Role of Higher Education Institutions in Addressing Climate Change Crisis: The Paradox of Core operations and Institutional Social Responsibilities

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Abstract—**The paper discusses the paradox of climate change and university education. It assesses the expected role of universities in addressing the climate crisis and some leading frameworks appear in sustainability education literature. The paper also postulates a framework that may be adopted to guide climate change education and actions through universities. In conclusion, using a Carbon Literacy Training as an example, the paper discusses the implantation aspects of the proposed framework.**

Index Terms—**Carbon literacy, Sustainability, Sustainable Development Goals, Climate Change.**

I. Introduction

According to the Intergovernmental Panel on Climate Change (IPCC), climate change is a change of the state of the climate which is attributed directly or indirectly to human activities that largely contribute to the changes in the composition of the global atmosphere [1]. Given the increasing amount of evidence of adverse effects of climate change (e.g., unforeseen heat waves in Europe and several other weather events in Australia) taking actions on climate change is crucial. According to the carbon budget which estimates the total quantity of CO_2-equivalent emissions that can be allowed in order to maintain a chance of staying within the Paris Agreement target of capping global warming at 1.5C this century, the atmosphere can absorb no more than 400 Gigatonnes (Gt) of CO_2. If we do not take climate actions and continue the status quo at this pace for another 10 years, we will have depleted the carbon budget entirely [2]. Taking serious actions towards reducing carbon emissions is, therefore, an utmost necessity.

Our ecosystems (e.g., rainforests, permafrost) do not work in isolation. Everything is intertwined. The melting of the permafrost will have effects on sea rise, effects on habitat and or species loss [3]. Given the high impact that human activities make on climate change, human activities should be significantly changed in order to tackle climate change. To this end, large institutions, such as universities have a crucial role to play discharging their social responsibility.

Several scholars investigate the role of universities in climate change education [4-6], engaging in climate policy debates [7, 8], empowering individual actions towards climate actions [9] and postulating alternative economic models [10]. According to the Blueprint for SDG (sustainable development goals), embedding SDGs into curriculum which is an initiative of UN Global Compact, actions of universities or business school are not *one size fits all* [11, 6]. Therefore, these higher education institutions should be able to develop a framework and guidelines in accordance with their strategic directions.

Fortunately, a great number of frameworks have been proposed to introduce or integrate climate actions through universities [12-15]. The assumptions and the scores of the frameworks, however, appear to be varied. This will make it challenging for universities to develop a framework and guidelines in this endeavour. Moreover, the field of research could use more scholarly conversations on some frameworks and guidelines to explore the key pillars of climate change actions of universities. In consultation with some of the scholarly conversations in the field, the aim of this paper is to spark such debate. After critically examining current frameworks through a literature review, the paper also proposes a way forward for universities who engage in climate change education and actions through all their operations.

Organised into four sections, following the introduction, the next section provides a critical overview of some of the existing frameworks in the field of research. Following the literature review section, the third, discussion section engages in a scholar conversation with a view to highlighting dilemmas and debates corresponding to key assumptions of the frameworks. This section also postulates an approach which can be used to resolve the paradox of core operations and institutional social responsibilities of universities.

II. Literature Review

This section first reviews the paradox of climate change and university education. Secondly, it appraises several frameworks that are discussed in literature with a view to demarcate the trajectory of climate change actions though universities. Following the literature review, the paper postulates a framework that may guide future research and practice of climate change education and actions through universities.

A wide range of climate change knowledge, competences and skills are essential in climate change education [4]. Fostering learning and teaching environment is extremely challenging due to many reasons. Among them, it appears that

despite the widespread conversations, many individuals still do not have a thorough understanding of climate change and its adverse effects. Climate change is seen as a scientific issue, an environmental, a political or a social issue. The occurrence of climate change and the impact of its adverse effects on our personal lives are, at times, seen as geographically and psychologically distant [16, 17]. Although more recent research shows that many individuals now perceive climate change as serious issue [12] and students are keen to take climate change actions [18], the above stated complexities could pose challenges for universities when advancing climate change actions. Further, despite their best effort, climate change is rapid and continuously evolving into a different phase, therefore, university educators may have to respond extremely rapidly to the changing phase [4, 19]. Given the overarching impacts of climate change on business, economy, society, the educators will also have to use multidisciplinary approaches in climate change education [12].

