Document No.:
Receiving Date:
(For APFNet Secretariat)

Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

COMPLETION REPORT

Innovative Sustainable Forest Management Education in the Asia-Pacific Region (Phase II)

[1st January 2018-30th June 2021]

[The University of British Columbia]

[AP-FECM Executive Office]

[Date of submission]

BASIC INFORMATION

Project Title (ID)	Innovative Sustainable Forest Management Education in the Asia-Pacific Region (Phase II)		
Supervisory Agency	University of British Columbia		
Executing Agency	Asia Pacific Forest Education Coordination Mechanism (AP-FECM)		
Implementing Agency	Executive Office, Asia Pacific Forest Education Coordination Mechanism (AP-FECM)		
Date of Project Agreement: [06/03/18]			
Duration of implementation: [01/18-06/21] 42 months (extended by 6 months)			
Total project budget (in USD)	794,600	APFNet assured Grant (in USD)	563,000
Actual project cost (in USD)		APFNet disbursed Grant (in USD)	475,760

Disbursement Status	Date of disbursement	Amount (in USD)
Initial disbursement	July/2018	168,880
Second disbursement	Nov/2019	168,880
Third disbursement	Jun/2021	138,000[1]
Balance to be disbursed		57,200
Reporting Status	Schedule [2]implementation	Project progress status[3]
First reporting (period covered: Jan 2018-Dec 2018)	On track	satisfactory
Second reporting (Jan 2019-Dec 2019)	On track	satisfactory
Third reporting (Jan 2020-Jun 2021)	On track	satisfactory

[1] APFNet retained USD 30,000 for external evaluation in the third-year grant

[2] Schedule [2]implementation status could be on track/behind/ahead of schedule

[3] Project progress status could be ranked as satisfactory, dissatisfactory, moderately satisfactory, moderately dissatisfactory

Abbreviations and acronym

Acronym and Abbreviation	Full Name
APEC	Asia-Pacific Economic Cooperation
APFNet	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation
AP-FECM	Asia Pacific Forest education Coordination Mechanism
BFU	Beijing Forestry University, China
CAF	Chinese Academy of Forestry
CIFOR	Center for International Forestry Research
CTLT	The Centre for Teaching, Learning and Technology, UBC
GFOI	Global Forest Observations Initiative Office, FAO
IPB	Bogor Agricultural University
HKU	University of Hong Kong
KU	Kasetsart University, Thailand
NTU	National Taiwan University
RECOFTC	The Center for People and Forests
SFM	Sustainable Forest Management
UBC	University of British Columbia, Canada
UCSD	University of California, San Diego, USA
UG	University of Georgia, USA
UM	University of Melbourne, Australia
UN-REDD	The United Nations - Reducing Emissions from Deforestation and forest Degradation
UPLB	University of Philippines-Los Banõs, Philippines
UPM	University Putra Malaysia, Malaysia
VNUF	Vietnam National University of Forestry
UF	University of Florida

Executive Summary

Excellent achievements have been made during the second phase of this project due to the strong partnerships and great collaborative efforts between APFNet, AP-FECM-EO, UBC, and AP-FECM member universities. World-class sustainable forest management education courses developed by eminent forestry experts from across the globe has already been delivered to 15, 000 learners from over 130 economies. This project has contributed to narrowing the gaps in education between forestry institutions across the Asia Pacific region by increasing access and promoting the sharing of these high-quality forestry education materials. The combination of emerging educational technologies, high-quality and relevant content, and online pedagogy generates an improved form of forestry education that shares the most current information on SFM and supports the interaction of peers and professionals around the globe without the constraints of geographical location and time. As a result, this project achieved global recognition through the 2019 IUFRO Award. In the face of the global COVID-19 pandemic, this project adapted to provide access to online SFM education for many institutions that were lacking online resources during the new normal.

This project was successful in realizing its overall goal to generate long-term improvements in forest education and sustainable forest management capacity in the Asia Pacific region and worldwide. This project adopted the world-leading online course platform, Canvas, to develop new online SFM courses that focused on tropical forests, and included the topics of forest monitoring, planning, climate adaptation, carbon management, and community forests and livelihoods. These courses will lead to the improved management of forest resources, which is essential to the sustainability of the environment and society. Further, the courses provide a foundation for regional universities to develop their own online SFM Master's programs that can help to fill the gaps in forestry education across the Asia Pacific. The project helps to increase equity in forestry education by providing more open educational resources and credential programs to global learners. Workshops and support provided by AP-FECM EO have introduced new technologies and pedagogies to various institutions to advance their long-term teaching quality. Finally, this project has created a platform for collaboration between schools and research organizations across the world to promote student mobility, research and educational cooperation, faculty exchange, and mutual course articulation and recognition.

1. BACKGROUND AND INTRODUCTION

1.1 Project Context

Higher forestry education has had to adapt to the changing needs of society as we are increasingly facing global issues such as climate change, illegal logging, and widespread deforestation. Forest education has shifted away from traditional forestry approaches to methods that focus on sustainable forest management and environmental conservation. The concept of Sustainable Forest Management (SFM) has emerged globally as an essential element for the sustainability and conservation of the world's forests. The SFM concept has facilitated education and research on pressing topics that can help governments, forestry practitioners and researchers to better manage their forested lands, expand forest coverage, and improve forest ecosystems. As the needs of the environment and society continue to change, forestry professionals need to master new technologies to manage natural resources and need to be capable of creating and implementing effective policies.

