Insights on Measuring UC3 Climate Action Progress

Research to Advance the University Climate Change Coalition (UC3) Strategic Plan 2020-2025

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March 2021

Disclaimer

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organizations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region.

This project was conducted under the mentorship of UBC Sustainability Initiative staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of the University of British Columbia.

Acknowledgements

The author would like to thank Victoria Smith and Molly Henry from the UBC Sustainability Initiative for their contribution, feedback, and support throughout the project.

Cover photo: UBC (2019) UBC ranks 34th in global Times Higher Education rankings. Retrieved from https://news.ubc.ca/2019/09/11/ubc-ranks-34th-in-global-times-higher-education-rankings/

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Purpose, Goals, and Objectives of the Report

The University Climate Change Coalition (UC3) is a collaborative coalition that leverages relationships and expertise to accelerate local climate solutions and build community resilience. As powerful and influential subnational actors, institutions of higher education are especially well positioned to act as agents of change in their communities to accelerate cross-sector climate action.

The objective of this report is to introduce a framework for tracking progress on the UC3 Strategic Plan 2020-2025, including a discussion of factors taken into considering in designing the framework. The intended use of this document will be to provide assistance to the UC3 in future planning exercises and is meant to inform the UC3 leadership on discussions related to how progress may be measured and tracked moving forward.

The structure of this report will be as follows: The Part 1 will begin by providing a literature review on the role that higher education institutions (HEI) play in addressing climate change. Part 2 will focus on providing a detailed analysis of the structure of the UC3. Part 3 will introduce the foundation of what needs to be considered in designing the metrics for the strategic plan. Part 4 will address the options available for monitoring. Lastly, Part 5 will include some recommendations in the course of action, tying everything together.

Part 1: The Role of Higher Education in Addressing Climate Change

Higher education institutions play a crucial role in addressing climate change, as they are charged with the responsibility of developing the proper competencies for students to address present and future conditions[1][2]. This responsibility has been long acknowledged in declarations since the first UN Conference on Human Environment in Stockholm in 1972[3]. Barth (2016) observes that activities to establish sustainability education in HEIs take place on at least three different levels: (1) research on climate issues, (2) learning and teaching activities, and (3) organizational change and management practices[4]. Research calls for the ability for HEIs to build transdisciplinary research communities in order to collaborate on complex problems[5]. On the one hand, scholars such as Yarime et al. (2010) found an increasing number of HEIs engaged in research on sustainability, and that there were significantly difference focus fields between regions[6], suggesting that HEIs are in fact slowly responding to challenges in climate change. On the other hand, much work is still needed to be done, as for the most part sustainability research is still lacking in many HEIs [7].

On learning and teaching activities, higher education bears the responsibility in educating future key actors and decision-makers for sustainable development[8]. Barth argues that HEIs need to implement

[1] Orr, D. W. (2004). *Earth in mind: On education, environment, and the human prospect (10th anniversary edition).* Washington DC: Island Press.
[2] Barth, M. (2016). *Higher education in the twenty-first century.* Routledge. Pg. 41
[3] Michelsen, G. (2016) Policy, Politics and Policy in Higher Education for Sustainable Development. Pgs. 40-56.
[4] Barth, M. (2016) *Higher education in the twenty-first century.* Pg. 46.
[5] Barth, M. (2016) *Higher education in the twenty-first century. Pg.* 16.
[6] Yarime, M., Takeda, Y., & Kajikawa, Y. (2010). Towards institutional analysis of sustainability science: a quantitative examination of the patterns of research collaboration. *Sustain Sci 5*. Pgs. 115-125
[7] Henderson, J., Beiler, A., & McKenzie, M. (2017). "Climate Change and the Canadian Higher Education System".
[8] Barth, M. (2016) *Higher education in the twenty-first century.* Pg. 47.

new approaches to teaching and learning in the paradigm of sustainable education, while also acknowledging that topics in sustainability are needed across existing curricula[9]. The challenge then is how to design a learning setting that combines developing competencies in ethically reflective decision-making, building bridges between disciplinary knowledge, and interdisciplinary oriented problem-solving approaches, while integrating everything to produce solutions of practical relevance[10].

Lastly, management and organizational change related to climate change considers the role HEIs play as local employers with significant ecological footprints[11]. Many institutions have implemented environmental management systems and integrated environmental aspects to the branches of their institutions in order to evaluate environmental performance[1213]. Resource management have become a part of campus operations in order to support a more integrative learning experience on sustainable education.

Taken together, higher education for sustainable development should aim to develop the necessary competencies for individuals by creating a transformative learning experience that combines engagement in research, learning, and operational leadership. The desire for greater commitment to sustainability within HEIs must come from both empowering bottom-up in individuals and groups to support systemic changes in HEIs, as well as top-down leadership by making use of existing initiatives and including sustainability as a new challenge and part of the institution's strategic planning[14]. Similarly, sustainability education must be holistically implemented, and therefore the distinctions between learning, research, and campus operations and management often need to be blurred in the process of achieving transformative change on sustainability education.

The discussions above are useful in synthesizing the general approach of this report in guiding the principles behind the choice of metrics considered. Any metric considered will also need to be assessed in terms of whether they advance any improvement on one or more of the three objectives that enhance sustainable education. In other words, it is not sufficient to design metrics based on reductions in greenhouse gases alone for example, without considering whether such a metric would help fulfill the overarching objectives/principles of sustainability education. However, this report also acknowledges that the UC3 may have objectives that are outside of the scope of sustainability education, given that it is a coalition of universities and colleges, and not considered as a HEI in itself. The next section will highlight a brief overview of the UC3 structure and the particular context that the UC3 is potentially situated in advancing educational goals among HEIs through the Strategic Plan.

[9] Barth, M. (2016) *Higher education in the twenty-first century.* Pg. 47.
[10] Barth, M., & Michelsen, G. (2013). Learning for change: an educational contribution to sustainability science. *Sustain Sci 8*. Pgs. 103-119.
[11] Klein-Banai, C., & Theis, T. L. (2011). An urban university's ecological footprint and the effect of climate change. *Ecological Indicators 11*. Pgs. 857-860.
[12] Henderson, Bieler, Mckenzie (2017) "Climate Change and the Canadian Higher Education System".
[13] Admonssent, M., & Michelsen, G. (2006). German Academia heading for sustainability? Reflections on policy and practice in teaching, research and institutional innovations. *Environmental Education Research 12:1*. Pgs. 85-99.
[14] Barth, M. (2016) *Higher education in the twenty-first century.* Pg. 132.

