

APEC Climate Economics Cross-Border Educational Course (CECC)

APEC Human Resources Development Working Group

July 2024



**Asia-Pacific
Economic Cooperation**



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EXECUTIVE SUMMARY

APEC region suffers from more than 70% of global natural disasters causing USD100 billion in annual loss and an 18% GDP reduction by 2050. This 10-month long project organized a hybrid seminar to develop APEC Climate Economics Cross-Border Educational Course (CECC). Through the participation of APEC key stakeholders and other multilateral fora related to education and training, the seminar gathered perspectives from experts/speakers and active participants to design and develop CECC.

The project fulfills the commitments made in the following statements:

- **2001 APEC Leaders' meeting** which focuses in “Enhancing economic growth, promoting human and social development and protecting the environment as interdependent objectives” strives to encourage more collaborate approaches to address climate issues for sustainable urban development.
- **APEC Education Strategy 2016-2030** regarding the first objective of “Enhancing and aligning competencies to the needs of individuals, societies and industries”, through promotion of cross-border education and modernization of education systems.
- **2015 Leaders' Statement** which “Underscored the synergy between our ambition to improving human capital development and our goals to improve people-to-people connectivity and continue the promotion of cross-border cooperation in education engagement, border education including through developing new modes and approaches to education delivery”.
- **2022 APEC Education Ministerial Meeting** under “Priority 3: Balance in all aspect” reaffirm the APEC Leaders' commitment to promote economic policies, cooperation and growth which support global efforts to comprehensively address all environmental challenges, including climate change, extreme weather and natural disasters, for a sustainable planet.
- **APEC Putrajaya Vision 2040** on the third economic driver “Strong, Balanced, Secure, Sustainable and Inclusive Growth”: To ensure that the Asia-Pacific region is resilient to climate crises, pandemics and other emergencies, we will foster quality growth that brings palpable benefits and greater health and wellbeing to all, including MSMEs, women and others with untapped economic potential.

The APEC Climate Economics Cross-Border Educational Course (CECC) developed in this project will act as a guide for APEC economies to restructure and effectively implement cross-border education to achieve climate action, inclusion and socioeconomic resilience in the Asia-Pacific region.

ACKNOWLEDGEMENT

"I would like to express my sincere gratitude to all team members, volunteers, experts/speakers and active participants during the commencement of this project. I am also thankful to Ms Azira Zuki, Focal Point of HRDWG Malaysia, Ms Angeline Goh, Program Executive, and Ms Harlena Harris, Program Director for their valuable guidance. This project was made possible by funding from APEC."

Associate Professor Dr Nurfaradilla Mohamad Nasri

Project Overseer HRD03 2023A

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INTRODUCTION

Climate economy

The concept of climate economy represents a critical juncture where two globally and regionally significant concerns converge, namely climate change and economic development. While often described as a single point of intersection, the term 'climate economy' is more accurately understood as a specialized field of study necessitating collaborative efforts among experts from diverse disciplines, including economists, climate scientists, data analysts, industry representatives, policymakers, and public sectors. Moreover, the climate economy embodies a multifaceted, dynamic relationship that influences climate adaptation strategies and economic growth. It delineates the intricate interconnection between environmental preservation and the facilitation of economic growth. In other words, climate economy recognizes that transitioning towards an environmentally sustainable and resilient economy is not merely a planetary imperative but also presents economic advantages.

Addressing climate change mandates, a fundamental reformation of economic frameworks, investment paradigms, and policy structures to disengage economic progress from the emissions of greenhouse gases (Stern, 2007). This endeavor entails leveraging innovation, market mechanisms, and regulatory instruments to promote energy efficiency, the adoption of renewable energy resources, and the sustainable stewardship of natural resources. Nonetheless, this approach not only reduces environmental consequences but also promotes economic resilience and growth in an ever-changing global landscape. By integrating sustainability into economic strategies, economies may transition to a low-carbon economy while providing inclusive and equitable development. These strategies highlight the vital significance of integrating economic activities with responsibility for the environment and connecting them to social factors in order to ensure long-term viability.

Recognizing the human impact of both climate change and economic development and vice-versa, it becomes imperative to prioritize awareness and education initiatives aimed at empowering individuals with insights into the climate economy. We argue that the intersection between climate economy and education stands as a pivotal factor in nurturing individuals adept at confronting the multifaceted challenges posed by climate change. As highlighted in the APEC Secretariat's Climate Change and Economic Impact Report, education assumes a catalytic role in fostering climate resilience, stimulating innovation, and empowering communities to adapt to shifting environmental dynamics. Through the integration of climate economy principles into educational curricula and policies, we can empower leaders,

entrepreneurs, and agents of change equipped to propel sustainable development, advocate for social equity, and safeguard the planet for forthcoming generations.

Climate change and economy

Climate change poses an existential threat to mankind in general. APEC economies, which are primarily located within the Pacific Ring of Fire, are subject to a variety of natural disasters such as severe earthquakes, tsunamis, intense monsoons, and volcanic eruptions. Furthermore, the region has a high frequency of tropical storms, with super typhoons occurring on a yearly basis. Extreme temperature fluctuations in the Pacific Ocean also influence rainfall levels and weather patterns across the region. Given their location and geographical diversity, APEC economies are vulnerable to the effects of climate change, as they experience more than 70% of global natural disasters.

Climate-related disasters impose a substantial economic burden. As illustrated in Figure 1, the Asia-Pacific region has faced substantial economic losses, accumulating total damages of USD2.71 trillion in 2022. Among these disasters, floods emerge as the most financially devastating, accounting for 35% of economic losses, followed by earthquakes at 25%, storms at 19%, and tsunamis at 11%. Droughts and other miscellaneous disasters contribute 5% and 6%, respectively, to the overall economic impact. This data indicates distinct patterns in disaster distribution and impact in the Asia-Pacific region compared to other regions. For example, floods and tsunamis account for 46% of economic losses in the region, far surpassing the global average of 17%. Additionally, earthquakes inflict greater economic loss in the region, reaching 25%, compared to the global average of 12%. These discrepancies highlight the unique geographic and climate challenges experienced by the APEC economies.