A joint educational online program entitled Innovative Sustainable Forest Management Education in the Asia-Pacific Region, began development of its first phase in 2014, is a series of 5 online self-directed learning courses in SFM with its content as Open Educational Resources (OER). The second phase of this project has been developed since 2018. Building upon the success of phase one, which attracted more than 3300 users from 91 economies, the second phase aims to develop new high quality SFM courses, to upgrade and promote the courses developed in Phase I, and to establish a systematic SFM online learning program to benefit the Asia Pacific region. Lessons learned and recommendations from Phase I's evaluation have been incorporated into the new course development. A team-based approach was used to ensure quality and stability of the project development. The project team for Phase II includes the AP-FECM Executive Office (EO), AP-FECM member universities, content experts and UBC CTLT. Phase II involved the development of 7 new full-fledged SFM credit courses (plus 3 funded by UBC), the upgrading of 5 existing courses, the integration of new technologies, course building on the Canvas platform, the establishment of AP-FECM and UBC's SFM Certificate programs, course implementation, and promotion of the project.

The SFM course program aims to effectively integrate educational technologies into an internationally developed and recognized high quality curriculum with innovative open pedagogy approach. A more holistic course structure is considered to integrate basic SFM knowledge modules with case studies or practical experience in specific regional contexts. With these 15 SFM courses, we aim to create a systematic curriculum that provides a strong foundation in forest management and policy, conservation and forest sciences, and training in latest technologies. This project aims to improve access to SFM education, enhance teaching equality, and improve curriculum and research capabilities, in order to build overall capacity among forestry universities, policymakers, and practitioners in the Asia Pacific Region. As a key unit to operate and manage the project, the Executive Office (EO) of the AP-FECM is responsible for continuously encouraging global utilization of the curriculum and increase international recognition of the project.

This online curriculum creates an accessible and flexible resource for high quality forest education to meet the demands of ever-changing societal and environmental conditions. The course development narrowed the gaps among universities in the Asia Pacific Region, as many universities have entirely or partially used the materials in their teaching curricula. This project is a great effort towards increasing equity in forest education around the world, which has largely enhanced the reputation of APFNet and AP-FECM. In addition, the project has set a baseline and an excellent example for future course articulation and mutual recognition regionally, which will further promote student mobility and faculty exchange, as well as collaboration in forest education at national, regional and global levels.

1.2 Project Goal(s) and objectives

The overall goal of the project is to generate long-term improvements in forest education and sustainable forest management capacity in the Asia Pacific region and worldwide. This is achieved through the development of a comprehensive systematic SFM online learning program to benefit a wide range of global learners. The project uses innovative pedagogical methods to deliver the knowledge of SFM and related issues to various forestry stakeholders through the combination of web-based learning and training, and the sharing of results and experiences. The project aims to transform forestry education, enhance experiential learning, and promote global learning and collaboration through integration of new technologies. Specifically, the project has the following objectives:

1. Build 15 high quality SFM courses that integrate comprehensive SFM knowledge with case studies and technology-enabled learning to provide a basis for developing a widely adopted core curriculum of SFM in the region. New online courses emphasize tropical forests, covering from forest measurement, planning, climate adaptation, carbon management to community forest and livelihoods to meet the demands of a changing society and environment.
2. Create a platform for the exchange of ideas and experiences on education among the new generation of foresters in the Asia Pacific Region and facilitate the collaboration in higher forestry education between developed regions and less developed regions.
3. Provide a foundation for regional universities to further develop online SFM Master's degree programs that will help filling the gaps in forest education across the region; and
4. Make efforts on increasing equity in forest education by providing more open educational resources and credential programs (Certificate and Master's degree) to global learners.

1.3 Project expected outputs and outcomes

Output 1: Establishment of the AP-FECM Course Completion Certificate and UBC's Graduate Certificate Program

While developing the first core courses as a self-directed and open-resource online program in Phase I, inquiries regarding credential and student engagement arose. A major incentive for many serious learners to pursue academic programs is the opportunity for them to upgrade and get verified for their qualifications. To support meaningful learning, students may also require an online course setting that includes greater interaction with peers and instructors, as well as graded assessments. An online program that provides a qualification such as a certificate, diploma or Master's degree would meet these requirements. The existing and developed courses can be updated and incorporated into a certificate program. In addition to the existing online courses, all newly developed and proposed online courses were targeted to meet the requirements of certificate programs to enable participating universities to establish a self-sustaining SFM web-based program regionally. The AP-FECM and UBC's SFM Certificate Program includes a series of online courses with innovative pedagogies enabled by instructor-facilitated active learning activities and student assessments.

Output 2: Development of ten SFM courses and upgrade of five existing courses

The second output is the development of ten web-based courses for SFM and the upgrading of five existing courses. This second phase of course development focuses on tropical forests and forestry in the changing world. Tropical forest resources in the AP region are diminishing in response to climate change where local communities are highly reliant on forest ecosystems for food, fuel, and other natural resources. To tackle these challenges, there is a clear need to prepare high quality education and training for human resources to promote and practice sustainable management in tropical forests.

All courses followed a module-based format so instructors at any forestry education institution can easily repurpose and incorporate the content into their own course teaching. The lead professors and content experts have been working closely with the UBC central learning and instructional design support team to identify best practices in online teaching and learning. A variety of learning theories, pedagogical approaches, and emerging technologies have been applied to the course development and upgrades. The Quality Matters (QM) quality standards for online course design was selected and introduced by UBC CTLT as a peer-review instrument to ensure the quality design of the courses. UBC CTLT referred to the QM quality standards to guide the course development process and reviewed all course core components in terms of course structure, learning outcomes, graded assessments, course schedule, content design, learning activities, instructional materials, and learning technologies. The AP-FECM EO has also been highly involved in the support and management of course development to ensure the high quality and efficiency of the process.