Part 2: The UC3 Coalition Structure

2.1 The UC3 Overview

The University Climate Change Coalition ("UC3", or "The Coalition") is comprised of 22 distinguished research universities throughout North America committed to promoting leadership and collaboration in environmental sustainability and climate action at the individual, community, and global scale. Since its conception in 2018, the UC3 has actively promoted and shared best practices on issues of governance, resource allocation, and climate action between coalition members[15]. Moving into its third year of operation, the Coalition has outlined its comprehensive goals in the *UC3 Strategic Plan 2020-2025*, which will build on its existing successes and facilitate further climate action engagement and leadership by members at the institutional, community, and global levels[16]. UBC has recently assumed Presidential leadership of UC3 and is therefore responsible for supporting implementation of the UC3 Strategic Plan 2020-2020[17].

Since 2018, the UC3 has held over 23 cross-sector forums which have engaged over 2980 university leaders, elected officials, policymakers, philanthropists, and advocates on topics related to climate action such as net-zero housing and waste-derived biofuels[18]. There has also been a steady increase in the UC3 coalition membership, with five additional members joining by the end of 2018, and three additional research universities in 2019[19]. In order to begin tracking the progress of the UC3 members and their engagement in climate change curriculum and leadership, the UC3 began working on a Climate Research Assets dashboard, which enables individual members to contribute and update the database of their climate action commitment, sustainability curriculum changes, and expansions of the living lab projects[20]. Recognizing that each member institution brings value in sharing lessons unique to their own place-based contexts, the UC3 has created the *Research for Policy Platform*, which is a joint research and development platform engaged in establishing a unified set of principles and policies in order to directly support higher education leaders in 1.5 degree-aligned climate policy engagement[21].

2.2 The UC3 approach to sustainability education goals

The five key pillars for the UC3 are as follows: (1) fostering transformative teaching and real-world learning experiences that engage students in studies and action around climate change, (2) coalition-wide collaboration and peer learning through sharing of knowledge across institutions, (3) developing cross-sector partnerships that build connections between students, faculty and staff with

[15] Second Nature. (2019). *UC3 2019 Impact Report.* Retrieved from Second Nature: https://secondnature.org/wp-content/uploads/SN_UC3ImpactReport_FINAL.pdf
[16] Second Nature. (2020). *2020-2025 University Climate Change Coalition (UC3) Strategic Plan.* Retrieved from Second Nature: https://secondnature.org/wp-content/uploads/UC3-Strategic-Plan-2020-2025.pdf
[17] University of British Columbia. (2020). *UBC, UC announce University Climate Change Coalition leadership transition.* Retrieved from UBC news: https://news.ubc.ca/2020/06/22/ubc-uc-announce-university-climate-change-coalition-leadership-transition/
[18] Second Nature. (2019). *UC3 Research for Policy Platform.* Retrieved from https://secondnature.org/wp-content/uploads/Research-for-Policy-Platform-Letter_July2019.pdf
[19] Second Nature. (2018). *UC3 2018 Progress Report.* Retrieved from Second Nature: https://secondnature.org/wp-content/uploads/SecondNature_UC3_2018ProgressReport-Final.pdf
[20] UC3. (2020). Climate Research Assets. Boston, Massachussets.
[21] Second Nature. (2019) *UC3 Research for Policy Platform.*

key stakeholders in the community, (4) generating demand-driven research that addresses important gaps in climate action, and (5) leveraging the leadership of university presidents and chancellors to build top-down consensus on pursuing climate action within the academic and operational settings[22].

In many ways, the goals of the UC3 align with the educational competencies set out in Part I of this report. Taken in this view, the UC3 organization acts as a platform to accelerate and support HEIs in developing sustainability education by providing a means to engage in cross-institutional knowledge sharing. Thus, this report takes a goal-driven approach in designing evaluation metrics by considering first whether a reported metric is able to capture an institution's ability in developing the core competencies highlighted in Part I. The function of the UC3 however departs from views that sustainability education is driven either by top-down or bottom-up action, by allowing consideration for horizontal drivers between education institutions. Most notable is the second core value of the UC3, which consists of the ability for the coalition to engage in coalition-wide collaboration and knowledge sharing. As a result, the metrics considered must include this additional dimension, namely, the ability to measure a contribution to a goal in the strategic plan that also advances the UC3's ability to be cross-institutionally collaborative.

Part 3: Greater clarity on the UC3 Strategic Plan metrics

Any metrics considered must first be evaluated based on whether it is able to capture the evaluation of the three levels of sustainability action: (1) research on climate issues, (2) learning and teaching activities, and (3) organizational/management practices and operational change[23]. In the section above, the report also noted the need to include considerations of the usefulness of what is to be reported also in the context of coalition-wide collaboration and knowledge sharing. Table 1 represents the dimensions required to assess the metrics to be considered in the following section.

Table 1: Parameters considered in selecting metrics

Climate Action Levels	Description
Research	Ability to engage inter and trans-disciplinary collaboration. Research driven by practice or problem-oriented approaches rather than disciplines.
Curriculum	Designing learning settings that are conductive to interdisciplinary, problem-oriented approaches in addressing solutions of practice relevance
Operational/Managerial	Evaluation of environmental or sustainability management systems, as well as the extent of impact on ecological footprints, and faculty and staff climate action engagement. Penetration of environmental objectives in the branches of organization in order to evaluate, report and improve environmental performance.
Cross-Institutional	Extent of engagement with other institutional members of the UC3 community.

[22] Second Nature. (2021). *About the University Climate Change Coalition*. Retrieved from Second Nature: https://secondnature.org/about-uc3-2/#structure

[23] Barth, M. (2016) *Higher education in the twenty-first century. pg.* 46.

The process of metric selection is as follows: The methodology begins with a brief literature review of the key instruments underlying each strategy, followed by an assessment of the measurements that will be used in the context of the core levels in Table 1. The goal is to design a criterion of measures that will be able to capture and evaluate the progress of each strategic point in all of the levels of higher education climate action where applicable. For example, it is not sufficient enough just to publish the estimated greenhouse gas (GHG) emissions reductions of a specific project, but that there also needs to be a clarification on the impact that the reductions had on either operations and management, facilitating research, curriculum/learning changes, or cross-institutional knowledge sharing. Sections 3.1.0 to 3.3.5 will deliberate on discussions surrounding each strategic point in greater detail.

