

Evaluation of Knowledge, Attitude, and Practice Generation Z about the Global Nature and Climate Change

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Abstract

This research paper investigates the structural interrelationship among knowledge and attitude toward Generation Z behavior, using Partial Least Squares Structural Equation Modeling (PLS-SEM), and bootstrapping is used. Data was distributed 600 structural questionnaires and 462 participants aged 18-30 years old from various regions in Thailand. It uses mixed methods through quantitative and qualitative, with group focus discussion with 30 samples conducted to gain deep insights into mindset and subconscious, the importance and impact of global nature and climate changes, with behavioral to shape this environment. Herewith, mediated analysis by attitudes, both the direct and indirect effects of knowledge on behavior in terms of production, consumption, transportation, and disposal activities in a context where non-linear plays a critical role. The results reveal that global nature and climate change not only influence their actions, but also their recognition, which is a strong influence on their consciousness, leading to their action. Furthermore, this study highlights the importance of attitude cultivation in influencing social responsibility.

Keywords: Attitude, Behavior, Climate Change, Environment and Knowledge

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การประเมินความรู้ ทักษะและการประพฤติปฏิบัติของคนเจนซีเกี่ยวกับการ เปลี่ยนแปลงของธรรมชาติและสภาพอากาศโลก

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บทคัดย่อ

งานวิจัยนี้ได้ศึกษาความสัมพันธ์เกี่ยวกับความรู้ ทักษะและการปฏิบัติของคนเจนซีเกี่ยวกับการเปลี่ยนแปลงของสภาพอากาศและการเปลี่ยนแปลงทางธรรมชาติของโลก โดยใช้วิธีการวิเคราะห์สมการโครงสร้างกำลังสองน้อยที่สุดบางส่วนและการบูตสตรัป โดยการแจกแบบสอบถาม 600 ชุด ได้แบบสอบถามที่สมบูรณ์ตอบกลับมา 462 ชุด ของคนในช่วงอายุระหว่าง 18 – 30 ปี งานวิจัยนี้ได้สำรวจโดยใช้วิธีแบบผสมทั้งในเชิงปริมาณและเชิงคุณภาพจากการสัมภาษณ์ 30 คน เพื่อเป็นการยืนยันผลวิจัยได้สอบถามเกี่ยวกับทัศนคติและความคิดเห็นเกี่ยวกับการเปลี่ยนแปลงของสภาพแวดล้อมทางธรรมชาติที่เปลี่ยนไปในปัจจุบัน และได้วิเคราะห์ตัวแปรคั่นกลาง ตัวแปรที่ส่งผ่านเกี่ยวกับทัศนคติทั้งที่ส่งผลทางตรงและส่งผลทางอ้อม ต่อการมีความรู้ความเข้าใจเกี่ยวกับสภาพแวดล้อมที่เปลี่ยนไปรวมถึงพฤติกรรมในชีวิตประจำวัน 4 ด้านในกิจกรรม ได้แก่ การบริโภค การเดินทาง การผลิตและการกำจัดทิ้ง ผลการศึกษาพบว่า คนเจนซีมีความรู้ เห็นความสำคัญของการใส่ใจต่อสิ่งแวดล้อมแต่อย่างไรก็ตามการปลูกฝังทัศนคติจะสามารถสร้างจิตสำนึกซึ่งส่งผลโดยตรงต่อการแสดงออกและการใช้ชีวิตประจำวันของพวกเขาได้เห็นผลประจักษ์กว่าให้ความรู้ในชั้นเรียนแค่นั้น

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1. Introduction

Recently, many countries in Asia have been confronted with perilous tribulations. For example, Thailand's weather copes with seasonal fluctuation. Hong Kong has 10,000 strikes of lightning in 1 hour. China faced heavy rain until huge flooding, including Japan, which has led to heat stroke, resulting in 53,000 patients, etc. (Agence France-Presse, 2024). This situation is not only a disease but also a critical global change.