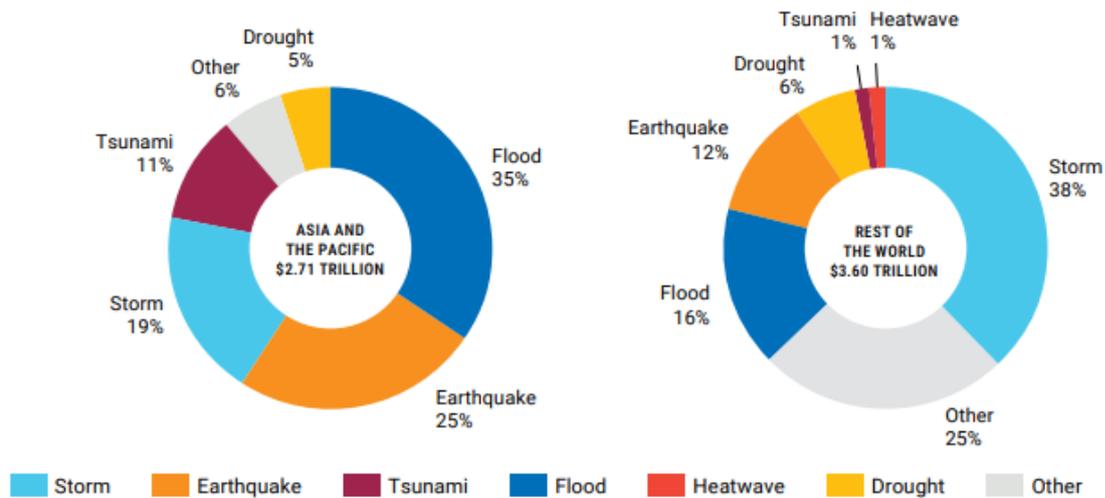


Figure 1. Economic damage from disasters in the Asia-Pacific region and the rest of the world, 1970-2022. Source: ESCAP

According to the World Bank, these impacts hit APEC developing economies the hardest. These economies are not only disproportionately susceptible to the adverse effects of climate change, but also particularly vulnerable to the impacts of climate change due to limited economic resilience and insufficient green investment. This vulnerability is exemplified in the Philippines, where annual economic losses from climate-related disasters in 2024 amount to 3% of its gross domestic product (GDP)—the highest among APEC economies and approximately 8 times greater than the second highest, the United States at 0.38% GDP (Swiss Re Institute, 2024).

The climate disasters also cause widening socioeconomic disparities in these economies, where vulnerable populations are often displaced from their homes and lose their incomes. According to a report by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), typhoon Haiyan impacted over 14.1 million people in the Philippines, resulting in the displacement of over 4.1 million from their residences. The typhoon also inflicted damage upon 1,126,738 houses, with 548,751 rendered completely uninhabitable. Furthermore, it rendered approximately USD1.1million instances of property damage and led to disease outbreaks, as well as psychological stress and trauma among relief volunteers and healthcare providers. Besides, approximately 5.6 million individuals required aid to mitigate the risk of food insecurity and to revive agricultural and fishing livelihoods in the wake of the typhoon's aftermath.

In the case of the Philippines, the socioeconomic impact of typhoons is particularly pronounced in rural and impoverished areas, where communities may lack adequate infrastructure, housing, and resources to withstand the impact of such disasters. These communities often rely heavily on agriculture for their livelihoods, and when crops are

destroyed by floods or strong winds, it leads to food insecurity and income loss. Moreover, the aftermath of typhoons exacerbates existing inequalities as marginalized groups and low-income families struggle to recover and rebuild their lives.

The implications of climate change on the economy of the Asia-Pacific region are complex, encompassing both immediate and long-term risks. In the short term, climate-related disasters lead to significant economic setbacks, including damage to physical infrastructure, disruptions to supply chains, declines in agricultural output, and heightened healthcare expenditures. These financial burdens not only strain public finances but also hinder efforts toward economic advancement and development in affected communities. Furthermore, the indirect consequences of climate change, such as food insecurity, water scarcity, and health hazards, exacerbate the socioeconomic challenges in the region, thereby undermining human needs and impeding progress towards achieving sustainable development.

Long-term economic impacts will differ between economies, depending on extreme temperature variations, adverse weather conditions, and economic structural stability. According to the World Bank (2019), the APEC region may face long-term economic losses of 7.3% of GDP by the year of 2100 as a result of the direct or tangible impacts of climate change. Moreover, it can be observed that lower middle-income APEC economies such as Indonesia and Papua New Guinea are projected to experience the most severe economic losses, ranging from 15% to 30% of GDP in comparison to other APEC economies.

Amidst the challenges brought about by climate change, there are opportunities for improving resilience and adaptation, which could fortify the Asia-Pacific economy against future risks. Directing investments towards climate-resilient infrastructure, disaster readiness, and prudent natural resource management has the potential to augment the region's ability to withstand and rebound from climate disasters. Embracing low-carbon technologies, renewable energy solutions, and sustainable land-use practices offers avenues for innovation, employment generation, and economic diversification, positioning the region for enduring prosperity amidst a shifting climate landscape. Through the integration of climate resilience considerations into economic strategizing, policymaking, and investment initiatives, APEC economies can alleviate risks, unlock novel avenues for growth, and forge a more sustainable and equitable future for all stakeholders.

As we deeply understand the complex relationship among the many factors directly impacting climate change and economics, it is vital to incorporate both elements through the lens of education. This report highlights the prospects for innovation, sustainable advancement, and progress by incorporating of climate economy principles into educational initiatives. Such an approach is critical for providing future generations with the requisite knowledge,

competencies, and relevant behaviors to navigate the complexities of an evolving climate landscape. Moreover, it facilitates the cultivation of informed decision-making skills and the formulation of climate relevant practices to effectively address the climate economy. We believe education remains the key to closing the gaps and minimizing the impact of climate economics across all APEC economies.

Within the context of this region, this statement is completely true, since we observed a positive gain in knowledge in three distinct domains, namely climate change, socioeconomic impacts, and curriculum development among seminar participants. More specifically, the results showed a 50% improvement in participants' understanding of how climate change affects APEC economies, as well as a 30% increase in participants' perceptions of the socioeconomic implications of climate change on APEC economies. Finally, there was a 70% improvement in understanding about curriculum development among participants after attending the seminar. In summary, we strongly argue that education can have a significant role in the dissemination and understanding of climate economics in the Asia-Pacific region.

Cross-border education

Cross-border education entails educational efforts and ventures that extend beyond economy, enabling the exchange of students, educators, programs, and institutions across international borders (Knight, 2008). This concept underlines the globalization of education, propelled by advancements in technology, mobility, and collaborative efforts on a global scale. Throughout history, cross-border education has manifested in diverse forms, including student exchange programs, collaborative degree ventures, distance learning initiatives, and the establishment of foreign institutions' branch campuses. These initiatives are geared towards fostering cultural interchange, academic mobility, and the dissemination of knowledge across varied geographical, cultural, and linguistic settings.

Within the Asia-Pacific region, the terminology used for cross-border education varies throughout APEC economies. Various terms are often employed to refer to the same component, with dual and joint degrees demonstrating the greatest diversity. The difference in the use of the term may reflect convoluted assumptions and historical contexts, but in many situations, it is evident that there is a lack of understanding within economies about why specific terminology are chosen. To put into perspective the complexities, CBE is also known as international education, transnational education, offshore provision, foreign-related education, offshore education, non-local education, international collaboration in higher education, and private education.