3.1.0 Goal 1 – Campus

3.1.1 Create and implement campus as a living lab initiative, programs, and/or projects.

According to Liedtke et al. (2012), a living lab is a "combined lab-/household system, analysing existing product-service-systems as well as technical and socioeconomic influences focused on the social needs of people, aiming at the development of integrated technical and social innovations[24]. Living labs (LL) aim to establish partnerships or programs to bridge academic activities in higher education institutions (HEIs) with non-academic partners[25]. Partnerships range from university internal operations[26], to businesses, local communities, and other external organizations[27]. In order to succeed, LLs need to consider both facilitating innovative ways to teach, as well as most engagement in research and technology transfers between the university and their local and regional communities. Filho (2019) therefore observes that one of the strengths of the Living Labs approaches is the ability to capture interactions between the academic sector and other parts of society by facilitating multi-stakeholder engagement in "new open and experimentative processes carried out in real world contexts[28]. Table 2 draws from Filho's synthesis of the measures that universities may deploy in maximizing the potential of their living labs and reframes the means of implementation as a possible checklist of metrics that can self-assessed in order to score each UC3 coalition member on the progress of their implementation of a campus as a living lab initiative.

[24] Liedtke, C., Welfens, M. J., Rohn, H., & Nordmann, J. (2012). LIVING LAB: user-driven innovation for sustainability. *International Journal of Sustainability in Higher Education 13(2)*. Pg. 106-118.
[25] EAUC. (2017). *EAUC Living Labs Project.* Retrieved from The Alliance for Sustainability Leadership in Education: https://www.eauc.org.uk/eauc_living_labs_project
[26] Robinson, J., Berkhout, T., Cayuela, A., & Campbell, A. (2013). Next Generation Sustainability at The University of British Columbia: The University as Societal Test-Bed for Sustainability. In K. Ariane, *Regenerative sustainable development of universities and cities: the role of living laboratories* (pp. 27-49). Cheltenham: Edward Elgar.
[27] Munro, A., Marcus, J., Dolling, K., Robinson, J., & Wahl, J. (2016). Combining forces - Fostering sustainability collaboration between the city of Vancouver and the University of British Columbia. *International Journal of Sustainability in Higher Education*. pg 812-826.
[28] Filho, W. L. (2019). Living Labs for Sustainable Development: The Role of the European School of Sustainability Sciences and Research. In W. Leal Filho, A. L. Salvia, R. Pretorius, L. Brandli, E. Manolas, M. Alves, . . . A. Paço, *Universities as Living Labs for Sustainable Development* (pp. 3-11). Cham: Springer. Pg. 4

Table 2: Measures to maximize universities' potentials as living labs adapted from Filho (2019)

Measurement	Means of implementation
Work in an integrated manner	Has the LL engaged colleagues across department and disciplines?
Engage local stakeholders	Has the LL project gone beyond the university and engaged with external actors?
Pursue partnerships	Has the LL project sought synergies with organizations pursuing similar goals?
Document experiences	Have Staff/Students written down experiences and published them?
Make an effort to meet peers	Have Staff/Students attended gatherings to exchange ideas and obtain necessary information?
Be visible	How transparent are the achievements available to the public/community stakeholders?
Foster talent	Were there engagement students at different levels? B.Sc., M.Sc., Ph.D.

Alternatively, Verhoef et al. (2019) proposed a framework meant to lead the development of a database to collect key data about LL projects, which tracks data collected on seven categories throughout the different stages of the Living Lab, as well as monitoring the outcomes and impacts of each stage[29]. Table 3 provides a summary of the seven key parameters.

Table 3: Seven Data Collection Categories as adapted from Verhoef, et al. (2019)

Collection Category	Description Summary
General	A summary of the Living Lab location, key contacts, status, timelines and budget.
Scope	The problem being addressed, historical details to the problem, the context, and the key sustainability 'theme' being addressed.
Participants and Co-creators	Different stakeholders and ways in which they are engaged.
Organization	Leading organizations, partnerships, potential risks.
Outcomes	Anticipated (and actual) sustainability outcomes in relation to the problem being addressed, as well as anticipated (and actual) educational, research and engagement outcomes.
Impact	Wider impacts outside of the Living Lab boundaries.
Reflection and Review	Evaluation of the Living Lab products and processes.

[29] Verhoef, L., Bossert, M., Newman, J., Ferraz, F., Robinson, Z., Agarwala, Y., . . . Hellinga, C. (2019). Towards a learning system for University Campuses as Living Labs for sustainability. In W. Leal Filho, A. L. Salvia, R. Pretorius, L. Brandli, E. Manolas, M. Alves, . . . A. Paço, *Universities as Living Labs for Sustainable Development: Supporting the Implementation of the Sustainable Development Goals* (pp. 135-149). Cham: Springer.

Instead, the framework proposed by Verhoef et al. is designed more as post-evaluation of existing campus as living labs initiatives, in which case studies of LL initiatives can be submitted to a UC3 reporting platform with metrics set under each of the seven data collection categories.

3.1.2 Establish pathways to incorporate concepts of climate action and sustainability across the curriculum.

Higher education for sustainability requires not only to collect and generate knowledge but also to reflect on the complexity and interrelations of behavior and decision-making in a future-oriented and global perspective[30]. Establishing pathways to incorporate concepts of climate action and sustainability must also imply attempting to re-adjust academic teaching in order to offer new learning settings. Similarly, Willats et al. (2018) note that it is not enough for HEIs to focus solely on operational environment performance, and that a core objective is also to foster sustainability literate graduates[31]. Barth & Timm (2011) highlight that in order to engage in curriculum re-design, at least four learning goals must be considered (Table 3).

Table 3: Learning goals adapted from Barth & Timm (2011)

Learning Goals	Description
Inter- and transdisciplinary problem-solving	There is a need to link knowledge of structures and interrelations with ethical orientations and anticipatory thinking. What is needed in higher education is interdisciplinary settings that integrate stakeholders and work close to a specific real-life context.
Dealing with complexity	Higher education has to familiarize students with the changeability of complex systems so that they understand better society.
Self-directed, collaborative learning	Open process of negotiation that calls for reflexive group discussions. Students should also be involved in steering the development and demand for experiential learning.
Competence development	Support the development of relevant competencies.

Pathways established can therefore be conceptualized to assist in realizing one or more of the learning goals from the table above. In order to measure the holistic effect of each pathway on curriculum design, Figure 1 provides an illustration of the steps of a pathway towards deep-rooted implementation, according to Barth & Timm. The first level of integration consists of inclusion of sustainability-related topics such as a lecture series, then increases in implementation and innovation as more of the learning goals as met in the context of sustainability issues. A key metric then, can be to evaluate the degree of innovation and implementation of UC3 members and extract their point estimates under this graph, ultimately with the goal of achieving deep integration of that encompass both a high level of innovation and implementation.