Output 3: Integration of emerging educational technology in the online courses and establishment of course sites on Canvas platform

The integration of emerging technologies is one of the key initiatives in the second phase. The goal of this project is to improve the capacity of Sustainable Forest Management (SFM) in the Asia-Pacific region and to facilitate the exchange of technologies and experiences in order to educate new generations of foresters in the APR. In order to improve both engagement and learning outcomes for the students, it is necessary to incorporate the most up-to-date learning technologies available, such as lab simulations, virtual reality, and artificial intelligence. It is also necessary for students of forestry to have the knowledge and skills to utilize emerging technologies in the field, so they can incorporate these technologies into their professional practice, including GIS, drones, and LiDAR. The AP-FECM EO, UBC, and course lead professors have explored a variety of learning technologies to enhance online-teaching and engage students. A variety of learning theories, pedagogical approaches and emerging educational technologies have been applied to the course development and upgrade. The AP-FECM EO provided guidance and support to facilitate this integration into each of the 15 courses.

All developed courses were migrated and established on the world leading online learning platform, Canvas. UBC has been using Canvas as the core learning technology environment since September 2018. There are lots of reasons to use Canvas other than the previous planed platform EDX. In addition to a clean, user-friendly interface, Canvas offers much more tools that instructors can use to save time and to enhance teaching and learning:

- SpeedGrader saves time by allowing instructors to view submitted assignments online and then annotate, comment, and assign grades to groups or individuals.
- The Canvas calendar helps your students stay on track by displaying all course assignments and events together in one place.
- Canvas offers mobile functionality. There's a Canvas app for your Android or iOS device. And because the platform was built using responsive design, it works well in most mobile web browsers.
- Canvas integrates with external tools, such as peerScholar, a peer review application that encourages constructive criticism, critical thinking, and self-reflection.

Canvas is a user-friendly tool for supporting teaching and learning that allows instructors and students to be even more creative and efficient in how they teach and learn. Functions such as mobile functionality, learner surveys, learning analytics and discussion forum are available to support learning management. To further improve student engagement and learning outcomes, creative active learning activities and assessment strategies were incorporated in the courses.

Output 4: SFM course implementation

Developed courses followed an effective course operational model. Courses are implemented as open educational resources to ensure accessibility and flexibility, and have been promoted to AP-FECM partner universities. Chosen courses were delivered through instructor-led sessions and integrated with a variety of different pedagogical approaches. Courses

implementation maximizes opportunities for student engagement, peer-to-peer interaction, self-reflection and evaluation. These instructor-led sessions were evaluated by students, and these evaluations will be used to improve course content, engagement, delivery, and effectiveness.

Output 5: Building capacity for higher forestry education

One of the most fundamental goals of the project is to assist participating universities in improving forest education quality to build capacity in sustainable forest management in the Asia Pacific region. All of the outputs contribute to this goal through increasing access to high quality SFM education materials and increasing collaboration between students, educators, and professionals across the Asia Pacific. Throughout the second phase of this project, The AP-FECM EO has strived to seek and create opportunities to achieve this goal.

Output 6: Promotion and management of the project

The Executive Office of AP-FECM was responsible for managing daily operations and administration of this online course program and organizing promotional activities. In order to further increase the global recognition, the project has been made available as open educational resources, and run continuously as repurposed OER courses, meanwhile creating credential certificate program to attract a wider range of learners. The AP-FECM EO has implemented a range of promotional activities such as the lecture series on online teaching and learning and TV show promotion in the "Silver Lining for Learning" to ensure that the SFM course material can be accessible to as many learners as possible in the Asia-Pacific region. Promotional activities were also aimed at forming a collaborative community of learners, educators, and professionals in the forestry sector and providing a platform to share research, knowledge, and experiences.

2. PROJECT PARTNERS' PERFORMANCE

2.1 Performance of Supervisory Agency and Executing Agency

The Faculty of Forestry at the University of British Columbia, Canada (UBC) is the Supervisory Agency (SA) for this project and the AP-FECM Executive Office is the Executing Agency (EA). Both SA and EA have been responsible for the planning, implementation of the initiative, financial management and coordination with local partners in the Asia Pacific region.

The AP-FECM Executive Office is held by the UBC Faculty of Forestry. It has undertaken the responsibilities and tasks successfully with respect to the project proposal, plan implementation, and execution of networking and information gathering. The project management team prepared work schedules that ensured partner collaborations.

2.2 Performance of APFNet

The APFNet committee successfully fulfilled its role of reviewing and providing feedback on the work plans, progress and final reports of the projects. Their feedback was timely, relevant, and helpful to the planning, implementation and efficient management of project activities.

3. PROJECT PERFORMANCE

3.1 Project achievements

3.1.1 Output 1: Establishment of the AP-FECM Course Completion Certificate program and UBC's Graduate Certificate Program

- **3.1.1.1 AP-FECM Repurposed OER Course Completion Certificate Program**

Careful design and promotion were conducted in establishment of a repurposed AP-FECM OER Course Completion Certificate Program. The first step was the analysis of the demand and target group. Once the target group was determined, the planning and designing of the repurposed OER courses would be conducted. A variety of student assessment strategies and learning activities were designed and integrated into the existing OER courses from Phase I for the purpose of meeting the requirements of a Course Completion Certificate Program. Course instructors were responsible for the development of course syllabus, course schedule, course assessments and assignments. With the instructional design support from Dr. Hailan Chen at UBC CTLT, assessments with detailed grading rubrics were developed by course instructors incorporating divers active learning strategies including module topic discussions, weekly key summary activities, thought provoking question activities, group discussions, final assignment with analysis and problem-solving questions, etc.. After that, the promotion of repurposed OER courses through a variety of channels such as Emails, UBC official website, Wechat, Twitter etc. were conducted to recruit learners.