The world is confronted with diverse complexed and disruptive challenged issues, and its inclusive 10 centers for 1) regions, trade, and geopolitics 2) the new economic and society 3) nature and climate 4) advance manufacturing and supply chains 5) health and healthcare 6) cybersecurity 7) finance and monetary system 8) urban transformation 9) the fourth industrial revolution 10) energy and materials (World Economic Forum, 2025).

The Sustainable Development Goals (SDGs) provide an overall global crisis situation, with 17 goals to protect the Earth. Goal number 12 calls for responsibility of consumption and production, and goal number 13 calls for urgent combat with climate change. The United Nations (2025) identified that since the 1800s, human activities have been the main driver of the climate change situation, including manufacturing, electricity generation, production, consumption, waste disposal, transportation, etc. Turrentine (2026) stated that the mid to late 19th century human activities have led to the greenhouse effect to a new level, increasing heating, drought, altered natural cycles, wrong seasons, flooding, forest fires, and unstable weather.

Especially, human behavior is the main driven that causes of global climate change. Their behaviors whether production, consumption, transport, or disposal activities have affected toward climate change. This paper is focused on the importance of cultivation for the young generation to understand how to preserve a sustainable environment, by providing information, knowledge, attitude, subconsciousness, and intention to behave in the right direction through learning, communication, transformation, curriculum design, including social norms with Generation Z (youth generation).

Indeed, educational sector is the fundamental institution such as school, college, university, including higher education institutions act as the role of information providing, knowledge sharing about crisis issues, useful or urgent global topics via teaching and curriculum design with students usually they are generation Z. Ready to move forward career path that cultivate them to grow and ready to be the good global citizen.

Moreover, several scholars and organizations cited that education for sustainable development (ESD) is not only about raising awareness and knowledge but also about climate change, in which learning to transform the world and to realize societal transformations toward pro-environmental behavior (Arbuthnott, 2009; UNESCO, 2018). Even though schools, higher education institutions, and universities across the world are looking for improvement in the way of transformation through teaching and learning toward sustainability and environmental agenda, such as wellness, circular economy, biotech, innovation, agriculture, and industry driven by AI, technology improvement, this paper study how to stimulate new generation recognize, deeply understand the global environment situations and also cooperate to preserve the ecosystem through their daily life spending.

Research objectives

The aims of this research are to evaluate knowledge, attitude, and behavior related to the Earth's changing nature and climate among Generation Z.

- 1) To evaluate the level of Generation Z knowledge towards the global nature and climate change.
- 2) To evaluate Generation Z's attitude towards the condition of the global environment and climate change.
- 3) To explore the practices of Generation Z towards the conservative global nature and climate conditions.
- 4) To examine the relationship between knowledge, attitude, and practices of Generation Z with global nature and climate changes.

Research questions

- 1) How well does Generation Z know about the global nature and climate changes?
- 2) How are they concerned about the global nature and climate change?
- 3) What actions are they currently taking?
- 4) How do these relationships between knowledge and attitude toward their practice?

2. Literature review

Shiel et al. (2016) cited that today, an increasing number of courses and universities worldwide are focused on sustainable development. While Leal Filho et al. (2021) and Sivapalan (2016) mentioned that not only higher education institutions do but also other stakeholders collaborate and invest resources in sustainability development. University students and teachers are pivotal to the success of Climate Change Education (Reimers, 2021; Putri et al., 2023). Higher education institutions (HEIs) are the source to disseminate, support, and cultivate the mindset of the new generation or youth about environmental care and quality of longevity through curriculum or course design with activities and lesson self-lifelong learning. Several scholars studied environmental sustainability and climate change, which have a big impact on the physical planet and humanity.

2.1 Knowledge – Attitude – Behavior Model

This study uses the knowledge, attitude, and practice (KAB Model) to examine Gen Z's knowledge, attitude, and behavior about environmental care in the dimension of climate change. It also assesses the relationship between what Generation Z understands, knows, how they feel, and how their knowledge and attitude influence their behavior about this crisis issue. Wan et al. (2016) referred that knowledge is the information that people acquire, analyze, retain, and utilize. Additionally, knowledge is an individual's intellectual property; it determines the sustainability of the environment by building personal awareness, attitude, and habitual behavior. Attitude is the way people assess something through emotion and tend to behave in that way, while practice is the manifestation of that attitude.