[30] Barth, M., & Timm, J.-M. (2011). Higher Education for Sustainable Development: Students' Perspectives on an Innovative Approach to Educational Change. *Journal of Social Science 7(1).* Pg. 13-23.
[31] Willats, J., Erlandsson, L., Molthan-Hill, P., Dharmasasmita, A., & Simmons, E. (2018). A University Wide Approach to Embedding the Sustainable Development Goals in the Curriculum—A Case Study from the Nottingham Trent University's Green Academy. In W. L. Filho, *Implementing Sustainability in the Curriculum of Universities* (pp. 63-78). Hamburg: Springer.

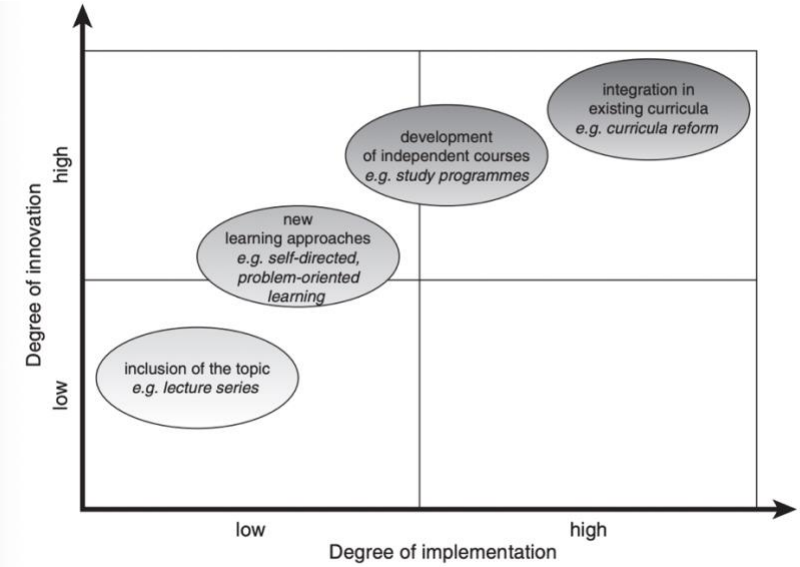

Figure 1: Steps of integration of curriculum change from Barth & Timm (2011)

In a similar configuration, Rusinko (2009) developed a generic matrix on how to integrate sustainability pathways in higher education curricula (Figure 2)[32]. Instead of a spectrum by which we can measure UC3 coalition progress along a continuum similar to the model from Barth & Timm, the SHE matrix categorizes existing and new structures along the lines of broad or narrow cross-disciplinary focus. Under this matrix model, evaluation of the UC3 progress can be tracked by the movement of the choice narrower structures from Quadrants I or II to Quadrants III or IV which contain broader sustainability-focused learning engaged in the curricula.

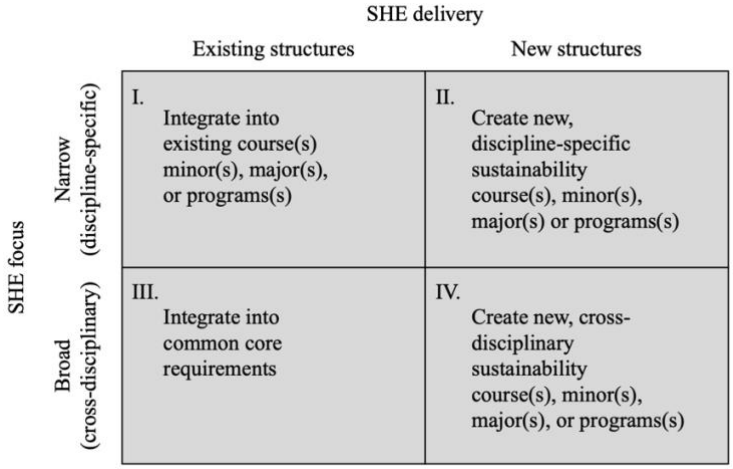

Figure 2: General Matrix to Integrate Sustainability in Higher Education from Rusinko (2010)

3.1.3 Support student participation in campus climate action activities and foster climate leadership.

[32] Rusinko, C. A. (2010). Integrating sustainability in higher education: a generic matrix. *International Journal of sustainability in Higher Education 11(3)*. Pg. 250-259.

Helferty and Clarke (2009) compiled eight different categories of campus climate change-related initiatives: (1) awareness-raising, (2) sustainability assessments and/or GHG inventories, (3) sustainability funds, (4) residence challenges, (5) on-campus retrofits or renewable energy production, (6) multi-sectoral collaborations, (7) staff/faculty-focused programs, and (8) policy development[33]. The authors then categorized each activity based on level of youth engagement, which sees youth engagement as a ladder moving from socialization-based engagement to eventually power-based engagement, where the student is ultimately given the opportunity to be a partner is decision-making (Table 4).

Table 4: Degrees of Student Engagement Adapted from Helferty & Clarke (2009)

Degree of Student Engagement	Level of Student Engagement	Type of Initiative
High	Power	Policy Development
		Multi-sectoral or multi-stakeholder collaboration
		Retrofits/energy production
		Sustainability funds
		Assessments
Medium	Influence	Assessments
		Residence challenges
		Retrofits/energy production
		Policy Development
Low	Socialization	Assessments
		Residence challenges
		Awareness-raising

Increasing student engagement is taken as an essential part of optimizing learning outcomes[3435]. The objectives of student engagement resonate in line with learning objectives in providing opportunities for students to engage in real world issues, engage in experiential learning, and embed sustainability into educational outcomes. Tilbury and Wortman (2004) define student engagement as attention which draws to (1) power threads in education activity, and (2) authentic participation opportunities where students inform and influence the activity. Student engagement is therefore committed to empowering and supporting the development of action competence and leadership capability[36]. Tilbury (2016) observes that a real obstacle to deeper student engagement is the tendency to view students as "empty vessels, ready to be filled with the ideas about sustainability from the 'experts' around them"[37]. This contrasts with student engagement based on critical-democratic principles

[33] Helferty, A., & Clarke, A. (2009). Student-led campus climate change initiatives in Canada. *International Journal of Sustainability in Higher Education 10(3)*. Pg. 287-300.
[34] Liu, L., & Gao, L. (2020). Enhancing Student Engagement in a Sustainability Class: A Survey Study. In W. Leal Filho, A. L. Salvia, R. Pretorius, L. Brandli, E. Manolas, M. Alves, . . . A. Paço, *Universities as Living Labs for Sustainable Development* (pp. 323-341). Hamburg: Springer.
[35] Tilbury, D. (2016). Student Engagement and Leadership in Higher Education for Sustainability. In M. Barth, G. Michelsen, M. Rieckmann, & I. Thomas, *Routledge Handbook of Higher Education for Sustainable Development* (pp. 273-287). New York: Routledge.
[36] Tilbury, D., & Wortman, D. (2004). *Engaging People in Sustainability*. Cambridge: International Union for Conservation of Nature and Natural Resources.
[37] Tilbury, D. (2016). Student Engagement and Leadership in Higher Education for Sustainability. Pg. 276

which underpin discourses of students as co-producers of climate action research. Measuring support for student participation based on educational outcomes must also consider the following dimensions[38]:

1. Students and student bodies working with faculty and staff identifying research questions.
2. Students and student bodies working with faculty and staff framing research design, methodology, and data capture.
3. Students and student bodies working with faculty in undertaking data analysis.
4. Students and student bodies playing a role in communicating research and applying research findings where possible.