Over time, cross-border education has garnered increasing attention as a prominent fixture within the global educational landscape. Institutions worldwide have embraced internationalization as a strategic imperative, aiming to attract learners, faculty, and resources from diverse backgrounds. The establishment of branch campuses, partnership arrangements, and online degree programs has broadened access to higher education for learners globally, providing avenues for academic enrichment and professional advancement. Moreover, initiatives such as the Bologna Process in Europe and the Asia-Pacific Quality Network (APQN) have facilitated regional collaboration and implemented mechanisms for quality assurance, ensuring the credibility and relevance of cross-border educational ventures.

According to the Asia-Pacific Cross-Border Higher Education Provider Mobility: Report on a Survey of Policy and Practice, the State University of New York's Cross-Border Education Research Team (C-BERT) is the largest source of outgoing cross-border education in terms of branch campuses, with 77 in other economies. Russia has 21 branch campuses, followed by Australia, which has 19. China is the largest host, with 32 branch campuses, followed by Malaysia with 12 and Singapore with 11. Figure 2 describes data provided by several APEC economies on their incoming and outgoing cross-border education.

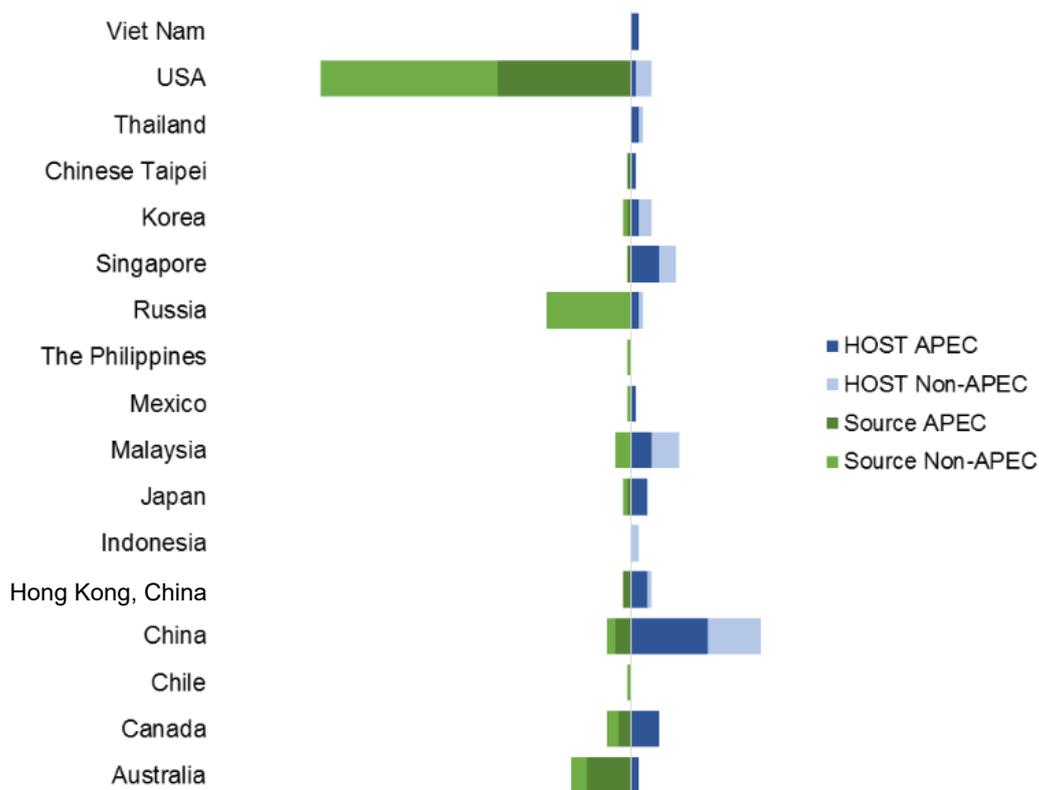


Figure 2. Incoming and outgoing cross-border education in 2017. Source: C-BERT

Despite achieving notable successes, cross-border education encounters significant challenges and obstacles. These encompass concerns regarding quality assurance, accreditation, acknowledgement of credentials, regulatory impediments, cultural disparities, and linguistic barriers. Additionally, sociopolitical and geopolitical factors, including academic freedom, government stability, and economic outlooks, may limit cross-border education success. Ensuring fair access, affordability, and inclusiveness in cross-border education remains a paramount objective, especially for marginalized groups and underserved areas. Additionally, the COVID-19 pandemic has emphasized the vulnerabilities and constraints of conventional educational delivery methods, prompting the need for innovative strategies and technological interventions to address evolving circumstances and maintain the continuity of learning.

The combination of cross-border education and education policy represents a potent instrument for tackling the convergence of climate change and the economy through strong partnerships. Through the integration of climate change education into educational frameworks, teacher training initiatives, and learning resources, institutions can heighten awareness, enhance capabilities, and cultivate sustainable behavioral shifts among both learners and educators. Moreover, collaborative efforts and partnerships across borders can facilitate the exchange of knowledge, collaborative research projects, and the dissemination of best practices pertaining to climate-related matters. This enables institutions to devise innovative solutions and advocate for evidence-based policymaking in addressing climate-related challenges.

SUMMARIES OF PRESENTATIONS

Our experts/speakers from various backgrounds and expertise have provided their insights on climate change, policy, economy and education. The six-hour presentation sessions focused on two important themes, namely 'Global & Asia-Pacific Overview of Climate Economics' and 'Asia-Pacific Approach of Addressing Climate Economics Education' to guide the development of climate economics cross-border educational course (CECC).

Presentation Session 1: Global & Asia-Pacific Overview of Climate Economics

On a global scale, the adverse repercussions of climate change across various sectors including agriculture, water resources, coastal regions, natural calamities, tourism, health, and energy systems. APEC economies, including those in the Southeast Asian (SEA) region, confront heightened frequencies of extreme weather events and economic repercussions, prompting the necessity for comprehensive policy measures such as decarbonization and institutional reforms such as the implementation of carbon taxes. Within the ASEAN+3, the shift towards a low-carbon economy presents both risks and opportunities, encompassing potential disruptions to businesses, destruction of assets, and economic downturns attributable to climate change. Nonetheless, there exist prospects for advancements in clean energy sectors such as solar, wind, and hydropower technologies. Initiatives for adaptation and mitigation are underway, demanding substantial financial resources for the transition of energy systems and the establishment of sustainable infrastructure.