During course delivery, teaching and learning support was provided for the repurposed OER Course Completion Certificate Program. With the tremendous support from APFNet, AP-FECM EO and UBC led the effort to provide support for all courses in the repurposed AP-FECM OER Course Completion Certificate Program. Instructors and Teaching assistants (TAs) were responsible for all courses to lead discussions, answer questions, conduct reviews, grade assessments and provide feedback on exams and assignments on the course Canvas platform. Finally, students had the opportunity to gain a course completion certificate for each course. To receive the AP-FECM SFM program's course completion certificate, students were required to successfully pass series of assignments which evaluate their specific knowledge (quizzes), critical thinking and argumentation (discussions and peer review) as well as writing with maintaining academic integrity (reading paper and writing reviews) etc. The Executive Office of AP-FECM at UBC was responsible for issuing the certificate, tracking student records and encouraging learner

engagement. In addition, evaluation and surveys were conducted for the purpose of enhancing the quality of repurposed OER courses.

In preparation for the official launch of the course completion certificate program, in 2018, the Executive Office of AP-FECM ran repurposed open-enrolled courses on the Canvas platform facilitated by UBC instructors. Course 1, Sustainable Forest Management in a Changing World ran from April to June 2018, and Course 5, Restoration of Degraded Forest Ecosystems and Forest Plantation Development, ran from October to December 2018. Together, 277 students joined the two courses. 118 students received certificate of course completion issued by the AP-FECM EO in 2018.

- **3.1.1.2 UBC Graduate Certificate Program**

Based on the award-winning courses developed in this project, the development of this Graduate Certificate program strictly followed the UBC Credit Programs Approval Process as listed at the link here (https://academic.ubc.ca/vpa-initiatives/new-program-proposals/credit-programs-approvals-process).

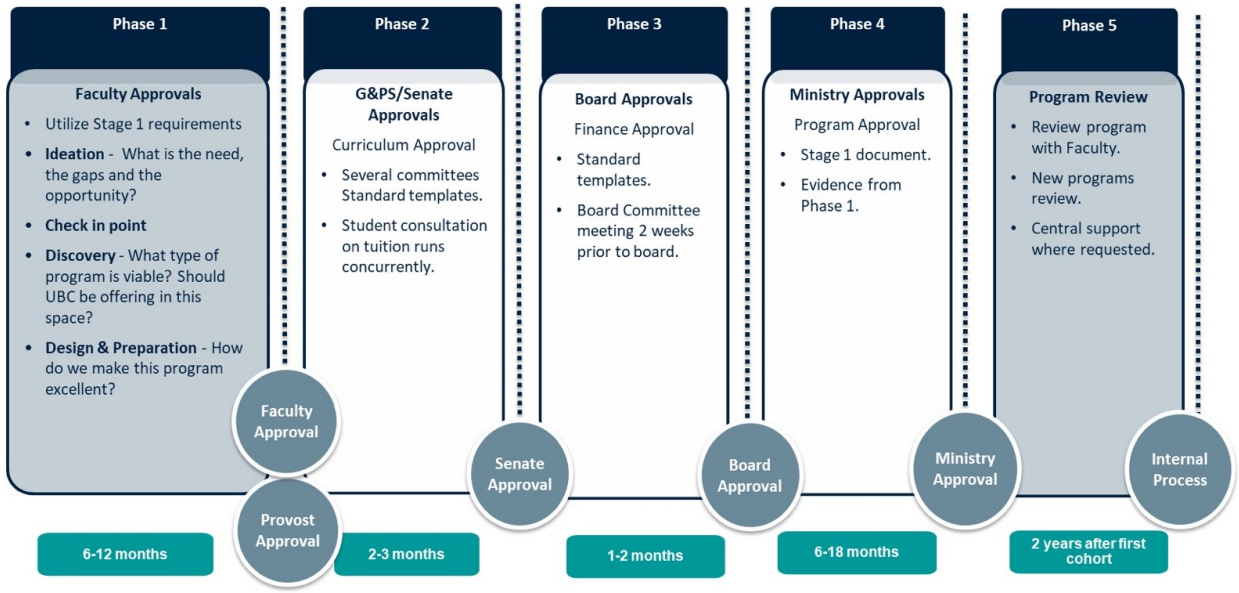

Fig.1 Credit Programs Approvals Process

UBC launched the Graduate Certificate in Forest Management and Conservation (GCFMC) https://forestry.ubc.ca/programs/certificate/forest-management-conservation/courses-and-timeline/ starting September 2021, which is a graduate level certificate that can be complete in 2 years or less. In this program, students from all over the world, with a desire to leverage new technology and use science-based practices, will learn the related knowledge and tools to sustainably manage forests in the rapidly changing social and political environment. The program is ideal for working professionals looking to advance their careers. The assessment mechanism

of the UBC graduate certificate program is more comprehensive compared with that of the AP-FECM course completion certificate program. More evaluation strategies were added such as mid-term exam, final exam and assays etc.. To be awarded the Graduate Certificate in Forest Management and Conservation, students must complete 15-credits (5 courses), which includes, FOPE 500: Sustainable Forest Management in a Changing World (Phase I), and four additional courses that suit their interests within the elective pool:

- FOPE 501: Geomatics in Forestry: Data Collection and Management (Phase II)
- FOPE 502: Introduction to Urban Forestry in the Asia Pacific Region (Phase II)
- FOPE 503: Climate Modelling and Forest Applications (Phase II)
- FOPE 504: Structure and Composition of Tropical Forest Ecosystems (Phase II)
- FOPE 505: Ecological Processes in Tropical Forests (Phase II)
- FOPE 506: Forest Conservation in Asia: Challenges and Opportunities (Phase II)
- FOPE 507: International Forestry Issues, institutions, and Multi-Lateral Agreements (Phase I)
- FOPE 508: Forest Ecosystem Services and Community Livelihoods (Phase II)
- FOPE 509: Plantation Design and Management (Phase II)