Supporting student-based climate leadership in this case can be measured by the degree of student engagement on climate-related decision-making processes that are occurring at the campus level. While it may be easy to rely on a measure of support to be evaluated based on financial contributions to student-group funding, which to a certain extent does indirectly support educational outcomes by relying on students to manage their own club operational budgets, a more accurate measure of supporting student climate action and climate leadership may be mapping the extent of access students have on power-based levels of engagement. Opening upwards mobility for students to engage in higher levels of initiatives can involve actions that are beyond financial commitments, including providing opportunities for student groups to engage in consultative meetings, collaborating on evaluative assessment projects, and providing input on educational and research design.

3.1.4 Encourage operational climate leadership on campus.

Kosta (2018) finds that one of the most important barriers for the implementation of sustainability in the curriculum is also in the absence of institutional strategy[39]. There already exists a rich body of literature on the study of operational leadership on sustainable development from HEIs. In their analysis of the Campus Sustainability Integrated Assessment (CSIA) in Michigan University, Marans, Caeelwaert and Shriberg (2015) assessed operational action under four areas: Climate action, waste prevention, healthy environments and community awareness[40]. More stringent measurements have been introduced by Zenchanka and Malcheka (2017), where they propose implementations of the principles of the International Standards Organization (ISO), specifically related to ISO 9001, ISO 14001, ISO 50001, and ISO 26000[41]. Focusing on operational climate leadership on campus, the ISO 14000 standards primarily aim to promote effective management systems in organizations, by providing cost-effective tools that make use of best practices for organization operational climate leadership[42]. On the other hand, Bernaldo and Frenández-Sánchez (2017) assert that there is

[38] Tilbury, D. (2016). Student Engagement and Leadership in Higher Education for Sustainability.
[39] Kosta, K. (2018). Sustainability Curriculum in UK University Sustainability Reports. In W. L. Filho, *Implementing Sustainability in the Curriculum of Universities* (pp. 79-97). Hamburg: Springer.
[40] Marans, R. W., Callewaert, J., & Shriberg, M. (2015). Enhancing and Monitoring Sustainability Culture at the University of Michigan. In W. L. Filho, *Transformative Approaches to Sustainable Development at Universities* (pp. 165-179). Hamburg: Springer.
[41] Zenchanka, S., & Malchenka, S. (2017). Three "Gs" for Campus Sustainability Development. In F. W. Leal, U. Azeiterio, F. Aves, & P. Molthan-Hill, *Handbook of Theory and Practice of Sustainable Development in Higher Education. World Sustainability Series.* (pp. 291-302). Springer: Cham.
[42] International Standards Organization. (2020). *WHAT IS THE ISO 14000 STANDARDS SERIES?* Retrieved from ISO: https://asq.org/quality-resources/iso

currently no agreed methodology for assessing operational action as a whole, and instead present five main tools used for assessing operational leadership on campus, comprised of AISHE (Auditing Instrument for Sustainability in Higher Education), SAQ (Sustainability Assessment Question), (ULSD), USAT(Unit-based Sustainability Assessment Tool), STARS (Sustainability Tracking Assessment & Rating System), and SUSTAIN TOOL (Program Sustainability Assessment Tool)[43]. Table 5 summarizes each tool.

Table 5: Approaches and scope of five sustainability assessment tools. Source (Bernaldo & Fernández-Sánchez, 2017)

Tool	Scope
AISHE	Check progress in sustainability in every area
SAQ	Current situation of the institution and future planning in sustainability
USAT	Independently evaluate each department for more accurate evaluation of the institution as a whole
STARS	Publication of reports between universities
SUSTAINTOOL	Plans, lines of action or sustainability programs at the institution

In general, by implementing assessment tools, HEIs are able to compel themselves to engage in operational leadership by publishing their operational climate action to assessment reporting tools that are publicly accessible. The STARS assessment platform at the present writing of this report appears to be the tool which contains the highest rate of participation among UC3 members, at close to 60 percent engagement. Measuring operational leadership then, can be tracked by improvements made by UC3 members under the rating system ranging from bronze rating to platinum rating[44]. The choice of reporting tool here is more founded on the basis of convenience, given that it is an establish assessment tool which coalition members already use.

3.1.5 Conduct comparative case studies on key climate issues across member institutions.

This report has highlighted the potential educational benefits in conducting these case studies in order to further develop key competencies in sustainability educational research and experiential learning outcomes not only for students, but for faculty and staff to engage in knowledge sharing of potential best practices. Measuring the track record of cross-member case studies can be done either by submitting to a UC3 reporting tool or assessed under Boolean phrase construction through academic search engines such as Web of Science, or Google Scholars. Barth & Rieckmann (2016) actually found in their study that case studies represented the most often indicated research method, comprising of 51.3% of the results extracted from their Boolean search method[45]. A potential goal

14000#:~:text=The%20primary%20objective%20of%20the,applying%20information%20about%20environmental%20management.

[43] Bernaldo, M., & Fernández-Sánchez, G. (2017). Sustainability Integration Approaches in Higher Education Institutions. A Case Study. In W. L. Filho, *Handbook of Theory and Practice of Sustainable Development in Higher Education Volume 4* (pp. 179-193). Hamburg: Springer.

[44] Association for the Advancement of Sustainability in Higher Education. (2020). *About STARS*. Retrieved from AASHE Sites: https://stars.aashe.org/about-stars/

[45] Barth, M., & Rieckmann, M. (2016). State of the art in research on higher education for sustainable development. In M. Barth, G. Michelsen, M. Rieckmann, & I. Thomas, *ROUTLEDGE HANDBOOK OF HIGHER EDUCATION FOR SUSTAINABLE DEVELOPMENT* (pp. 100-114). Oxon: Routledge.

for the UC3 may be to track each individual institution's search results in mentions of case studies surrounding their own respective practices in promoting climate action.