Climate change in the SEA region is exerting a discernible influence on food availability and security, predominantly attributable to heightened occurrences of extreme weather events and escalated food costs. Projections indicate that this effect is poised to become a pressing concern across all socio-economic strata within the forthcoming three years. As for decarbonization efforts, impediments encompass a dearth of research and development, technological advancements, specialized knowledge, and insufficient financial allocations. The imperative shift towards renewable energy sources like solar, hydropower, wind, and geothermal energy reinforces the essence of the transition. Nonetheless, confronting challenges such as mounting energy expenses, employment diminishment, and the exacerbation of social disparities necessitates urgent attention and mitigation strategies. The adoption of carbon tax at economy-level, highlighting that individuals with elevated socio-economic standing are more inclined to support it. Moreover, natural gas is perceived as a temporary substitute for coal, while calls are made for the reduction of fossil fuel subsidies, particularly among those with greater financial means. Furthermore, the session proposes the

role of ASEAN in expediting a transition towards clean energy by establishing regional energy infrastructure, endorsing agreements on renewable energy, and establishing a collective energy fund. Concerning responses to climate change in the SEA region, vulnerabilities such as sea-level rise affecting Indonesian islands and erosion impacting the Mekong Delta in Viet Nam are accentuated. Regional endeavors encompass annual joint declarations, high-level discussions, climate change task forces, and initiatives aimed at bolstering climate change adaptation and environmental preservation. The imperative for swift action on climate change in the SEA region and globally, emphasizing the criticality of decarbonization, transitioning to renewable energy sources, implementing policy reforms, and fostering regional collaboration to mitigate risks and capitalize on opportunities for sustainable development.

The first presentation of *Global & Asia-Pacific Overview of Climate Economics* examines the negative consequences of climate change on multiple sectors across the region, highlighting the urgent need for policies like decarbonization and carbon taxes to support a transition to a low-carbon economy.

Presentation Session 1	Discussion Points	Key Findings
Global & Asia-Pacific Overview of Climate Economics	<i>Impacts of climate change on food security</i> - Climate change affects food availability and security due to extreme weather events and rising food costs.	This impact is anticipated to affect all socio-economic groups in the SEA region within the next three years.
	<i>Challenges in decarbonization efforts</i> -Decarbonization efforts face impediments such as insufficient research, technology, and financial resources.	These challenges hinder the transition towards renewable energy sources like solar, wind, and hydropower.
	<i>Adoption of carbon tax at economy-level</i> - Individuals with higher socio-economic status are more likely to support the adoption of carbon tax.	Natural gas is considered a temporary substitute for coal, while calls are made to reduce fossil fuel subsidies, particularly among those with greater financial means.
	<i>Role of ASEAN in clean energy transition</i> - ASEAN can expedite the transition to clean energy through regional infrastructure establishment and renewable energy agreements.	Regional vulnerabilities to climate change, such as sea-level rise and erosion, underscore the importance of collaborative efforts for adaptation and mitigation.
	<i>Global repercussions of climate change</i>	APEC economies, face heightened frequencies of extreme weather events and

	- Climate change adversely affects various sectors globally, including agriculture, water resources, and energy systems.	economic repercussions, necessitating comprehensive policy measures like decarbonization.
	<i>Opportunities and challenges in low-carbon economy</i> - The shift towards a low-carbon economy presents both risks and opportunities within ASEAN+3.	While there are prospects for advancements in clean energy sectors, challenges such as business disruptions and economic downturns persist.
	<i>Initiatives for adaptation and mitigation</i> - Initiatives for adaptation and mitigation are underway globally and in the SEA region, requiring substantial financial resources.	Swift action on climate change is imperative, emphasizing decarbonization and regional collaboration to achieve sustainable development.

Table 1. Discussion points and key findings on Global Asia Pacific Overview of Climate Economics presentation

Presentation Session 2: Asia-Pacific Approach of Addressing Climate Economics Education

The domain of cross-border tertiary education underscores its multifaceted nature encompassing both practical application and overarching strategic objectives. It commences by unveiling the concept of cross-border education, citing examples such as the Kohl-Mubarak agreement in Egypt, which introduced German dual apprenticeship models. Central themes such as climate economics and self-sufficiency emerge as pivotal, pointing out education's capacity to tackle global challenges while safeguarding autonomy. Nonetheless, challenges such as excessive dependence on international partners emphasize the imperative for meticulous negotiation and adaptation. Other example includes the transnational vocational education and the Singapore-Australian Master of Training and Development program, which exemplifies the complexities involved in implementing curricula abroad. Educators are portrayed as reshaping curricula to accommodate diverse cultural contexts and learner requirements. An essential aspect emphasized is the strategies employed by educators to reshape and adapt curricula for effective teaching and learning. These strategies, encompassing curriculum appraisal, prioritization, modification, expansion, design, experimentation, and collaboration, play a crucial role in enhancing learners' learning experiences. These experiences offer valuable insights for curriculum development, pinpointing the significance of clear objectives, comprehension of preceding conditions, and the adoption of efficacious models. Additionally, the convergence of human capital and the climate economy stressing on the economic importance of workers' expertise and capabilities in confronting climate change. It juxtaposes conventional perspectives on climate change with

the burgeoning climate economy, underscoring the imperative transition toward low-carbon industries to mitigate environmental degradation.

Education emerges as fundamental for individuals to comprehend and engage in these emerging fields. The idea of allocating resources towards education infrastructure and facilities is deemed imperative for advancing awareness of climate economics and cultivating sustainable practices. APEC's strategies are recognized as essential for integrating awareness of the climate economy, technological progress, adaptability of the workforce, and reduction of costs to bolster competitiveness. Theoretical frameworks such as human capital theory and diverse climate economic models play a critical role in fostering economic growth and forecasting the ramifications of environmental policies. Emphasis is placed on the continual investment in education to align with technological advancements and effectively disseminate knowledge of the climate economy. The significant impact of climate change on children and the educational sector was highlighted, championing for transformative reforms through education. It emphasized the integration of environmental, sustainability, and climate-related topics into science education, focusing on the cultivation of skills to address socio-ecological challenges.

The APEC Education Strategy 2016-2030 was introduced as a framework to enhance competencies aligned with societal and industrial demands, stimulate innovation, and bolster employability. Initiatives such as enhancing quality assurance, fostering cross-border education, and stimulating collaboration among stakeholders were emphasized. The alignment with the APEC Education Strategy for Climate Economics Education (CEE) was spotlighted, focusing on aspects such as curriculum development, learning objectives, content delivery, and engagement with subject matter experts. The importance of education in addressing the challenges of climate change was underlined, advocating for a holistic approach incorporating curriculum development, learning objectives, content delivery, and the utilization of cutting-edge technologies such as artificial intelligence (AI). It reinforces the significance of fostering competencies pertinent to green skills, 21st-century skills, and employability to align educational strategies with the evolving demands posed by climate change.

The second presentation of *Asia-Pacific Approach of Addressing Climate Economics Education* focuses towards the role of cross-border tertiary education and strategic educational initiatives in tackling global issues such as climate change by developing curricula that build competencies crucial for the climate economy and sustainable practices.

