integrated into learning needs to be continuously improved. A cultural base that is integrated with learning approaches such as STEAM can foster student EA (Christidi & Christopoulou, 2022; Rahmawati et al., 2023; Taylor & Taylor, 2019). It is

important for students as prospective teachers to have this attitude, they must be sensitive, aware, and willing to follow developments in sustainable development (Türkoğlu, 2019). There are various ways to raise environmental awareness for students, one of which is through culture-based STEAMEDP education (Erol et al., 2022). Everything can be maximized if culture becomes the basis for growing EA (Joshi, 2006). With the maturation of Indonesian design and culture rooted in local wisdom, efforts to raise awareness of the role of students in overcoming environmental problems can be resolved.

CONCLUSION

The conclusion of this study is that students' environmental awareness still needs to be improved. Strengthening Indonesian local culture rooted in local wisdom in growing environmental awareness is urgently needed to achieve sustainable development goals. The recommendation in this study is that the use of an active learning approach, for example STEAM, which can stimulate creative problem solving skills for environmental problems, can be a solution in developing students' environmental awareness. Efforts to stimulate students' environmental awareness must continue. Biology Education Students as Biology teacher candidates play an important role in growing environmental awareness in society, especially the school environment and their students. One effective way is to integrate environmental learning with local cultural values. This can make a major contribution in overcoming environmental problems that have obstacles where prospective teachers have not contributed to efforts to save the environment through EA. Student EA really needs to be built properly so that environmental development can be sustainable and SDGs can be achieved.

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