The KAB Model was used based on a survey with a systematic review of the literature published between 1990 and 2016 (Salas-Zapata et al., 2018). It is a framework that analyzes personal behavior. Its application implies that knowledge, attitudes, and behavior are measurable constructs that are related and influence each other (Wan et al., 2016). This research studied four domains: (1) demographic factors of respondents, (2) knowledge about climate change, (3) attitudes toward climate change, and (4) their behavior regarding this issue. Furthermore, a knowledge, attitude, and behavior study is to understand the inner perception and behavior of individuals toward the climate change situation.

The KAB Model has been popularized and assessed for the health and education sector. UNESCO (2014) identified that the sustainable development strategy ought to educate all global citizens. Especially, the youth generation must be recognized, and understand how it's important and also related to their obligation and responsibility, thus education requirements both in curriculum design, core course, teaching consequences, and learning process to enable people to behave to preserve the environment and this world appropriately.

The UN adopted 17 SDG goals in 2015 as part of the sustainable development agenda in 2030, one of which aims to address climate change and environmental degradation. Additionally, the United Nations Educational, Scientific, and Cultural Organization ((SDG) with a personal mindset about knowledge, and intentional behavior with a worldwide sustainable environment UNESCO plays an essential role through the United Nations Educational, Scientific, and Cultural Organization with a personal mindset about knowledge, and intentional behavior with a worldwide sustainable environment. (Lee et al, 2022)

(Shift to Social implication) part) Individuals must have adequate knowledge and a good mindset, and be willing to learn about the importance of the environmental surroundings, about the big impact for all, therefore, they ought to participate in both their own awareness, recognition, and behavior, and the local community, whether any project engagement or budget donation through a related issue. The public and enterprising sectors provide resources and engage in a circular model (BCG), sustainable processes such as green production, lean logistics, organic product and packaging, innovated marketing, and strategy designing, along with sustainable development goals. (SDG)

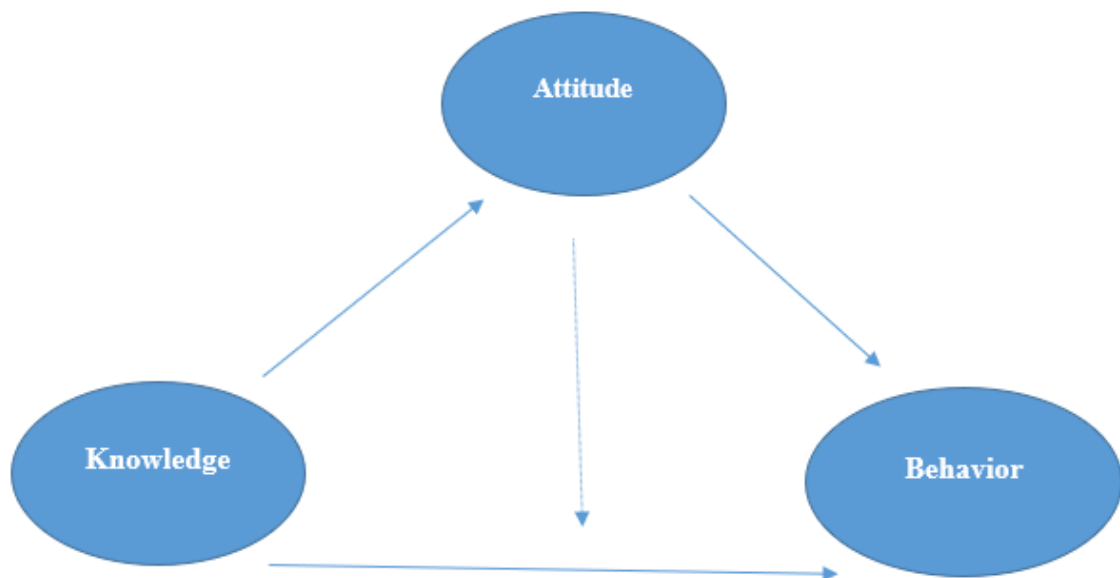
2.2 Social identity theory (SIT)