A great variety of frameworks are proposed to engage in climate change educations and actions through university operations [e.g., 12, 13-15]. [Reference 15] argues that any university could have five modalities of climate changes action corresponding to their operations. They are education, knowledge production, service delivery, public debate, and campus operations. Each modality has three characteristics including action (the nature and extent of activity), interaction (interaction between activities) and impact (social impact). Figure 1 depicts the stages of impact of climate change education through universities.
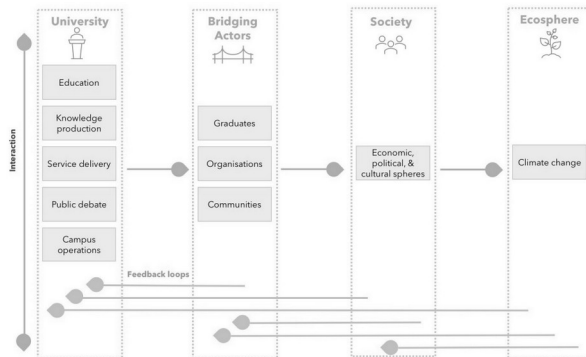

Figure 1: The stages of impact of climate change education through modalities [15, 9].

McCowan's [15] five modalities clearly demonstrate the spill over effects and the social role that can be played by universities in climate change education and action. The five modalities assume two main layers of university activities. The first layer relates to their primary role of knowledge production and dissemination. This includes research, teaching and taking part in public debates surrounding climate change issues. The second layer is the universities' role as a business organisation with complex operations that produce large amount of greenhouse gas emissions. Universities are expected to play a leading role in producing cutting edge climate change research providing a sound scientific foundation to the climate change actions. Dissemination of climate change knowledge can occur via research publications, public debates, and curricula. According to Reference [20],

however, universities have been predominantly focused on climate change science education, now, given the unprecedent weather events and other climate disasters we see, it is imperative that universities focus on integrating climate change mitigation education widely, across all disciplines.

Leading researchers in the field [e.g., 13, 20] argue that climate change education should enable every student to go beyond the awareness of climate change. They should make a real impact on the students, their peers, families, as well as other stakeholders such as employers. Illustrating how climate change education could be integrated widely across all disciplines, the researchers postulate below framework (see figure 2) for climate change education in universities.

	Existing structures	New structures
Narrow curricular	**Quadrant I** **Piggybacking** Integration of climate change education (CCE) within existing structures by adding CCE to individual sessions of courses or modules.	**Quadrant II** **Specialising** Creation of specific climate change modules, courses or degrees such as a MSc in Climate Change.
Broad curricular	**Quadrant III** **Mainstreaming** Integration of climate change education within existing structures but with the emphasis on a broader cross-curricular perspective (entire curriculum).	**Quadrant IV** **Connecting** **(transdisciplinary)** Integration of climate change education through new cross-disciplinary offerings such as a course on climate change offered to all student within a university or faculty integrating teaching content from different disciplines.

Figure 2: Framework for climate change education in universities [20, 3437].

As depicted in figure 2, universities can integrate climate change education through existing curriculum delivery structures as well as develop new curriculum delivery structures. They can adopt a narrow focus such as adding or creating new climate change related learning modules. They can also adopt a broad approach to climate education with the emphasis on cross-curriculum perspectives while utilising the existing curriculum delivery structures or create new cross-curriculum structures for climate change education. For example, piggybacking (quadrant 1) can be done by including climate change related perspectives in an existing subject under several themes. For logistics and supply chain subjects, educators could include perspectives such as sustainable sourcing of raw materials and components. For a strategic management /Marketing subject, educators could include perspectives of sustainable lens to critically assess the emissions levels of each strategic decision.

Specialising approach in quadrant II calls for introducing dedicated climate change education modules and degree programs. Some universities have already introduced Bachelors, Majors and Masters in Climate Change. Mainstreaming in quadrant III relates to designing degree programs embedding climate change education as a main theme that transcends across entire curriculum. This requires serious commitment and specific worldview from curriculum designers and educators.

Quadrant IV, connecting, calls for 'whole of university curricula' approach to integrate climate change education across several disciplines. For example, business students could be required to take a compulsory subject on climate change that is offered in collaboration with science and soci-

ology departments. On the other hand, a subject could be designed by taking inputs from several disciplines across the university to cover diverse social, political, ecological, environmental and economic perspectives of climate change.