3.1.2 Output 2: Development of ten SFM courses and upgrade of five existing courses

- **3.1.2.1: Development of SFM curriculum for the AP region**

In collaboration with member universities, content experts and UBC CTLT, in the project second phase, the AP-FECM EO has developed 10 new courses and the existing 5 courses have been upgraded. With these 15 courses, we have created a systematic curriculum covering a foundation of forest management and governance policies, conservation and forest sciences, and technical training. Course topics were consulted with content experts and partner universities and were identified from reviews and surveys in order to meet the needs of interests of learners and society. The first phase of course development covered the general topics on sustainable forest management while the second phase was focused on tropical forests and on forestry management in the context of the ever-changing global environment and society. Together, the new courses provided a systematic knowledge and skill set for forestry professionals to understand plantation forests planning and decision making for tropical forests management and utilization, geospatial technologies in environmental management, climate modelling tools for forestry applications, REDD+ forest measurement and reporting, as well as contextual factors that influence conservation and livelihood outcomes in tropical forest areas.

We ensured that the course development process was as efficient and effective as possible in the three years of the project. The course development process was also very valuable in creating opportunities for connection and collaboration between leading professors and experts in the forestry field. A comprehensive program curriculum and course templates were set to meet the best practices in online learning through integrating SFM knowledge modules

with case studies and technology-enabled learning activities. It was important to set a high overall standard for instructional design on student learning and assessment activities and module content development. An advanced Learning Management System, Canvas, was incorporated into the project to enhance course operation and learning analytics.

- **3.1.2.2: Course Development Workshop**

The Executive Office of AP-FECM has managed the course development process and has been working closely with all stakeholders to empower them, provide resources and support, and to maintain effectiveness and progress. An on-site course development workshop for online learning was organized from July 30th to August 3rd, 2018. Over 30 lead experts from partner universities participated in the workshop at UBC to determine content and format of each course and to form course development teams. The workshop was built upon the essential need for participants to understand the broader curriculum goals of the online course program, as well as to help develop the curriculum map for all the courses while incorporating best practices for online learning from teaching and learning approaches to the selection of learning technologies. The workshop also enabled the standardization of course structure as well as the establishment of a timeline for deliverables. In the workshop, the content and format for each course was thoroughly discussed to ensure that all were built following the same requirements for quality and style. The three main focuses of curriculum development, evaluation and cooperation were: 1) avoid overlap among courses, 2) agreement over the depth and breadth of each course, and 3) ensure interconnection of each course. Copyright compliance issues were also emphasized during the workshop.

Fig 2. Course Development Workshop at UBC, 2018.

- **3.1.2.3: New SFM course development and existing courses upgrade**

In the course development process, the AP-FECM EO with support of UBC CTLT implemented a team-based approach, consisting of lead professors, regional content experts, project management and instructional design professionals, to ensure high quality and efficient progress. Together, the content experts had a broad knowledge in a diversity of management strategies, ecosystems, socio-economic contexts, and forest types. Each course has a lead professor designated to take responsibility for developing the course. The lead professors were encouraged to invite other contributors from regional institutions to join the course development teams. The lead professors worked with their development teams to decide on the overall learning outcomes, course structure, course content, course materials, learning activities, and assessment strategies. Separate Technical Service Agreements (sub-contracts) were signed between the Executive Office of AP-FECM (Executing Agency) and the lead professors/institutes (Implementing Agencies).

All courses were developed following the same general principles and a consistent format. The general principles include: courses can be tailored to reflect each particular national context; they can be integrated into current curriculum planning; duplication of course content is minimal; and benefits accrued by participating institutions are equitable. Typically, each course (3 credits) would contain minimum 4 modules and each module would contain at least 3 topics. Each topic requires approximately 9-12 hours of work for a person intimately familiar with the topic. Extra time are required if the instructor needs to update knowledge on a particular topic (which is inevitable). New technologies such as virtual field trips, VR/AR, were incorporated where appropriate into the courses to promote student engagement as well as peer to peer and student-instructor interactions while providing visualized interactive practical experiences to online learners. For example, in course FODE004, 360 degree video was employed while in FODE 007 and FODE012, the one button and local studio were used for the course development. In some other courses such as FODE010, the voice over the slides is the major format. The embed videos were also widely used in course development such as in FODE 009.

For the self-directed version of a course, each topic typically consists of background information, online video lectures, supplemental readings, and self-directed activities in the form of self-tests, self-directed reflection questions, and/or self-directed forum discussions. For the certificate version of a course, instructor-facilitated active learning activities were added to each topic and graded assessments were added to the course. Canvas course site authoring of the new courses were conducted and assisted by UBC CTLT to ensure quality of the course package and cross-platform usability. AP-FECM coordinates with the leading institutions to monitor the development process.