Tajfel (1978) stated that the social identity theory is that "part of an individual's self-concept which derives from one's own knowledge of the membership of a social group together with the value and emotional significance attached to that membership". Almost all people tend to engage in norm or behavior of social group as needs of belonging. When individuals perceive themselves as part of a community that supports environmental norms, their pro-environmental behaviors tend to be strengthened (Steg & Vlek, 2009) Whiles, Qin and Jiang (2025) mentioned that social identity is a psychological theory that individuals perceive themselves as members of a social group and, based on this identity, determine their behaviors, attitudes, and values. Masson and Immo, (2021); Bamberg et al., (2015) stated that Social identities shape responses to climate change through processes like group norms, collective efficacy and emotions.

Pro-environmental behavior is the human action to preserve the environment (eco-friendly behavior) that plays a very important role in the world's responsibility for all. Pro-environmental behavior can initiate self-taken action, always lead to the local community, and contribute to society, nation, and worldwide in terms of norms, culture, manners, values, policy, and legislative implementation. Behavior can be changed by focusing on the motivation relevant to the desired goal (s). This research also broadens the knowledge about the motivations to undertake pro-environmental behaviors, and it incorporates common worldwide environmental concerns and climate change situation into the knowledge-attitude-behavior (KAB) framework to evaluate Generation Z's understanding of the right knowledge with their consciousness, feelings towards this issue, and leads to their real action in daily life.

Conceptual framework

Figure 1: Conceptual framework



This paper explores the KAB model to support knowledge and attitude relationship with behavior, the moderation mechanism in their attitude toward nature and climate change, and the link between knowledge and their behavior. Attitude is the partial moderator tested between knowledge and behavior.

The conceptual model is validated via data and a survey with Generation Z (18-30 years old). This gene has very powerful group of people and strong influenced by its surroundings, and also diffuses to others as well.

This research is structured in four main sections: the following section presents a comprehensive literature review; the methodology and data collection process are then described; this is followed by an analysis of the findings; and the paper concludes with the theoretical contributions to literature, providing actionable recommendations for consumers and related entrepreneurs, including various levels of higher education institutions, and identifying the road to future research about climate change and crisis global warming situation.

3. Materials and Methodology

3.1 Respondents and data collection

This research was surveyed in Bangkok province with non- probability convenience sampling techniques by using conveniences sampling. This study was conducted from Sept 2024 to July 2025 by distributing 600 questionnaire and screening out incomplete questionnaires. It has collected 462 questionnaires for data analysis, with respondents' ages between 18 and 30 years old.

These respondents are female (72.3%), male (27.7%), and their ages are 18-21 years old (54.1%), 22-25 (14.1%), and 26-30 years old (31.8%). Almost all of the samples are undergraduate students about 300 respondents (64.9%), below undergraduate students are 157 respondents (34%), PhD. level are 3 respondents (0.6%), and master degree level is 1 respondent (0.2%) respectively.

Table 1: Demographical data

Topics	Details	Number of respondents	Number of respondents (%)
Gender	Female	334	72.3%
	Male	128	27.7 %
Ages (years old) Gen Z	18-21	250	54.1%
	22-25	65	14.1%
	26-30	147	31.8%
Educational level	Below bachelor	157	34%
	Bachelor	300	64.9%
	Master	1	0.2%
	Ph.D.	3	0.6%

This surveyed questionnaire was depicted into three elements about knowledge, attitude, and behavior have towards the global nature and climate change. It was depicted in four parts.

- 1) Demographic details
- 2) Individual knowledge
- 3) Individual attitude
- 4) Individual behavior about global climate change

The structural measured questionnaire by using a Likert scale was classified through 5 5-point; 1 stands for strongly disagree, five stands for strongly agree.