3.2.0 Goal 2 – Community

3.2.1 Continue hosting local cross-sector climate forums that identify climate action goals in the community and establish potential opportunities for cross-sector collaborations

Local cross-sector climate forums that engage with community leaders are important drivers of what Ernest Boyer of the Carnegie Foundation refers to as 'engaged scholarship'[46]. In many ways, cross-sector collaborations cut across areas of teaching and research that is linked with experiential learning outcomes. Similarly, many of the objectives in Goal 1 (Campus) from the strategic plan aim to provide opportunities to bridge community engagement. The university can become a community partner for example, by implementing a living lab initiative which engages in collaborating with the local community.

At present, the UC3 measures cross-sector climate forum engagement from member institutions by publishing the total number of forums engaged at the end-of-year impact reports (Second Nature, 2019; Second Nature, 2018). The reporting also includes the number of participants that have attended. Disaggregating the event descriptions by topics, or industries engaged may further assist in measuring progress of this strategy by ensuring multidisciplinary engagement with local communities. Marans, Callaewart and Shriberg (2015) for example, highlighted four themes under the CSIA, which consisted of climate action, waste prevention, healthy environments, and community awareness[47]. Providing a record of forums that address each of the key areas in sustainability and climate action goals will provide an additional depth of comprehensive community engagement in all areas of campus climate action.

3.2.2 Create applied, community engaged learning opportunities for students that address place-based climate issues.

Measurements of community engaged learning opportunities often run in parallel with measuring the success of campus as living labs initiatives. In fact, LL initiatives are also applied learning opportunities with community engagement for students to address real-world, place-based climate issues. Thus, measuring the status of this strategy can adopt a similar checklist to section 3.1.1, which is adapted from Filho's (2019) measures to maximize universities" potentials as living labs (Table 6).

Table 6: Measures to maximize universities' community learning opportunities as adapted from Filho (2019)

[46] Barth, M. (2016) *Higher education in the twenty-first century. pg.* 120.
[47] Marans, R. W., Callewaert, J., & Shriberg, M. (2015). Enhancing and Monitoring Sustainability Culture at the University of Michigan.

Measurement	Means of implementation
Work in an integrated manner	Has the program engaged colleagues across department and disciplines?
Engage local stakeholders	Has the program gone beyond the university and engaged with external actors? Who are the actors involved?
Pursue partnerships	Has the program sought synergies with organizations pursuing similar goals or sough further engagement beyond the project?
Document experiences	Have Staff/Students written down experiences and published them?
Make an effort to meet peers	Have Staff/Students attended gatherings to exchange ideas and obtain necessary information?
Be visible	How transparent are the achievements available to other public/community stakeholders?
Foster talent	Were there engagement students at different levels? B.Sc., M.Sc., Ph.D.

The measurements would consist of qualitative recounts of community engagement projects that are submitted. Ultimately, tracking the measurement of this strategy would possibly involve the design of a self-reporting tool where faculty can provide an outline of programs that emerge throughout the five-year period.

3.2.3 Co-develop university-community research projects with cross-sector partners

Similar to strategy 3.2.1, the measurement of this strategy can draw from existing measurement models highlighted in the living labs strategy. One particular point to note however is that research projects with cross-sector partners related to climate action tend to be problem and practice-driven. The seven data collection categories from Verhoef et al. (2019) can be also applied to measure the status of university-community research projects, as the categories capture both the cross-sector partners involved, the inter-disciplinary students engaged, as well as the educational and practical outcomes achieved.

Table 7: Seven Data Collection Categories adapted from Verhoef, et al. (2019)

Collection Category	Description Summary
General	A summary of the research location, key contacts, status, timelines and budget.
Scope	The problem being addressed, historical details to the problem, the context, and the key sustainability 'theme' being addressed.
Participants and Co-creators	Different stakeholders and ways in which they are engaged. Different disciplines and ways in which they are engaged.
Organization	Leading organizations, partnerships, potential risks.

Outcomes	Anticipated (and actual) sustainability outcomes in relation to the problem being addressed, as well as anticipated (and actual) educational, research and engagement outcomes.
Impact	Wider impacts outside of the research boundaries.
Reflection and Review	Evaluation of the research products and processes.

3.2.4 Make collective climate solutions resources accessible and useful to policymakers and other key decision-makers in the community.

One of the key constraints to this objective is the fact that most research-based products tend to be submitted to journal publications, which are effectively restricted from open access via paid subscriptions. Measuring the progress of this strategic goal can be accomplished either by expanding the UC3 reporting tool by allowing member institutions to publish their resources online the platform, or by creating department specific web platforms in each individual institution which contains an area that public stakeholders can access with resources available of recent projects.

The University of British Columbia's Sustainability Scholars program for example, contains a project library which documents the work that scholars have complemented since 2011[48]. The library showcases both student learning outcomes as well as community engagement by project overviews of projects completed by scholars who directly work with local community partners. Another way of measuring this strategy therefore can include the number of 'project libraries' that are available for public access.

3.2.5 Identify funding sources and establish regional programs that incentivize cross-sector collaboration for place-based climate solutions.

Unlike the previous strategies that focus on leveraging existing resources in order to propel educational outcomes, this strategy relies on leveraging existing resources in order to generate more funding for potentially future resources. It may be useful then first to provide a brief overview of the likely frames that funding foundations may have and fit them into the context of the UC3's operational goals. Lindley Mease of the Climate Leaders in Movement Action (CLIMA) Fund highlights five narrative frames that potentially influence climate philanthropy[49]:

1) Innovation: New creative and novel ideas to respond to climate change
2) Scale & Speed: Fast-tricked solutions that reach a global scale
3) Metric & Measurability: What is important to measure over what time frame, and who has access to data
4) Capacity: Bridging gaps to funding for smaller organizations
5) Geographic Reach: Funders often give to what they know and where they live.

[48] UBC. (2020). *Project Library*. Retrieved from UBC Sustainability: https://sustain.ubc.ca/teaching-applied-learning/sustainability-scholars-program/project-library

[49] Colting-Stol, J. (2020). *Foundations and Climate Action Exploratory Research*. Retrieved from Canadian Philanthropy Partnership Reserach Network: https://philab.uqam.ca/wp-content/uploads/2020/09/Foundations-Climate-Exploratory-Research-.docx.pdf

Geographic reach is particularly notable given that funding can occur at the campus, community, and global levels. In many cases, funding is often restricted at the cross-jurisdictional approach, and therefore member institutions in different countries may be restricted in receiving funding from external organizations outside of Second Nature. Measuring the progress of this objective can be therefore broken down into categories of funding partners either geographically (i.e. coalition-wide, individual member, individual program), or by type of program.