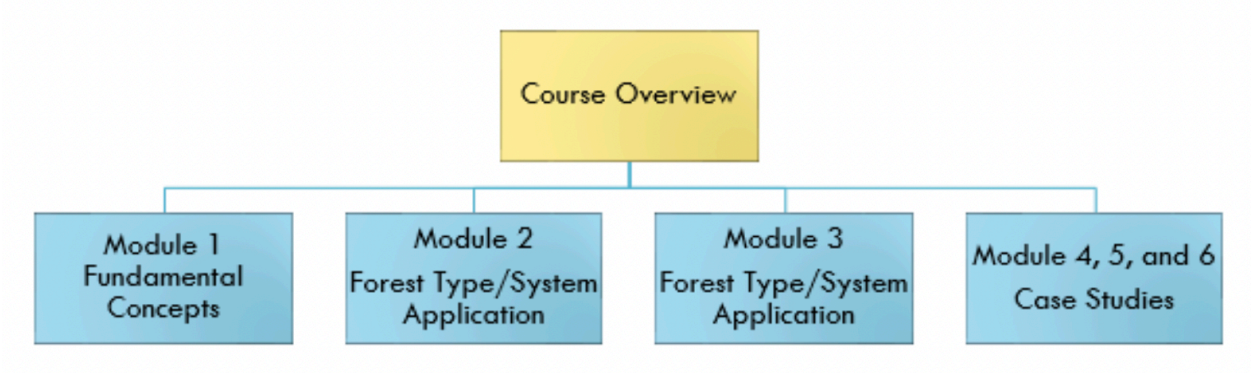

Fig 3. General format for SFM course development

Online-based studies enables the flexibility and accessibility to reach a wide range of young scholars, mid-career professionals, and older forestry students, which are also our main types of students for the SFM online courses. The course development process brought together the specialists in SFM in the Asia-Pacific region to contribute their expert knowledge in the field. To upgrade the existing courses, under the leadership and management of the AP-FECM EO with support from UBC CTLT, lead professors have redesigned their course structure and presentation formats, added modules to subject content, updated reading materials and data, as well as established more engaging learning activities and practical experience for learners. Together, the 15 SFM courses have covered the breadth of knowledge and skills necessary to understand issues in SFM in order to educate a new generation of forestry professionals.

- **3.1.2.4: Support from UBC CTLT**

The UBC CTLT is responsible for providing central learning and instructional design support in terms of curriculum development, instructional design, learning technology integration, Canvas course site authoring, graphic design, project coordination and professional development. To ensure the quality development of these innovative online courses, three major quality assurance strategies were introduced and implemented in this international collaboration effort 1) guiding course development following a modified ADDIE course development model going through the process of Analysis, Planning, Design, Development, Implementation, and Evaluation; 2) guiding the establishment of team-based approach during course development and implementation to bring in professional instructional design staff, content developers, and administration support staff at different stages of course development; 3) introducing Quality Matter (QM) quality standard as guideline for course development. It was important to establish a set of standards to ensure high quality online course design including effective alignment of learning outcomes, assessments, instructional materials, learning activities, and learning technologies. Quality Matters (QM) quality standard for online course design was selected, introduced, and used as a self and peer-review instrument for course development. QM quality standards are among the highest recognized standards used to evaluate the design and quality of online and blended courses. The UBC CTLT provided guidance to partner universities and development teams for each course to ensure QM standards were met. Content templates based

on Quality Matters (QM) were created, and used to develop the course outline, course schedule, graded assignments, and module content pages for each course. Course maps were proposed, established, and eventually built one by one for each course based on agreed upon structure and content. Courses in development were actively reviewed and revised in terms of course structure, course schedule, content design, learning outcomes, graded assessments, instructional materials, learning activities and learning technologies referring to the QM quality standards. The existing five courses have been upgraded to maintain the same quality following the Quality Matters standards. All completed course syllabus, detailed descriptions of assessments, module content, teaching materials have been submitted to UBC CTLT for review, feedback, and Canvas site authoring. A survey was designed to evaluate whether the course design was in line with the QM standards upon completion of course development. Self, peer, and student reviews of courses were recommended and supported by UBC CTLT.

Table 1. The 10 new courses developed during Phase II (all finished except for FODE013)

Course	**Leading Professors**
FODE009: Geomatics in Forestry (Data Collection and Measurement) (UBC)	Dr. Nicholas Coops, UBC Mr. Chris Colton UBC
FODE012: Urban Forestry in the Asia Pacific Region (UBC)	Dr. Cecil Konijnendijk, UBC Dr. Lorien Nesbitt UBC
FODE008: Tropical Forests Ecology (UBC) I. Structure and Composition of Tropical Forest Ecosystems II. Ecological Processes in Tropical Forests	Dr. John Innes, UBC Dr. Terry Sunderland, UBC
FODE010: Climate Modelling and Forest Application (UBC)	Dr. Tongli Wang, UBC Dr. Brad Seely, UBC Dr. Shirong Liu, CAF (Chinese Academy of Forestry)
FODE011: Conservation in Asia: Challenges and Opportunities (UBC)	Dr. Guangyu Wang, UBC Dr. Anil Shrestha, UBC Dr. Futao Guo, FAFU
FODE013: Carbon and REDD+ Forest Measurement and Reporting (UM) (Delayed due to the Covid-19 pandemic)	Dr. Chris Weston, UM
FODE014: Natural Forest Management in the Tropics (UF)	Dr. Jack Putz, UF
FODE004: Sustainable Use of Forest Ecosystem Services and Community Livelihoods (UPLB)	Dr. Juan M. Pulhin, UPLB Dr. Peter del Rosario Dr. Roberto Figueroa, Jr
FODE007: Silviculture, Plantation Design and Management (BFU)	Dr. Yong Liu BFU Dr. Yulong Ding NFU

	Dr. Damrong Pipatwattanakul, KU (Kasetsart University, Thailand)

Table 2. The 5 existing courses updated during phase II (All finished)

Course	**Host University**
FODE001: Sustainable Forest Management in a Changing World	UBC
FODE002: Forest Governance, Public Relations, and Community Development	UPLB
FODE003: International Dialogue on Forestry Issues	UBC
FODE005: Restoration of Degraded Forest Ecosystems & Forest Plantation Development	UM
FODE006: Forest Resource Management and Protection	BFU

- **3.1.2.5: Self, Peer and Student Review of Courses**

Upon course development, each of the courses went through the self, peer and student review process to ensure the highest possible quality of SFM education using the QM rubric. External review by a guest subject matter expert was organized by UBC Faculty of Forestry to evaluate course quality. Upon completion, courses and course packages were returned back to all participating universities by UBC CTLT to have leading professors and course co-authors undergo self-assessment and testing after they were built on the Canvas platform. A handful of students in target regions were recruited by AP-FECM EO to conduct student reviews for each course. Courses will be continuously modified for content or correction of technical issues based on the feedback received.