3.2 Methodology

A mixed methods study using quantitative and qualitative methods (Schoonenboom and Johnson, 2017). Surveyed with 600 population, respondents were 462 sampled through an online survey based on a social media platform, and 30 were interviewed for result confirmation. Descriptive analysis and confirmatory factor analysis (CFA) were conducted with this model by using a two-stage structural equation, and examined construct validity and discriminant validity of each aspect.

3.3 Data analysis

This research analyses data into four parts as follows:

- 1) Personal knowledge of the four elements in the consumption, disposal, transportation, and production dimensions
- 2) Personal attitude in the four elements of consumption, disposal, transportation, and production dimensions
- 3) Personal behavioral intention in the four elements of consumption, disposal, transportation, and production dimensions

Finally, it provides information about the relationship among knowledge, attitude, and behavior, with recommendations about curriculum designing, teaching, and training, including new generations' mindset and attitude cultivation about global caring and environmental preservation

Results

Table 2: Results of factor loading and composition reliability of global nature and climate change

Construct Validity	Factor loading	VIF	AVE	CR	Cronbach's Alpha
Behavior B 1- B 18	0.82 - 0.92	4.46	0.80-	0.99	0.98
Attitude 1- Attitude 18	0.83-0.94	4.41	0.83	0.99	0.99
Knowledge 1- Knowledge 18	0.77-0.91	4.46	0.78	0.98	0.98

Table 2: shows convergent validity that AVE is more than 0.5, CR is more than 0.7, and Cronbach's Alpha is 0.98 – 0.99, whiles VIF is 4.41 – 4.46 Fornell and Larcker (1981); Diamantopoulos and Siguaw (2000) indicated that latent variables can explain valid and reliable observable variables of personal knowledge, attitude, and behavior towards global nature and climate change.

4. Results analysis

The aims of this study are to focus on the several dimensions of consumption, disposal, transportation, and production in the scope of knowledge, understanding, attitude, and practice in daily life. This conceptual model is examined in terms of reliability and validity, and the studied constructs are indicated in Table 2. Herewith, the key reliability and validity index in terms of Cronbach's alpha, composite reliability (CR), average variance explained (AVE) values, and factor loading are studied.

Table 3: P value with HTMT

Herewith, Table 3 described that discriminant validity both attitude and knowledge have the impact toward behavioral intention to environmental caring, especially attitude has the strongest influence on Generation Z (HTMT is less than 0.85, and P value is less than 0.05). Thus, understanding and recognizing the importance of environmental caring and global saving is an essential issue. Therefore, Generation Z should be cultivated about these topics since teaching - learning in the classroom and good mindset building.

HTMT ratios (good if < 0.90, best if < 0.85)				P values (one-tailed) for HTMT ratios (good if < 0.05)			
	Behavior	Attitude	Knowledge		Behavior	Attitude	Knowledge
Behavior				Behavior			
Attitude	0.861			Attitude	0.001		
Knowledge	0.845	0.844		Knowledge	<0.001	<0.001	