The framework for climate change education in universities proposed by Reference [20] provides clear roadmap or a blueprint for universities to embark on a journey of engaging with climate change education and action. It appears that the framework informs several other blueprints of integrating sustainability and climate change education into university curricula such as the Blueprint for SDG integration Into curriculum, research and partnerships which is an initiative of UN Global Compact [11].

One of the recent initiatives of the United Nations Global Impact, entitled, 'Blueprint for SDG integration into curriculum, research and partnerships' (2020) presents good examples of approaches already adopted by business schools as an integral part of ongoing efforts to incorporate the PRME into educational activities. The Blueprint proposes a systematic process to achieve sustainable development goals (including goal no.13: Climate action) by integrating them through university education as shown in figure 3.
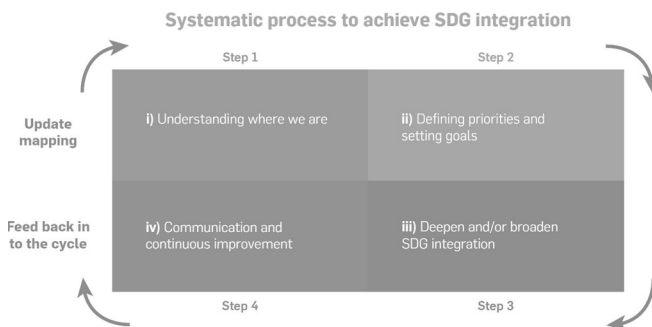

Figure 3: Systematic process to achieve SDG integration [11, 23].

The Systematic process to achieve SDG integration adopts strategic decision-making approach to suggest how to achieve SDG integration. The process begins with defining the problem, in other words, identifying gap areas of the existing performance corresponding to SDGs. This includes scanning the external (e.g., expected level in advancing SDGs as outlined in global and local protocols) and internal environment (e.g., existing level of carbon emissions through overall operational activities of a university) of universities to assess where they are, in terms of SDG integration. This will lead to the second step which includes setting or shifting priorities to the underperforming areas of SDG integration, reinforcing good practices, and set new goals where necessary. The set priorities and goals inform the third step which develops a plan of actions for deepening and/or broadening SDG integration. The success of the plan of actions should be continuously monitored. This can be done in the fourth step which ensures the set goal are achieved and areas of continuous improvements are identified.

SDG integration to university curricula have been widely debated. Many opportunities, advantages and barriers have been discussed [e.g., 21, 22, 23]. Annual reports of universities as business organisations are bound by accounting reporting conventions to include Economic, Social and Governance (ESG) performance. As signatories of Principle for Responsible Management Educations (PRME) universities are required to regularly share information with its stakeholders on the progress made in implementing the Six Principles through a Sharing Information on Progress (SIP) report (PRME 2022) to facilitate dialogue and foster a learning community among signatories.

It is, however, argued that there is no coherence and focus on the current performance matrixes used by universities especially because many of the functions could fall under any of the 17 SDG goals broadly. Towards this end, there has been an important initiative by Garwood et al, [24] to popularise a dashboard for universities to visualise SDG actions for achieving performance reporting and best practice sharing. The dashboard is depicted in figure 4.
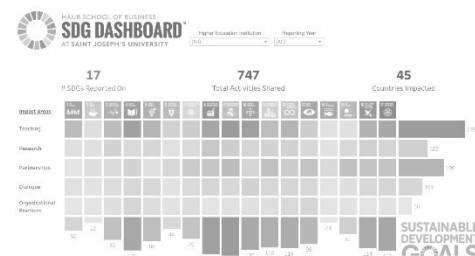

Figure 4: SGD Dashboard [24]. AIM2FLOURISH, 2023, retrieved from <https://aim2flourish.com/sdg-dashboard>

As shown in figure 4, the SDG dashboard captures SDG goal performance under 5 impact areas (Teaching, research, partnerships, Dialogue, and organisational practices). This dashboard could be further finetuned to focus on climate change education and actions. SDG goal 13 specifies of climate action whereas, Goal 6 clean water and sanitation, Goal 2 Zero hunger, Goal 7 affordable and clean energy, Goal 11 sustainable cities and communities, Goal 12 responsible consumption and production, Goal 14 Life below water, and Goal 15 life on land, are indirectly related to climate change. Therefore, a dashboard capturing university performance in these goals could enhance best practice among universities locally as well as globally.