3.1.3 Output 3: Integration of emerging educational technology in the online courses and establishment of course sites on Canvas platform

- **3.1.3.1 Establishment of Course Sites on Canvas Platform**

Canvas is a powerful, user-friendly tool for supporting teaching and learning that allows instructors to be even more creative and efficient in how they teach. UBC has been using Canvas as the core learning management system since September 2018. In addition to a clean, user-friendly interface, Canvas offers tools that instructors can use to save time and to enhance teaching and learning, for instance just naming a few:

- Canvas has its built-in quiz/survey tools, discussion board, assignment drop boxes, group pages to organize interactive course activities.
- Canvas integrates with external tools, such as peer Scholar, a peer review application that encourages constructive criticism, critical thinking, and self-reflection.
- Speed Grader saves time by allowing instructors to view submitted assignments online and then annotate, comment, and assign grades to groups or individuals.
- The Canvas calendar helps students stay on track by displaying all course assignments and events together in one place.
- Canvas offers mobile functionality. There's a Canvas app for Android or iOS devices. And because the platform was built using responsive design, it works well in most mobile web browsers.
- Canvas learning analytics helps to monitor student's progress and engagement in the course, and timely advice if required.

We learned from several years of online course development and delivery that a simple asynchronous online class discussion platform like Piazza is insufficient for students to properly manage their learning, which resulted in reduced motivation amongst students. This challenge was addressed with the help of the Canvas learning management platform, since this system enables us to apply best practices in online learning, including advanced teaching support and learning analytics, user friendly interfaces, multiple tools for online discussion and self-reflection. This project took advantage of UBC's transition to advanced learning management system, and has established sites for all finished courses on the platform (Fig 3, 4).