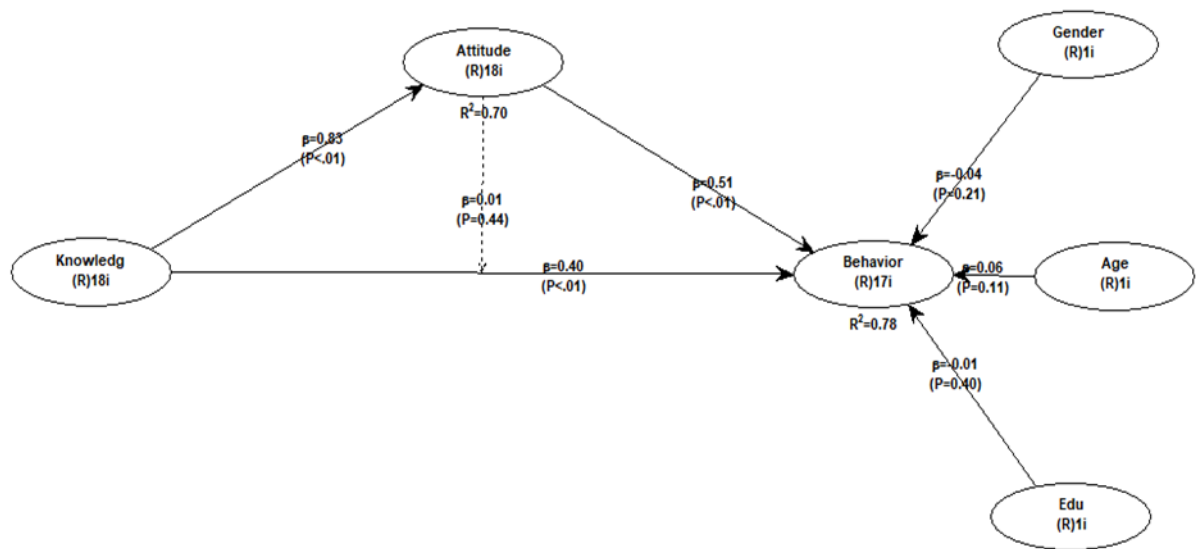
Figure 2: PLS-SEM

Figure 1: identifies the non-linear bi-variate causality direction ratio (NLBCDR) to examine the causality of two variables: knowledge and attitudes toward Generation Z's practicing accordance. The level of knowledge has an influence on their practice, especially understanding cause and effect with knowledge, and also having a positive attitude has a strong influence on their practice.

Table 4: Direct Impact KAP of Gen Z

Beta	Attitude	Knowledge	Gender	Age	Edu	Attitude*Knowledge
Behavior	0.507	0.399	-0.038	0.057	-0.012	0.007
Attitude		0.834				
P-value						
Behavior	<0.001	<0.001	0.205	0.109	0.4	0.442
Attitude		<0.001				

Table 4: describes the direct impact of knowledge, understanding, and attitude on the practice of Generation Z in 4 activities, as follows in Table 5.

Table 5: Knowledge, Attitude and Behavior Intention about environmental saving

Activities	Knowledge - Attitude - Behavior (KAB)
Consumption	I know, and have a positive attitude to eat meat less is healthy I try to eat meat less
	I know and have positive to eat vegetable much is healthy I try to eat vegetable much
	I know, and have positive attitude about turn on - turn off I turn on - turn off electricity in electricity in necessarily
	I know and have positive attitude about turn on air condition at 25 degree Celsius I turn on air condition at 25 degree Celsius
	I know and have positive attitude to use water economical I use water economical
	I know and have positive attitude to use cooking-gas economically I use cooking-gas economically
	I know and have positive attitude to take warm shower in necessarily I take warm shower in necessarily
Disposal	I know and have positive attitude to separate waste before throw I separate waste before throw away
	I know and have positive attitude to use personal cup instead plastic cup I use personal cup instead plastic cup
	I know and have positive attitude with non-use plastic bag I don't use plastic bag

Activities	Knowledge - Attitude - Behavior (KAB)
	I know and have positive attitude to use personal clothing bag I use personal clothing bag
Transportation	I know and have positive attitude to reduce drive personal car I drive personal car
	I know and have positive attitude to fill gasohol or biogas I fill gasohol or biogas
	I know and have positive attitude to drive electrical car I drive electrical car
	I know and have positive attitude to take public transportation I take public transportation
Production	I know and have positive attitude to plant without chemical I plant without chemical
	I know and have attitude with animal feeding without chemical I feed animal without chemical
	I know and have positive attitude with non-release garbage I don't release garbage into river

Table 5: depicts the relationship among Generation Z's knowledge, how to understand causes and effects of global nature and climate changes, attitude: scales 1-5 of attitudes towards global nature and climate changes, and their practicing towards the global nature and climate change, and how frequently they engage in eco-friendly habits. This research paper clarified that the four human activities are consumption, disposal, transportation, and production.

Have big impacts to the livable globe, human is main driven to release toxic materials increasingly including hazardous pollution form daily life, therefore we should understand how they recognize of these issues, how they think about it and also how they act before we reform or recover these crisis global situations with variable control in terms of gender, age, and education level respectively.