3.3.0 Goal 3 – Global

3.3.1 Release collective statements and calls to action advocating for bold and ambitious global climate mitigation and adaptation actions and targets that incorporate climate justice.

A particular strength of institutional collaboration such as the design of the UC3 is in its ability to mobilize collective action on systemic issues such as addressing climate change. Measuring collective statements and calls to action can be separated under three categories. The first category falls in line with a series of institutionalized events such as G20 or G7/8, BRICs, and UNFCCC Conference of Parties (COP) meetings, that engage on climate leadership at the nation level. The measurement here is emulated from existing practices of other higher education climate networks such as the International Universities Climate Alliance, who had issued out their climate declaration to the G20[50]. The second category falls on more episodic events that require mobilization of climate leadership. Notable examples of the second category include calls to action surrounding the climate emergency, climate strikes, or carbon neutrality by 2050. While the first two categories tend to be reactionary to global events, the third category falls on statements that are driven by coalition leadership, which may include campus operational commitments, or coalition-wide support for outcomes published by UC3 platforms.

3.3.2 Use the *Research for Policy Platform* to publish joint primers, policy statements, research briefs, and talking points on key global climate change issues and solutions that are inclusive of climate justice.

The *Research for Policy Platform* involves a two-fold measurement process. The first part involves measuring the ability for the platform to produce coalition-wide educational outcomes and cross-sectoral partnerships, in terms of the extent of engagement from students and local community stakeholders in drafting joint primers, policy statements, and research briefs. A related point should be evaluating whether research outcomes involved taking an interdisciplinary approach by considering the inputs of scholars and staff working in different disciplines/departments/industries. The second part of the evaluation needs to incorporate a dimension of considering the scope of the platform in being able to tackle different issues related to climate change and sustainability. The categories of topics can include, but not be limited to Helferty and Clarke's list of campus initiatives: (1) awareness-raising, (2) sustainability assessments and/or GHG inventories, (3) sustainability funds, (4) residence challenges, (5) on-campus retrofits or renewable energy production, (6) multi-

[50] International Universities Climate Alliance. (2020). *ALLIANCE OF TOP UNIVERSITIES URGE G20 LEADERS TO PRIORITISE NET ZERO EMISSIONS*. Retrieved from https://www.universitiesforclimate.org/climate-declaration-announcement/

sectoral collaborations, (7) staff/faculty-focused programs, and (8) policy development[51], or climate change-related issues that are outside of the realm of HEIs.

3.3.3 Represent leading research universities at international climate change conferences, forums, and summits.

As discussed in section 3.3.1, the measuring of this strategic goal can consist of both reactionary efforts in representing the UC3 through active engagement in attending international climate change conferences, forums and summits, as well as leading/spearheading discussions surrounding the role of HEIs in these forums. Measuring progress would consist of year-end reporting of the total number of international climate change conferences attended by the UC3 membership, as well as the number of collective statements issued regarding global events.

3.3.4 Work with other university alliances, networks, and coalitions to identify mutual areas of interest and opportunities to lead international efforts to promote climate action at universities across the globe.

Measuring this strategic goal can be disaggregated to track the progress of engagement with both regional university networks, as well as global university networks. Climate action can be then measured on the basis of activity type, which includes cross-organization forums, joint statements, and joint research publications.

3.3.5 Develop joint collaborative, cross-Coalition research projects and initiatives.

Measurement of this strategic goal will be similarly to 3.3.4 by tracking progress along the lines of the type of coalition engaged (local vs regional vs global), as well as the type of issue addressed. In the context of the UC3's current progress, the target set for this action is to launch a major cross-Coalition collaboration project with another leading HEI organization.

Part 4: Strategies

Reporting will be conducted at a year-to-year basis or leading up to an annual UC3 leadership summit. The immediate problem that occurs is considering the extent of feasibility in being able to report on these metrics. Issues of feasibility include the lack of time or resources to be providing a comprehensive report on the progress of a university on all fifteen goals. Quality of information reported is the second factor to consider. Issues surrounding access to information can be associated with a lack of primary data collected, reporting false information, reporting duplicate information, or potential biases in reporting. Access to information, and resources availability/feasibility are the two dimensions to consider in order to assess which targeted actors can be used to provide measurement of UC3 coalition member progress. Figure 3 maps various measurement options in the context of the two established criteria.

[51] Helferty, A., & Clarke, A. (2009). Student-led campus climate change initiatives in Canada.