Presentation Session 2	Discussion Points	Key Findings
Asia-Pacific Approach of Addressing Climate Economics Education	<p><i>Understanding cross-border tertiary education</i></p> <p>- The session elucidates the concept of cross-border education, highlighting examples such as the Kohl-Mubarak agreement in Egypt.</p>	<p>Challenges such as excessive dependence on international partners underscore the need for meticulous negotiation and adaptation in cross-border education.</p>
	<p><i>Implementation challenges in transnational education</i></p> <p>- Tangible examples like transnational vocational education and the Singapore-Australian Master of Training and Development program exemplify the complexities of implementing curricula abroad.</p>	<p>Educators' strategies in reshaping and adapting curricula play a crucial role in enhancing learners' learning experiences, offering valuable insights for curriculum development.</p>
	<p><i>Convergence of human capital and climate economy</i></p> <p>- The session explores the economic importance of workers' expertise in confronting climate change, emphasizing the transition toward low-carbon industries.</p>	<p>Education plays a pivotal role in advancing awareness of climate economics and cultivating sustainable practices, necessitating investment in education infrastructure and facilities.</p>
	<p><i>APEC's role in integrating climate economy awareness</i></p> <p>- APEC's strategies are essential for integrating awareness of the climate economy, technological progress, and workforce adaptability to bolster competitiveness.</p>	<p>Theoretical frameworks like human capital theory and diverse climate economic models foster economic growth and guide environmental policy-making, highlighting the need for continual investment in education aligned with technological advancements.</p>
	<p><i>Impact of climate change on education</i></p> <p>- The session underscores the significant impact of climate change on children and the educational sector, advocating for transformative reforms through education.</p>	<p>The APEC Education Strategy 2016-2030 emphasizes enhancing competencies aligned with societal and industrial demands, stimulating innovation, and fostering collaboration among stakeholders, particularly in climate economics education.</p>
	<p><i>Holistic approach to addressing climate change through education</i></p>	<p>Fostering competencies relevant to green skills, 21st-</p>

	<p>- The pivotal importance of education in addressing the challenges of climate change is emphasized, advocating for a holistic approach encompassing curriculum development, learning objectives, and the utilization of cutting-edge technologies.</p>	<p>century skills, and employability aligns educational strategies with the evolving demands posed by climate change, ensuring a comprehensive response to the global challenge.</p>
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Table 2. Discussion points and key findings on Asia-Pacific Approach of Addressing Climate Economics Education presentation

CLIMATE ECONOMICS CROSS BORDER EDUCATIONAL COURSE (CECC)

Background

Climate economics cross border educational course (CECC) is an outcome of the project HRD03 2023A that aims to improve the capacity of APEC economies to implement inclusive, sustainable and quality education and strengthen education cooperation in the Asia-Pacific region under the principles established by the APEC Education Action Plan/ Education Strategy 2016-2030. More specifically, CECC serves as evidence of regional cooperation and support to address climate change under the principles of the Aotearoa Plan of Action 2021, and to improve socioeconomic resilience under the Putrajaya Vision 2040.

Given the complexities of the impact of climate change on both economic growth and socioeconomic development, as well as the reciprocal influence of economic development on climate change, CECC is designed to assist in raising awareness and knowledge among people across APEC economies about critical aspects of the climate economy. With this in mind, CECC is thereby hoped to encourage appropriate actions or informed behaviors that can better support a more inclusive and sustainable future for APEC economies.

Learning theory

The development of CECC is underlined by strong adoption or adherence to one of the major learning theories, namely the sociocultural learning theory. The sociocultural learning theory, which is based on Vygotsky's work (Vygotsky 1987), challenges the study of individual thinking and learning processes in order to promote cognitive development. Vygotsky claimed that thinking has its roots in social processes. This entails a knowledge that an individual's cognitive development is embedded in a societal, institutional, or historical framework. According to this perspective, individual cognitive development does not only result from social interactions; rather, the specific structures and processes demonstrated by the individual can be traced back to their interactions with other individuals. According to Illeris (2018), a sociocultural approach requires knowledge of social interaction as well as attention to the larger social framework in which learning occurs. These tenets are aligned with CECC, which focuses on increasing people's mutual knowledge and understanding of the climate economy across APEC economies.

Another key component of sociocultural learning theory is the recognition of cultural and social impacts on teaching and learning. This sensitivity to sociocultural impacts is critical since climate change is seen differently among economies, resulting in varying levels of significance.

This theory informed the CECC development, which stated that each APEC economy may have a distinctive understanding of climate change and the economy, as well as how they affect their lives. As a result, the development of CECC is made more responsible and sensitive to the sociocultural differences of people across APEC economies, allowing them to better understand climate economy and thus promote more sustainable, environmentally friendly, and economically beneficial practices.

Concept

The development of CECC is made based on the concept of open educational resource (OER), where Open Educational Resources (OER) are educational materials that are openly licensed and made freely available to use, revise, remix, and redistribute. These resources can include learning contents such as books, notes, presentations, videos, and simulations that support learning and teaching; tools such as software, applications, and platforms used to support access to knowledge and facilitate learning; and media such as multimedia elements that enhance educational content. Key characteristics of OER include:

- **Open License:** OER are typically licensed under an open license, such as Creative Commons licenses, which allow users to legally and freely access, use, adapt, and share the materials.
- **Accessibility:** OER are designed to be freely accessible to learners and educators worldwide, promoting equitable access to education resources.
- **Flexibility:** Users can adapt OER to suit their specific educational needs, translating them into different languages, or modifying them to fit different educational contexts.
- **Cost:** OER are often available at little to no cost, reducing financial barriers to accessing high-quality educational materials.

The advantages of OER include cost savings. For example, OER can significantly cut expenses for learners and educational institutions, especially in instances in which traditional textbooks and resources are expensive or inaccessible. OER also promotes educational equality by offering access to high-quality educational materials regardless of geographic location or financial means. As a result, public sectors, educational institutions, non-profit organizations, and educators worldwide support OER initiatives, which help to achieve the larger goals of open education and lifelong learning for all.

Further discussion also reveals that different industries or disciplines may want to adopt CECC into their settings and thus a more context-specific CECC should be designed. In these cases, upon demand and request, CECC can be remodeled to tailor to the needs and demands of

institutions or organizations following the concept of open educational practices (OEP). OEP refer to the use of Open Educational Resources (OER) and other open practices in teaching, learning, and research. OEP itself is a set of strategies and approaches that educators and institutions can adopt to enhance teaching and learning through the use of open resources and methods. OEP can be characterized by principles such as:

- **Open Licensing:** Materials are openly licensed (e.g., Creative Commons licenses) allowing for free access, use, adaptation, and redistribution.
- **Collaboration:** Encouraging collaboration among educators and learners globally, facilitating the sharing of knowledge and resources.
- **Flexibility:** Providing flexible learning pathways and adapting content to meet diverse learner needs.
- **Innovation:** Fostering innovation in teaching and learning practices through the integration of open technologies and methodologies.

While OEP promotes the use of OER, it does not necessarily mean that everything related to OEP is completely free to everyone in every context. For instance, in terms of access, the extent of access of OEP may depend on factors such as internet connectivity, technological infrastructure, and policies governing access to educational materials. Furthermore, there may still be costs associated with accessing online platforms, technology, or other resources needed to fully participate in OEP. Additionally, while OEP encourages openness and affordability, their implementation and adoption can vary based on institutional policies, funding models, and regional regulations.