Aforementioned frameworks [e.g., 11, 20, 24] can be effectively utilised for climate change education and actions in universities to various degrees, however, they do not clearly capture the variety of pedagogical approaches that may be adopted by universities in climate change education. To this end, Reference [25] claims that especially in business schools, pedagogical approaches of sustainability and climate change education seem to achieve two competing objectives: instrumental and emancipatory educational objectives. The former aims at utilising sustainability and climate change education to achieve business objectives, hence demanding changes in educating conventional business models and behaviour among students is common. The latter aims at leaving space for students' emancipation or subjectivity. This may be especially required in sustainability and climate change education which can be flourished through pedagogical approaches that aim at enhancing critical thinking and reflexivity among students [26].

One way of viewing the instrumental and emancipatory objectives in sustainability and climate change education is through paradigmatic views that guide business scholars in

designing teaching and learning activities. For example, if the business scholars share the assumptions of critical realism they recognise the reality of natural order, the events and discourses of the social world [27]. They assume that understanding and changing the social world is possible only by identifying the social structures that generate events and discourses [28]. This approach may call for newer and alternative perspectives on business decision making, business models and subsequent pedagogical approaches.

While the aforementioned frameworks guide educators to explore the options of integrating climate change utilising existing as well as programs, it does not recognise the contribution that universities make at climate change policy making levels. Adding a new direction to climate actions through universities, Reference [6] show how the principles of participatory action research can be utilised to enhance university capacities to take climate actions. Their key recommendations include moving beyond changing individual behaviour to respond to climate change to establish norms, procedures, and practices across university, building collectives with key individuals whose voices are to be heard in climate change debates and actions, enabling reciprocal relationships between universities as well as wider societies to influence university governance and wider climate-related policy-making processes. The researchers' conceptual framework which is organised as a capacity map is shown below.
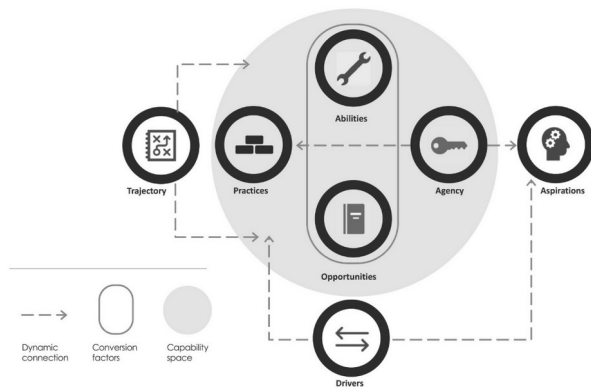

Figure 5. Capability map to investigate university capabilities in climate change education [6, 103]

According to Reference [6], taking climate change actions through universities consists of four elements; institutional aspirations, practices, abilities and opportunities. Universities should know their aspirations and existing practices towards the advancement of climate actions. After assessing the gap between the aspirations and the excising practices, universities should be able to improve their abilities to take climate actions and exploit more opportunities of climate actions as well. The researchers claim that participatory action research could guide universities through the process. The capacity map, as the researchers claim, recognises climate change as a global as well as a local issue. Therefore, taking climate actions call for paying attention to both synergies and specifics. Unlike some of the university education focused frameworks [e.g., 20], this capacity map recognises a social role universities can play in taking climate actions. However, one of the drawbacks of the capacity map is the

exclusion of wider boundaries of climate actions especially those could create a wider gap between the aspirations and the excising practices of climate change actions of universities.

Reference [29] postulated the Doughnut economic theory which argues that humanity should not collectively overshoot the planetary boundaries that protect the planet's ecosystems. In consultation with the Doughnut economic theory Reference [10] postulates a framework of climate actions though universities including social and planetary boundaries of climate actions. As shown in the figure 6, the framework calls that climate actions of universities should be built on planetary boundaries of climate change, biodiversity loss and resource use. They are considered the baseline requirements that all universities should meet in advancing climate actions.
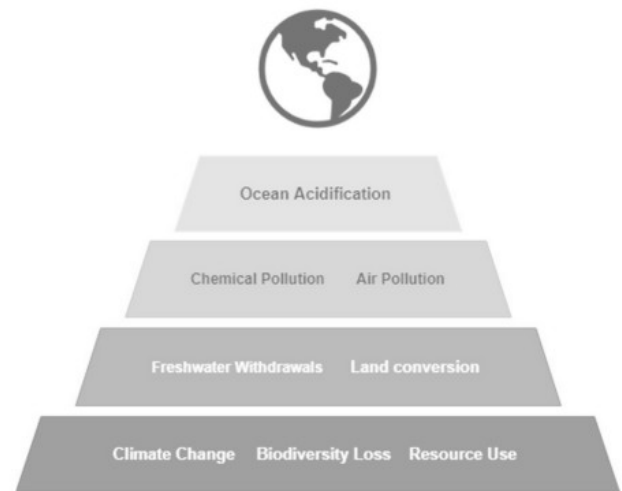