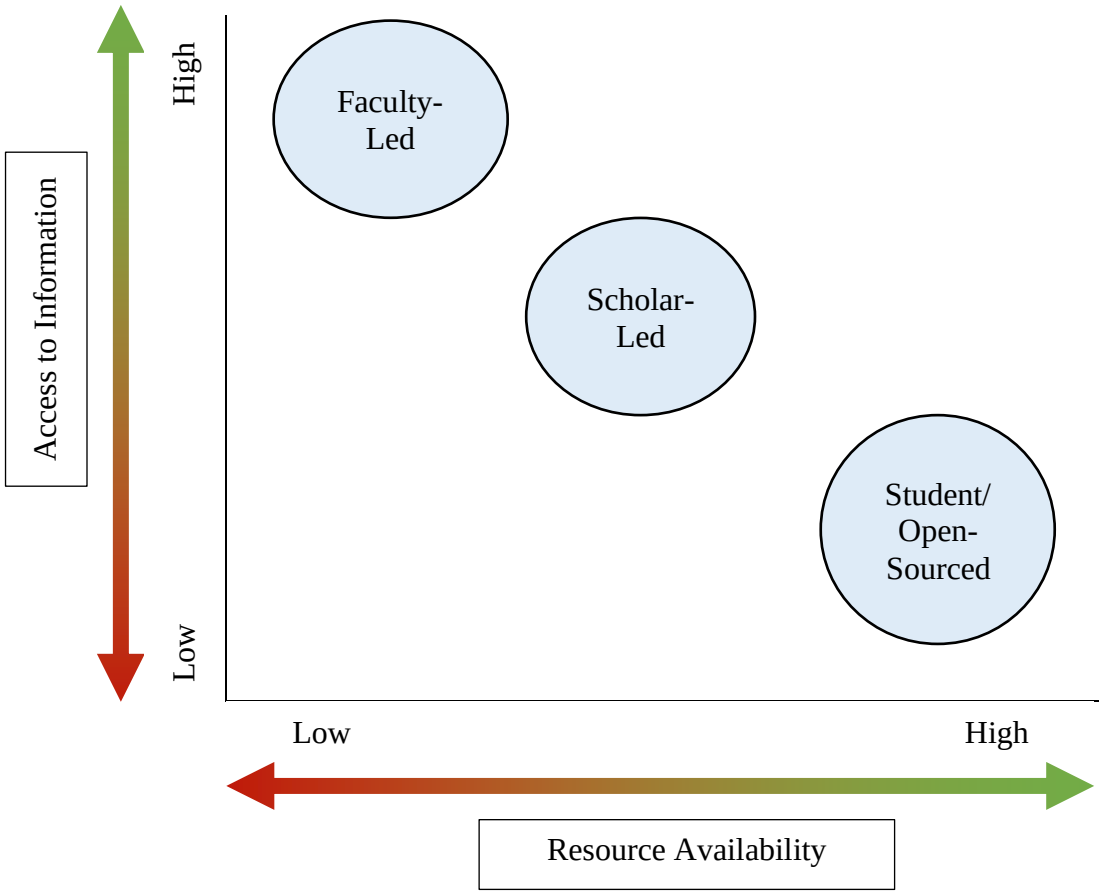

Figure 3: Access to information and Feasibility of different reporting strategies.

Option 1: Faculty/Staff-led Metric Contribution

Within each institution, there are four types of liaisons appointed by the university head with assistance from the Coalition Executive Liaison: Executive Liaison, Operational Liaison, Research Liaison, Communications Liaison[52].

The first option is to delegate the reporting of UC3 progress to the internal liaisons of each respective university. Information collected will need to be consulted by each liaison in order to obtain consistency and depth in results.

The benefit of this option is that each staff Liaison will be up to date on UC3 events and progress and will be able to provide consistent information on progress in the five-year period. As a result, access to information is relatively high compared to the other options. On the other hand, because Liaisons would not be dedicated in tracking UC3 progress, they may be limited in terms of the resources available, such as the amount of time they can dedicate to working on UC3 progress, including completing detailed surveys, and case studies.

[52] Second Nature. (2021). *About the University Climate Change Coalition.*

Option 2: Scholar-led Metric Contribution

The second option involves hiring an in-house scholar to engage in drafting the compliance of UC3 members to the strategic plan. This option can be implemented by inviting member institutions to award a post-doctoral followship and/or a graduate student internship to become a UC3 Fellow/Scholar that is tasked with spearheading university-specific climate initiatives or creating case studies that are relevant to the goals of the Strategic Plan. Scholars can also form a Cohort with other member universities in order to draft comprehensive reports on UC3 progress, including a transfer of knowledge and best-practices related the UC3 goals.

Although the scholar will have less access to university-wide data relative to faculty/staff counterparts, a benefit of this option is that it encourages student engagement on issues of university climate action at a high level. This encourages the application of knowledge in a practical setting by allowing the scholar to create case studies that can be used to showcase climate action across the UC3 in the context of the strategic plan. On the other hand, this option is still limited in resource availability as universities will need to earmark funds in order to pay for the scholarship, which also limits the number of scholars that will be available to work on UC3-related projects and case studies.

Option 3: Student/Open-Sourced Metric Contribution

The third option expands the level of outreach to student clubs or open sourcing that would be interested in measuring climate action in compliance to the strategic plan. Open-sourcing represents the most decentralized form of obtaining measurement progress, which involves an open-source reporting mechanism that allows individuals to submit progress in the form of a Google Form, or related software. This is similar to what is currently on the UC3 reporting tool's information submission section, where users are allowed to submit on behalf of their organization.

While this option promotes a high level of student engagement, information may be inconsistent. Information sources will come from publicly available data, which is not always up to date nor accurate. Similarly, duplicate submissions of the same information may occur, which places additional burdens to Second Nature staff to sort through the information provided. Lastly, there may also be a risk of bias, which will affect the results of the progress reported.

Part 5: Recommendations & Conclusion

The most realistic method of tracking the UC3 progress on the Strategic Plan is to create a comprehensive survey that members are to complete on a year-to-year basis, which provides evidence of UC3 progress on each of the fifteen goals, constrained under the context of research, curriculum, and operational leadership, at the campus, community, and global levels. The survey will therefore provide a checklist of in-depth goals for each. Ultimately, the expectation is therefore not for all universities to meet them, but to also provide a guide in terms of what is needed to be achieved for the majority of coalition members.

This report has also provided three options to consider regarding the parties that can be responsible for the measuring process. While staff-led reporting is anticipated to lead to relatively more up-to-

date reporting, given the likelihood of access to current data on respective universities' climate action progress, and general expectations of UC3 data, constraints due to the limited amount of time may pose as a risk prevent tracking to be updated on the yearly basis. An in-house scholar can be hired in order to create dedicated case studies and measurements of UC3 progress but is again limited in resources available due to possible budget constraints. Lastly, there is also an option to open up the UC3 reporting process to the general student population or open-source collection via a public Google Forms survey. While there are obvious risks of a lack of quality data collected in this method, student reporting also represents the least number of resources committed by university members.

The recommendation of this report is to consider exploring the possibility of creating scholar-led reporting, due to the fact that it presents a balance between the ability to produce a high-quality, and comprehensive report on the progress of UC members towards advancing the goals of the Strategic Plan, as well as achieving overarching goals of sustainability in higher education by fostering student engagement. The scholar can be responsible in general in creating a comprehensive case study assessing any particular project among UC3 members throughout the year, along with creating a report of their respective university as deliverables for the during of the scholarship. This program can also help students engage with faculty to understand existing complexities associated with the educational system, which will foster more depth in comprehension to issues on climate action on campus. Furthermore, the final draft of the progress reports can be reviewed by Liaison members prior to submitting to Second Nature to ensure that the information is consistent, without excessively overburden university faculty and staff.

Ultimately, the goal of this report is to provide a guidance in the areas of consideration regarding measuring progress for the UC3 2020-2025 Strategic Plan. Recalling once again, higher education for sustainable development should aim to develop the necessary competencies for individuals by creating a transformative learning experience that combines engagement in research, learning, and operational leadership. The desire for greater commitment to sustainability within HEIs must come from both empowering bottom-up in individuals and groups to support systemic changes in HEIs, as well as top-down leadership by making use of existing initiatives and including sustainability as a new challenge and part of the institution's strategic planning. Similarly, sustainability education must be holistically implemented in order to integrate learning, research, and campus operations and management into a coherent and unified process of achieving transformative change on sustainability education.

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