DISCUSSION

The design and development stage of CECC follows a meticulous step-by-step approach, to gain a consensus on crucial components of the course. The following questions and answers regarding the design and development of CECC are described as follows.

Who is CECC beneficiaries?

Mutual agreement is reached by focusing on targeting a broad audience, particularly in the Asia-Pacific region. This approach ensures that CECC addresses regional learning needs, delivering content that is both created and intended for the benefit of the general learners in APEC economies.

Moreover, we aim for CECC to be customized by organizations and institutions interested in understanding climate economy impact on their operations. This perspective highlights how the CECC can be remodeled and valuable to public sectors, academic institutions, industries, and business owners alike.

What is the underlying principle in developing CECC?

The curriculum planning for CECC is based on Tyler's Curriculum Planning Model (1949). The model consists of four fundamental questions that serve as the foundation for developing effective educational courses or programs. These questions are:

- What are the objectives or goals of the educational course?

This question involves determining what learners should know, understand, and be able to practice by the end of the course.

- What learning experiences will help learners achieve these objectives?

Once the objectives are defined, the next step is to plan the learning experiences which includes selecting appropriate teaching methods, instructional materials, activities, and resources that align with the objectives.

- How will the learning experiences be organized to ensure effective learning?

The organization and implementation of the learning experiences involves considering factors such as pacing, duration, grouping, and coordination of resources to optimize learning.

- How to determine whether these objectives have been achieved?

The assessment and evaluation involve identifying appropriate methods and tools for assessing progress and determining whether the learners have met the stated objectives.

What is the best strategy for ensuring the development of CECC focused, purposeful, and conducive to learner success?

Constructive alignment is a concept that is used to ensure coherence and alignment among the intended learning outcomes, teaching and learning activities, and assessment tasks within a curriculum.

- Intended Learning Outcomes

These are the goals or objectives that define what learners should be able to know, do, or understand by the end of a learning experience. The intended learning outcomes should be clear, specific, and measurable, outlining the knowledge, skills, and attitudes that learners are expected to achieve.

- Teaching and Learning Activities

These are the instructional strategies, methods, and resources used to facilitate learning and help learner achieve the intended learning outcomes. Teaching activities should be designed to actively engage learners, promote deep learning, and support the development of the targeted knowledge and skills.

- Assessment Tasks: Assessment tasks are used to evaluate whether learners have achieved the intended learning outcomes. These tasks should align closely with the intended learning outcome and measure the knowledge, skills, and understanding that learners are expected to demonstrate. Assessment in constructive alignment focuses on authentic tasks that mirror real-world challenges and allow learners to apply what they have learned.

Additionally, constructive alignment involves coherence, transparency, and engagement. Coherence ensures a clear connection between learning outcomes, teaching activities, and assessment tasks. Transparency helps learners understand expectations and objectives. Engagement promotes critical thinking, problem-solving, and knowledge application. Assessment tasks should also be designed to encourage deep learning and reflection.

What are the learning objectives in CECC?

The following are learning objectives in CECC. Learners are expected to:

- Gain understanding and awareness of the importance of climate change, economy, and climate economy,
- Develop skills that are relevant to green skills, 21st century skills, and employability skills,
- Develop competencies applicable to climate-resilient strategies, technologies, employment and policies, and
- Demonstrate their knowledge and competencies of CECC into applying into daily routine activities or solving real-world problems.

What are the key learning contents to be included in CECC?

Several key learning contents are designed to be included in CECC:

- Understanding Climate Change
- Behavioral Economics
- Economic Impacts of Climate Change
- International/Regional Cooperation
- Law and Policy
- Technological Innovation

What are the main learning areas in CECC?

- Climate change awareness
 - Basic Climate Science: Understanding the science behind climate change, including greenhouse gas emissions, the greenhouse effect, and the impacts of climate change on ecosystems and human societies.
 - Economic Impacts of Climate Change: Studying the economic consequences of climate change, including its effects on agriculture, infrastructure, health, and migration patterns.
 - Behavioral Economics and Climate Change: Exploring how human behavior affects climate change, including topics such as consumer behavior, pro-environmental behavior, and the role of incentives.

- Climate Change and Development Economics: Examining the intersection of climate change and development economics, including how climate change affects poverty, inequality, and sustainable development.
- Ethical and Equity Considerations: Considering ethical and equity considerations in climate economics, including intergenerational equity, environmental justice, and the ethics of climate change mitigation and adaptation policies.
- Climate economics
 - Climate Finance: Understanding the role of finance in climate change mitigation and adaptation, including climate finance mechanisms such as the Green Climate Fund and carbon markets.
 - Policy Instruments for Climate Change Mitigation: Studying the various policy instruments available for reducing greenhouse gas emissions, such as carbon taxes, cap-and-trade systems, and renewable energy standards.
 - Climate Change and Risk Management: Understanding how to manage climate-related risks, including the role of insurance, risk assessment, and risk communication.
 - Climate Change and Innovation: Exploring the role of innovation in addressing climate change, including technological innovation, business model innovation, and policy innovation.
 - Communicating Climate Economics: Developing skills in communicating climate economics concepts to different audiences, including policymakers, businesses, and the general public.
- Technological Innovation - Considering the role of technological innovation in addressing climate change, including the development and deployment of low-carbon technologies and the economic incentives and barriers to their adoption.

What are the delivery approaches of CECC?

Many different approaches are available in implementing CECC, which include but not limited to the following:

- Integration into existing economics curricula

Integrating CECC into existing economics curricula may be in the form of full-semester courses on environmental economics, natural resource economics, and climate change economics. The CECC can either be provided as a mandatory or an elective course for economics students.

- **Interdisciplinary programs**
Interdisciplinary programs may combine CECC with other fields such as environmental science, policy, or sustainability studies to provide a more comprehensive understanding of climate change issues.
- **Specialized courses and programs**
Specialized courses or programs that specifically focus on climate economics may be suitable for advanced studies as they can cover topics such as the economics of climate policy, carbon markets, or the economics of adaptation and resilience.
- **Research centers and institutes**
Research centers or institutes that are dedicated to studying climate change and its economic implications can offer CECC through seminars, workshops, accelerated learning programs and other educational events.
- **Online Education**
Online courses and resources available on CECC can make it more accessible to a broader audience. In this way, the online education may offer short courses, compact courses or micro credentials to help in the recognition of their learning.

What is the teaching and learning approaches that can be used to deliver CECC?

The teaching and learning approaches that can be utilized in CECC are, namely:

- **Interactive and learner-centered learning approaches**
These approaches promote learners to assume responsibility for their education through collaborative efforts with instructors and colleagues. Examples of learner-centered approaches that encourage interactive learning include debates, discussions, simulations, and hands-on activities.
- **Problem-based learning (PBL)**
The learning that occurs from the process of working towards the understanding or resolution of a problem (Barrow, 1980). A structured approach to PBL typically consists of several stages such as presentation of problem scenario, brainstorming and defining problem, setting learning objectives and engaging self-directed learning, conducting small group discussion and sharing feedback or reflecting.
- **AI-supported teaching and learning**
Several ways AI can be effectively utilized in delivering CECC:
 - **Personalized Learning:** AI can analyze learner data and behaviors to create personalized learning paths. By understanding individual learning styles, preferences, and progress, AI can recommend specific content, resources, or

activities tailored to each learner's needs. This personalization helps to optimize learning outcomes and engagement.