Figure 6: Planetary boundaries of climate change actions through universities [10, 46].

III. DISCUSSION

The paper is a critique of some of the leading frameworks and guidelines of climate change actions and education of universities. Following the literature review, this section engages in a discussion of the frameworks with a view to proposing a way forward for universities who engage in climate change education and actions.

The literature review shows that while some of the frameworks provide guidelines in terms of positioning for climate change education within existing or new education programs [e.g., 20], some other frameworks stress the impact of such education on all the operations of universities [e.g., 6]. On the contrary, more systematic approach which begins with assessing the situation, in other words, assessing the strategic fit in terms of SDG integration are proposed [11]. Adding more fire onto the debate, several other researchers demonstrate how the impact of climate change education goes beyond the universities [e.g., 15], emphasising on focusing on an approach which pays attention to the planetary boundaries and alternative economic models [10, 29].

None of the frameworks, however, include an element of measuring tangible outcomes of climate change education and actions. As detailed in the introduction section, given

the increasing amount of evidence of adverse effects of climate change, depleting carbon budget and the urgency of capping global warming at 1.5C this century, taking actions with measurable impact of reducing carbon emissions is an utmost necessity. Therefore, we argue that climate change education and action through universities should thrive for achieving tangible outcomes for all their stakeholders. The efforts will spill over into wider communities both at local and international level.

Climate change education and actions can be seen from the perspectives of corporate social responsibility (CSR) [30-32]. The notion of CSR is a valuable debate which evolves over the years [33-35]. One leading argument was that for any organisation [35-37], ethical CSR (doing good) is mandatory, however, for a publicly held business organisation, altruistic CSR (doing good works at the possible expense of stockholders) is not legitimate and hence organisations should limit their philanthropy to strategic CSR (doing good also good for business) (Lantos (2001, p. 606). Resolving the debate to a certain extent, Reference [38] proposed the notion of "creating shared value", which they showed as a link between the competitiveness of a firm and the wider society. Clearly CSR can no longer be separated from a firm's overall business strategy. If this is the case, what is the nature of business of universities? How should universities engage in climate change education and actions discharging their (corporate) social responsibility?

We argue that universities are positioned in a peculiar position in the context of climate change crisis. Unquestionably, many would agree that the main business of universities is to produce and disseminate knowledge through teaching and research. In responding to the climate change crisis, however, many universities have shifted their strategic business priorities. This is reflected in their mission and vision statements that have been revised including priority areas such as social impact. Given the criticality of climate change crisis, sustainability has emerged as a key strategic priority for firms as well as universities, main global drive being the wide acceptance of United Nation's sustainable development goals.

We propose that carbon literacy-based education and actions should be an integral element of universities' business. Carbon literacy means being aware of the impact of everyday activities on the climate; and knowing what steps can be taken to reduce emissions as an individual, a community group, or an organisation, and why it is important that we all take these steps (Carbon Literacy Project, 2021). Hence, carbon literacy goes beyond knowing and includes emotional and behavioural enablers. More importantly, carbon literacy should empower individuals and collectives to measure the amount of carbon they emit through everyday actions and take on carbon reduction actions.