Table 6: Indirect impact

Moderator	Knowledge-Attitude-Behavior	
Beta		0.422
P-value	<0.001	
Std.Er		0.055
Effect Size		0.352

In Table 6: the effect size is 0.352, which is not lower than 0.02, the p-value is less than 0.001, and the beta is 0.422. These research results imply that global saving and environmental caring knowledge providing has an impact on Generation Z's behavior; however, knowledge can indirectly affect practice through attitude, and it is a partial moderator. Furthermore, attitude cultivation has the strongest influence on their behavior, covering positive mindset, healthy culture, and social responsibility as well.

Social Implications

This research results provide the suggestions on how to respond to the growing hazardous environment and global warming. Particularly, how to apply KAB framework to change people behavior with attitude cultivation is the core stone for social successful implication. In additionally, we interviewed with 30 youth people for research result confirmation about how attitude has influenced toward their daily life activities about global and climate changing, all people agree with knowledge, attitude and their behavior are related and new generation ought to aware and also collaborate to save this world. It is the obligation for all global citizen; it is not only youth generation.

Together with all stockholders collaboration, starting with personal recognition, intended action, and urgent implementation since policy commandments, social responsibility consciousness, and right behavior adaptability. Especially, the education sector transforms the Sustainable Development Goals into lesson learn, activity in class, or life skill in reality.

For the individual level, we must have adequate knowledge and a good mindset, and be willing to learn about the importance of the environmental surroundings, about the big impact for all, therefore, they ought to participate in both their own awareness, recognition, and behavior, and the local community, whether any project engagement or budget donation through a related issue. The public and enterprising sectors provide resources and engage in a circular model (BCG), sustainable processes such as green production, lean logistics, organic product and packaging, innovated marketing, and strategy designing, along with sustainable development goals. (SDG)

The education sector shapes students, the next generation or namely: education sustainable development (ESD) guides learning process to enable people, particularly generation Z almost all are students in several levels to acquire knowledge, cultivate attitude, and subconsciousness that lead them to practice until behavior intention to normal habit in favor of the nature and global environment. UNESCO (2024) identified this strategy for all education levels, including higher education levels. Moreover, educational institutions can add on chapters or principles in lesson learning about these issues, from elementary to higher education, whether curriculum

design, short courses, or a degree level in this field. Not only does it really affect all, but it also guides a change of duty, obligations, and career path in the future

In business sector, whether production process, logistic process, packaging, marketing, advertising campaigns, communication, or service providing can change the way of perform to accordance with these trends otherwise, any business can't survive in long term, unless adjust the environment policy into main element of your brand, consumers are new generation to understand, learn from education institutions, family, surrounding context focus on saved Earth, saved lives, also have healthy mindset, and it all the things or responsibility to protect our planet.

In government sector should focus on climate changes policy and ecosystem education with all party by campaigns implementation, support new generation participation and engagement in environment conservation, either educational institutions or business industry ought to develop and invest budget about curriculum, or business policy, marketing plan, marketing strategy, including impact global nature and climate changes communication with deeply understand and behavior or habitual changes to tailored, especially Generation Z.

Limitations

The KAB model is usually studied with medical or biosciences studies; however, many scholars, such as Aziz et al. (2013), identified how the use of a problem-based learning method generated significant changes in student behaviors. Lozano and Young (2013) indicated that changes toward sustainability might be related to the high number of students.

On the other hand, Redman (2013) stated how a process of education for sustainability with a group of young people did not contribute to the adoption of pro-environmental behavior, apparently due to the influence of the social and cultural environment of the participants. Kolbe (2015) agreed that other factors also have influenced toward participants' immediate environment, such as the family, influence behaviors. These limitations also refer to KAB studies carried out with university students.

Future research

We should follow up on human collaboration and practical behavior change with these issues. How are the climate and environmental situations throughout the world, comparing pre- and post-policy with implementation taking place? Moreover, we should concentrate on global climate change with predictive future directions for disruptive disaster coping

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