- Automated Grading and Feedback: AI algorithms can automate the grading process for objective assessments such as multiple-choice questions or numerical problems. Additionally, AI can analyze learners' written responses to provide feedback on assignments, essays, or discussion posts, saving instructors time while maintaining consistency in assessment.
- Predictive Analytics for Learner Success: AI can analyze historical data to predict learners at risk of falling behind or dropping out. Early identification of these learners allows instructors to intervene with targeted support strategies, such as additional resources, mentoring, or personalized learning plans.
- Facilitating Collaborative Learning: AI can facilitate collaborative learning experiences by matching learners with peers who have complementary skills or interests. AI-powered tools can also moderate online discussions, analyze contributions, and provide insights into group dynamics to foster effective teamwork.
- Professional Development: AI can support instructors' professional development by providing personalized feedback on teaching practices and suggesting areas for improvement. AI-powered platforms can analyze teaching methods and outcomes, offering insights into effective strategies that can enhance teaching effectiveness.
- Language Translation and Accessibility: AI-powered translation tools can break down language barriers by providing real-time translations of course content or discussions. AI can also assist in making online courses more accessible to learners with disabilities by generating audio descriptions, captions, or alternative formats for learning materials.

How to assess the learning?

Several assessment methods are available to evaluate whether learners have achieved the learning objectives such as:

- Continuous assessment

This formative assessment refers to an ongoing process in education where learners' progress is assessed regularly throughout a course or academic year, rather than solely through exams or tests at the end. Continuous assessment should provide feedback regularly and combines various assessment methods such as quizzes,

projects, presentations, assignments, class participation, and periodic tests. This variety helps in capturing different aspects of learning. Continuous assessment is more suitable for longer duration courses rather than shorter mini-courses.

- **Authentic assessment**

This assessment mirrors real-world situations or tasks relevant to learners' lives or future careers, such as case studies, problem-solving tasks, or roleplaying exercises.

- **Project-based learning**

Learners engage in extended, interdisciplinary projects that require them to apply knowledge and skills to solve complex problems or address real-world problems.

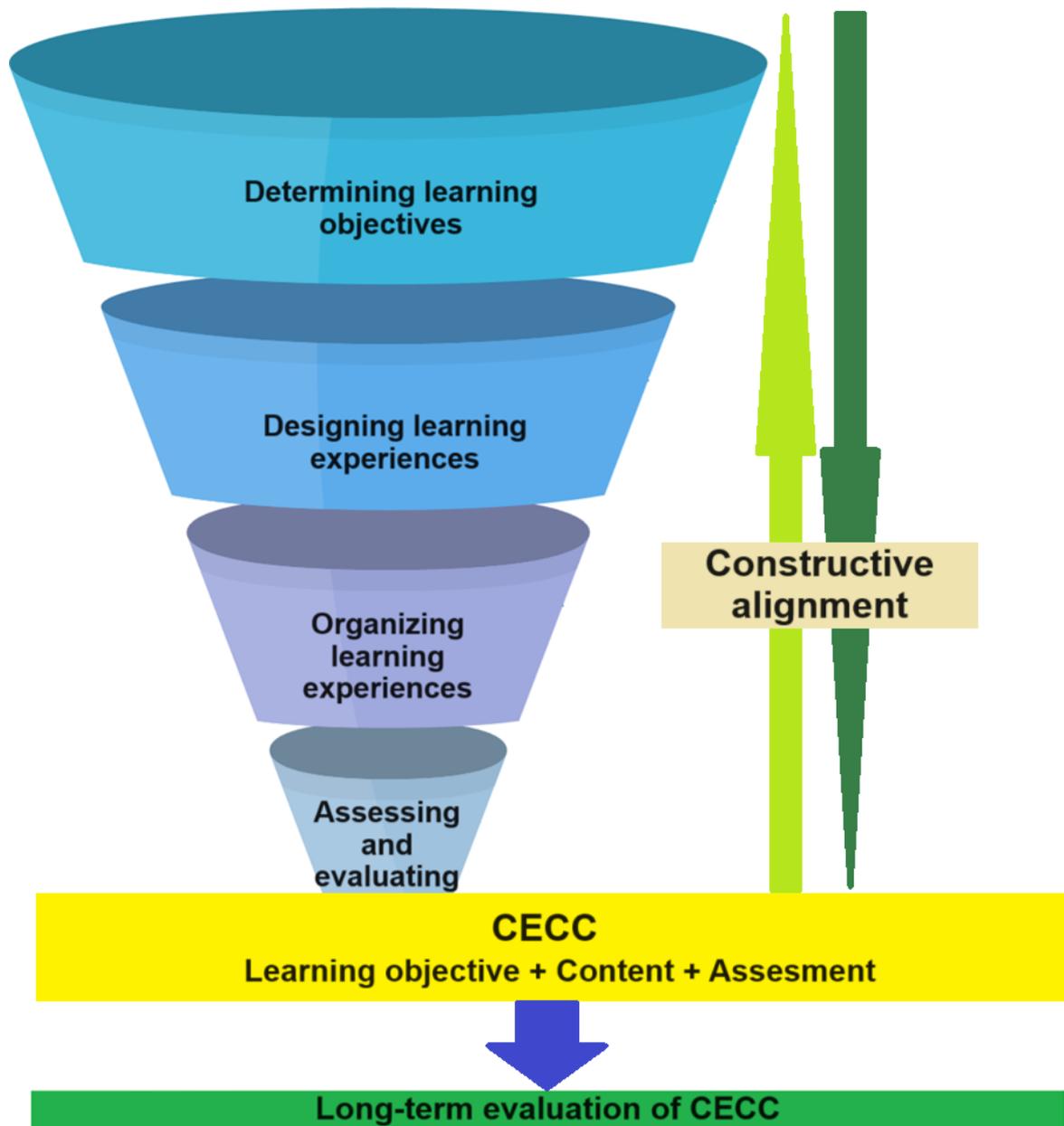
- **Portfolios**

Portfolios are collections of learner work over time, showcasing their progress, achievements, and reflections. They can include written assignments, artwork, multimedia projects, and other evidence of learning.

- **Presentations**

Learners may be asked to give presentations on topics related to CECC, where they can showcase their understanding and communication skills about the topic.