In consultation with the frameworks that we have reviewed earlier in the paper, paying due attention to climate change crisis and urgency of taking actions, we propose a framework to demonstrate the role of universities in addressing climate change crisis. It is expected that the proposed framework will resolve the paradox of core operations and institutional social responsibilities of universities. The framework is depicted below, figure 7.
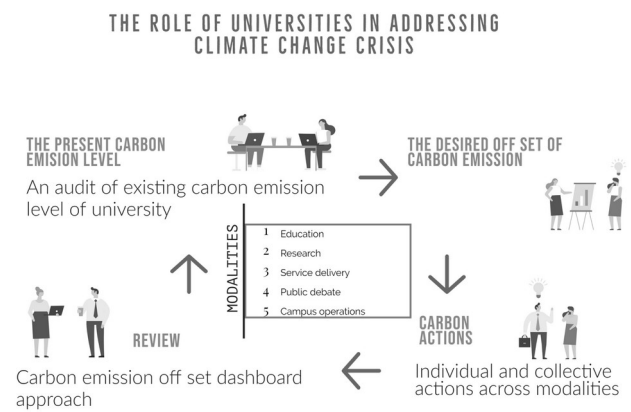

Figure 7: The role of universities in addressing climate change crisis (source: Authors).

The framework proposes a systematic process [11] to perform the desired role of universities addressing climate crisis. The framework adopts strategic decision-making approach to suggest how to achieve a set carbon off set level. The process begins with taking an audit of existing level of carbon emission of a university [6]. This includes scanning the macro level planetary boundaries [10, 29] and internal environment of the university corresponding to five modalities [15]. This will result in findings where a university stands in its carbon emission level. This will also lead to the second step which includes setting or shifting priorities to the underperforming areas of carbon emission off sets, reinforcing good practices, and set new goals where necessary. The third step develops individual and collective plan of actions [13, 20, 25] to reduce carbon emission across the five modalities. The success of the plan of actions should be continuously monitored. As the fourth step, we suggest utilising carbon emission off set dashboard approach [24] to ensure the set goal are achieved and areas of continuous improvements are identified.

IV. Carbon Literacy Training

Having explored the key frameworks utilised by higher education institutions in embedding climate change education, we identify a major gap in transforming awareness into meaningful, grassroot level actions. Towards this end, we elaborate the key elements of the framework our existing carbon literacy training program (CLP) that is being implemented in Australia as a collaboration between Carbon Literacy Project (CLP), UK and three leading Universities in Australia, Swinburne, Federation University and University of Queensland.

Initially 4 academics from Swinburne and Federation Universities participated in CLP training and got certified as Carbon Literate citizens. These academics pledged in their CLP training that they would deliver CLT in their respective universities. Several discussions took place for a potential collaboration between Swinburne, Federation and Queensland universities. Queensland university had already developed an adapted version of the training materials to suit the Australian higher education context. We were successful in forming this collaboration where trainers from Swinburne and Federation Universities deliver the training and manage the assessment pledges. To be certified as carbon literate,

each participant needs to do several short online modules and four live online sessions of 1.5 hours each and make a pledge in the form of an assessment piece which is sent to CLP project, UK to evaluate and issue certificates. The training enhances the knowledge of climate change science, the impact of climate change on the planetary boundaries and empowers catalysts of taking action on climate change.

So far, about 56 participants have been certified as carbon literate and they have made pledges to reduce approximately 30 tonnes CO_2 through 120 individual and collective actions. This training is focused on academic and professional staff of the Swinburne and Federation Universities initially. It has been suggested that a learning module based on this training is offered to all the students as well. Sustainability managers of the universities are interested in developing a HR training module based on this CLT. One notable achievement of the program is that many academics have pledged to incorporate CLT into their respective subjects. On the other hand, professional staff has pledged to reduce carbon emissions by developing innovative work designs that save significant carbon emissions.

V. CONCLUSION

Engaging in and committing to carbon neutral operations such as green sourcing, green energy and sustainable business practices, many universities have already initiated meaningful actions. However, it has been argued that universities could do much more in the areas of climate change education and actions, especially because universities are strategically positioned in the context of climate change crisis and awareness. They have a key role to pay in terms of implementing measurable climate change education programs and actions with a view to energising the advocacy of the institutions through all their operations. It is important to empower existing stakeholders of the universities and specially students to act as advocates of carbon mitigation actions in their workplaces, communities, and family & friendship circles. Together, the university communities could mobilise a large section of grassroot level people taking meaningful action. This could be done through embedding carbon literacy awareness into curricula in such a way that students are motivated to act upon.

Organised as a critique existing scholarly conversations on integrating SDGS and climate change discourse, the paper proposed a framework to demonstrate the role of universities in addressing climate change crisis. Many of the frameworks discussed in the paper are still in theoretical domain. The lack of empirical evidence on the frameworks is a limitation of the paper. A comparative investigation on the effectiveness of the frameworks could enhance the contribution of the paper in the future.

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