APECCECC Framework



The APECCECC Framework combines two fundamental principles of Tyler's curriculum planning model and Bigg's Constructive Alignment. There are four stages of curriculum planning adopted in the curriculum development process. The course is made to offer effective learning experiences by aligning three essential components, namely intended learning outcomes, teaching and learning activities and assessment tasks. Most importantly, CECC will be made accessible to all learners via online mode considering the geographical diversity of APEC economies. In terms of CECC long-term sustainability, the course will be regularly evaluated to ensure its continuous success.

Best CECC Practices

- 1 CECC is to be first implemented to target general population or people across APEC economies.
- 2 Online delivery serves to be the best approach in the implementation of CECC that involves different economies.
- 3 People across different demographics should have equal access to CECC.
- 4 The learning objectives are developed to ensure optimal or maximal learning opportunities.
- 5 The learning contents are designed to be reflective with the daily lives of people in the Asia-Pacific region.
- 6 Specific CECC units are dedicated to discuss gender elements and underprivileged communities.
- 7 Interactive teaching and learning methods include utilizing and solving scenario problems through PBL.
- 8 Combining appropriate assessment methods such as mini quizzes and portfolios can be used to assess knowledge, skills and competencies.
- 9 CECC is designed to be adaptable and transferable to a variety of educational settings.
- 10 CECC can be remodeled to target specific needs of organizations, institutions, businesses or policymakers.
- 11 Long-term CECC viability should be regularly assessed to ensure it can achieve evolving learning needs.

CONCLUSION

This project has developed CECC to promote capacity building and education collaboration among APEC economies. Through seminars, reviews and surveys, we have identified regionally significant components or themes to be included in CECC. These findings underscore the importance of addressing climate change while promoting economic growth to ensure a more inclusive and sustainable future in the Asia-Pacific region.

Furthermore, our project has implications for community and people across APEC economies to understand the importance of climate economics on their daily lives. By understanding the complex relationship between climate change and economy, we can empower people to act more sustainable, environmentally friendly, and economically beneficial practices.

Overall, this project successfully acts upon the priority highlighted in the APEC Education Strategy 2016-2030, Putrajaya Vision 2040, Aotearoa Plan of Action and the Bangkok Goals on Bio-Circular-Green (BCG) Economy through the development of CECC. It provides a foundation for potential future developments or applications of CECC in different organizations, businesses, community centers and schools. As such, it is hoped that this project will stimulate continued exploration and innovation in climate economics for the prosperity of APEC economies.

RECOMMENDATIONS

Language differences

- Integrate the use of AI to help with language differences in the form of captions or live translation.

Diversity of learners

- Pre-assessment survey can be utilized to identify learner's needs.
- Learning content to be carefully selected and specified following the needs.
- Be responsive to learners with special needs (sign language).

Administrative task

- The operationalization of CECC should be centralized and supervised by one education provider or institute.
- Multiple engagement of different education providers can be made possible after some time.

Instructional demands

- Short CECC courses may not require intensive pedagogical load.
- Adopting virtual tutors or teachers can be made through AI adoption to lessen academic load.

Certification process

- Mutual recognition to recognize CECC as certificate or participation level should be achieved across all APEC economies.
- Higher level of certificates may be required for higher educational level.

REFERENCES

Asia-Pacific Economic Cooperation. (2019). Asia-Pacific cross-border higher education provider mobility: Report on a survey of policy and practice. SOM Steering Committee on Economic and Technical Cooperation (SCE), Human Resources Development Working Group (HRDWG). Retrieved from https://www.apec.org/docs/default-source/publications/2019/12/asia-pacific-cross-border-higher-education-provider-mobility/219_hrd_asia-pacific-cross-border-higher-education-provider-mobility.pdf?sfvrsn=d8f7cf90_1

Asia-Pacific Quality Network (APQN). (n.d.). Asia-Pacific Quality Network (APQN). Retrieved from <http://www.apqn.org/>

APEC Secretariat. (2020). APEC climate change and economic impact report. Retrieved from <https://www.apec.org/>

Barrows, H. S., & Tamblyn, R. M. (1980). Problem-based learning: An approach to medical education. Springer Publishing Company.

Bologna Process. (n.d.). Bologna Process. Retrieved from <https://www.ehea.info/>

Illeris, K. (2018). An overview of the history of learning theory. *European Journal of Education*, 53(1). <https://doi.org/10.1111/ejed.12265>

Knight, J. (2008). Higher education in turmoil: The changing world of internationalization. Brill.

Office for the Coordination of Humanitarian Affairs. (2014). Typhoon Haiyan: Information management handbook.

Office for the Coordination of Humanitarian Affairs. (n.d.). Philippines Typhoon Haiyan situation humanitarian response camp coordination and camp management. Retrieved from <http://fts.unocha.org>

Stern, N. (2007). The economics of climate change: The Stern review. Cambridge University Press.

Swiss Re Institute. (2024). Changing climates: The heat is (still) on.

United Nations Economic and Social Commission for Asia and the Pacific. (2023). Seizing the moment: Asia-Pacific disaster report 2023. <https://repository.unescap.org/handle/20.500.12870/6258>

Vygotsky, L. S. (1987). *The Collected Works of L. S. Vygotsky, Volume 1: Problems of General Psychology* (R. W. Rieber & A. S. Carton, Eds.). Plenum Press.

World Bank. (2016). *Shock waves: Managing the impacts of climate change on poverty*. World Bank Group.

World Bank. (2019). *Climate change in APEC: Assessing risks, preparing financial markets, and mobilizing institutional investors*. World Bank Group.

APPENDIX

APEC Hybrid Seminar On
Climate Economics Cross Border Educational Course (CECC)

EXPERT SLIDE PRESENTATION



The Climate Change In Southeast Asia Programme, ISEAS-Yusuf Ishaq Institute

Climate Change Risks and Opportunities in the ASEAN-11

TDR

The severity of climate change and its global and regional socioeconomic impacts

A REVIEW OF CLIMATE ECONOMY FROM HUMAN CAPITAL PERSPECTIVE

Mitigating Climate Change: Leveraging the Transformative Potential of Education

Combining certificate and course development in cross-border tertiary education

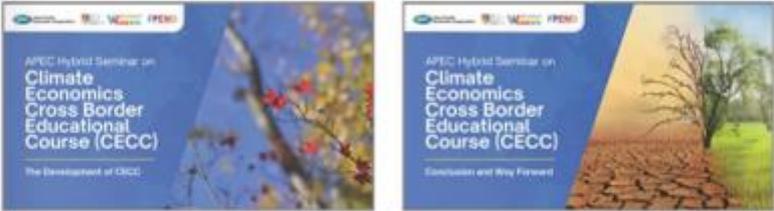
APEC Hybrid Seminar on Climate Economics Cross Border Educational Course (CECC) - 2019

Madani Akbar, ISEAS, Indonesia

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Climate Economics Cross Border Educational Course (CECC)

EXPERT SLIDE PRESENTATION



APEC Hybrid Seminar on Climate Economics Cross Border Educational Course (CECC) - The Development of CECC

APEC Hybrid Seminar on Climate Economics Cross Border Educational Course (CECC) - Conclusion and Way Forward

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