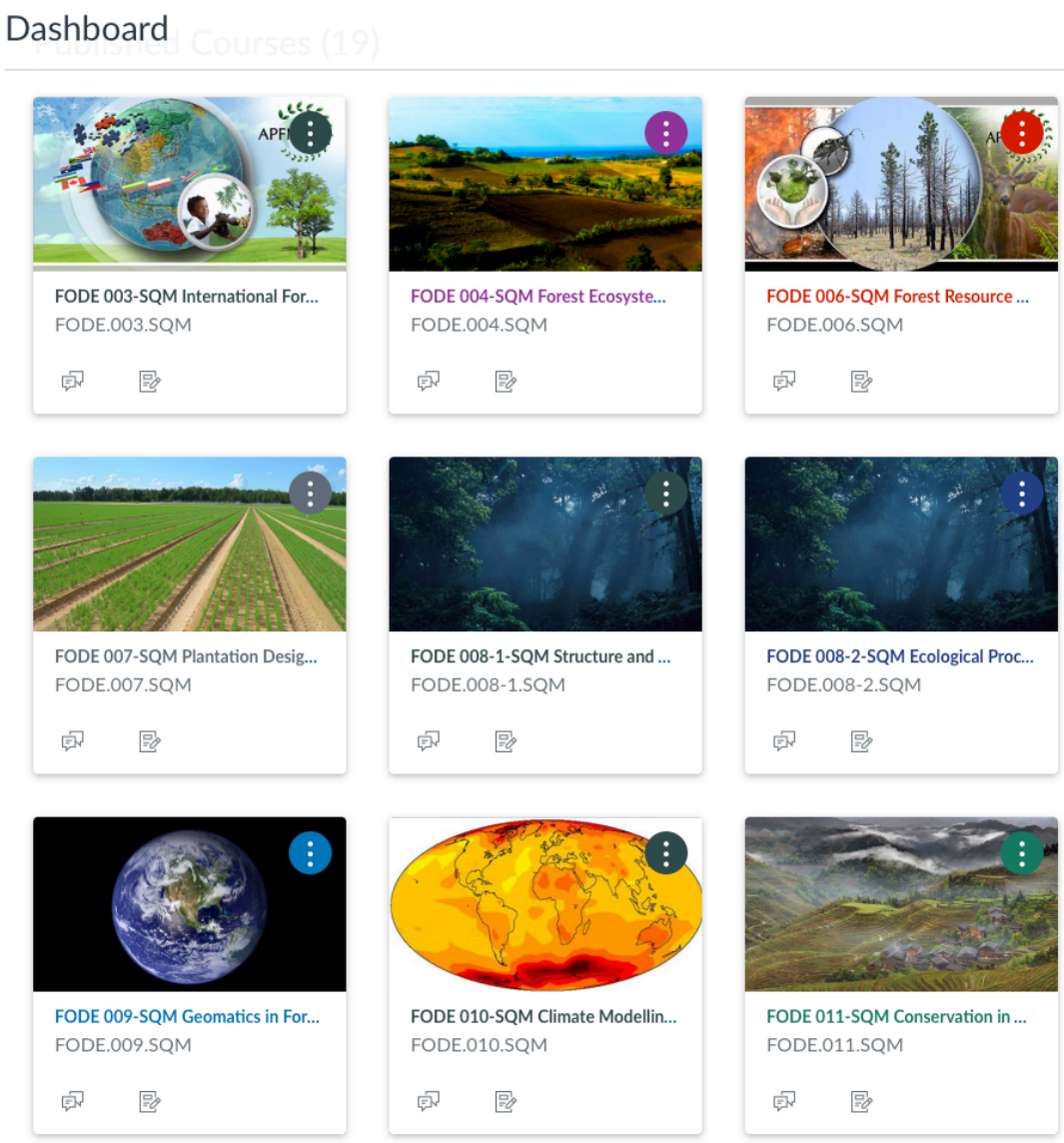

Fig 4-1. Course Sites on Canvas Platform

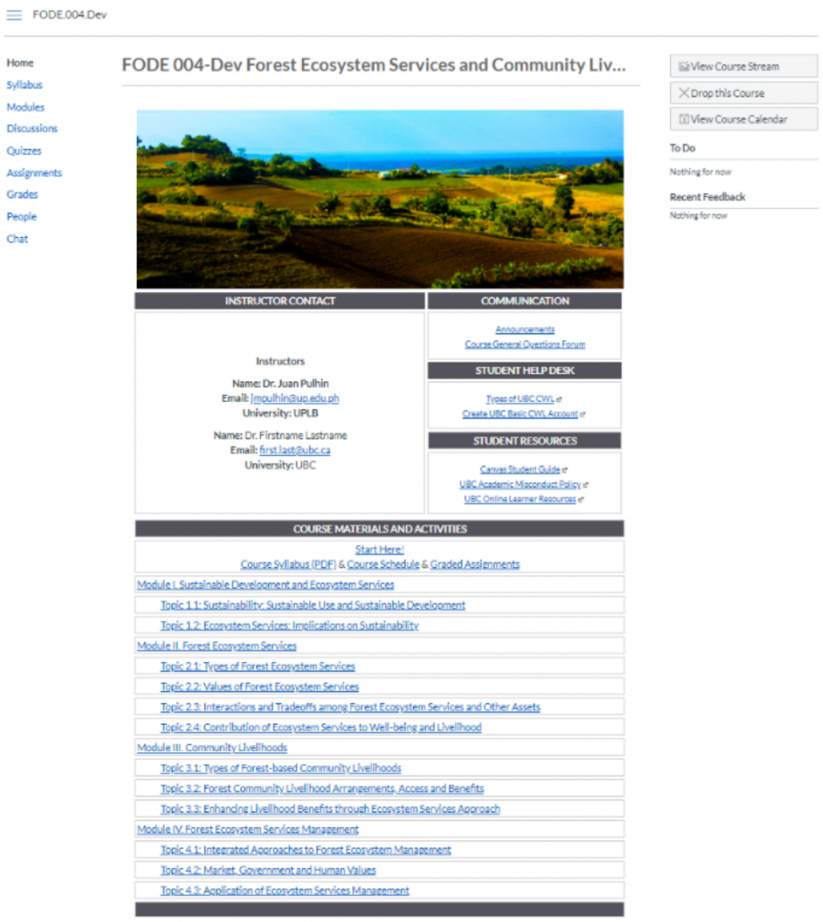

Fig 4-2. FODE004- Forests Ecosystem Services and Community Livelihoods on Canvas Platform

- **3.1.3.2 The Integration of New Technologies in Course Development**

The integration of emerging technologies is one of the key initiatives in the second phase. The AP-FECM EO, UBC, and course lead professors are continuously exploring a variety of technological tools to enhance online-teaching and engage students. A variety of learning theories, pedagogical approaches and emerging educational technologies have been applied to the course development and upgrade. To further improve student engagement and learning outcomes, creative learning activities and assessment strategies have also been incorporated in the courses.

While encouraging lead professors to use new technology in their courses, we encountered resistance at the beginning. Most of the professors' resistance was due to lack of experience and sufficient support. To address this, we first provided training on technology during the course development workshop in 2018. Hands-on experiences were given to lead professors when taking the UBC Studio Tours of DIY one-button studio, DIY lightboard studio, professional interview studio, VR and AR demonstration, and field demonstration of 360° videos.

UBC CTLT instructional design and media experts were also in place to provide consultation on pedagogical techniques and the integration of new technologies during the course development process. This included how to incorporate virtual forest tour and 360-degree videos, how to use visual content (videos, images, etc.), and how to use web-conferencing system for synchronous interactive learning activities. They also recommend equipment and provide advice for recording and filming. Lead professors are also encouraged to work with their local technology experts to explore feasible and appropriate options to enhance learning. Good sample work done by lead professors was shared across course development teams, e.g. how to use lecture videos for fundamental concept presentation, how to use software such as Google Earth, QGIS, and FUSION as tools for spatial analysis, how to use 360 degree videos as prompt for problem inquiry and case study, etc. This team-based approach greatly addressed the concerns of the course development teams and ensures the effective integration of technologies.

Copyright is another key component to consider in developing an online course that will be shared among international partners as open educational resources (OER). After consulting with UBC Librarian, it was advised that all the images, tables, figures, charts, or maps used in lecture ppts, lecture videos, or lecture notes for the online courses would need to be properly cited to give credit to the creator of the objects and at the same time to clearly state under what permissive license the objects are reused in the OER learning materials. A series of comprehensive guidelines have been provided by UBC Librarian and CTLT to all course authors to ensure how to properly provide attributions for images and data visualizations for OER learning materials.

The course development teams have been working extensively with UBC CTLT, regional forest industry and government to explore and identify relevant and sustainable options for the program. Emerging educational technologies include 2D and 3D images and videos, drone, LiDAR, GIS, etc. More tools and technologies will be discovered in the future and will continuously integrated into the courses where appropriate in supporting learning and achieving learning outcomes.

Fig 5. Incorporating new technologies at the course development workshop, 2018

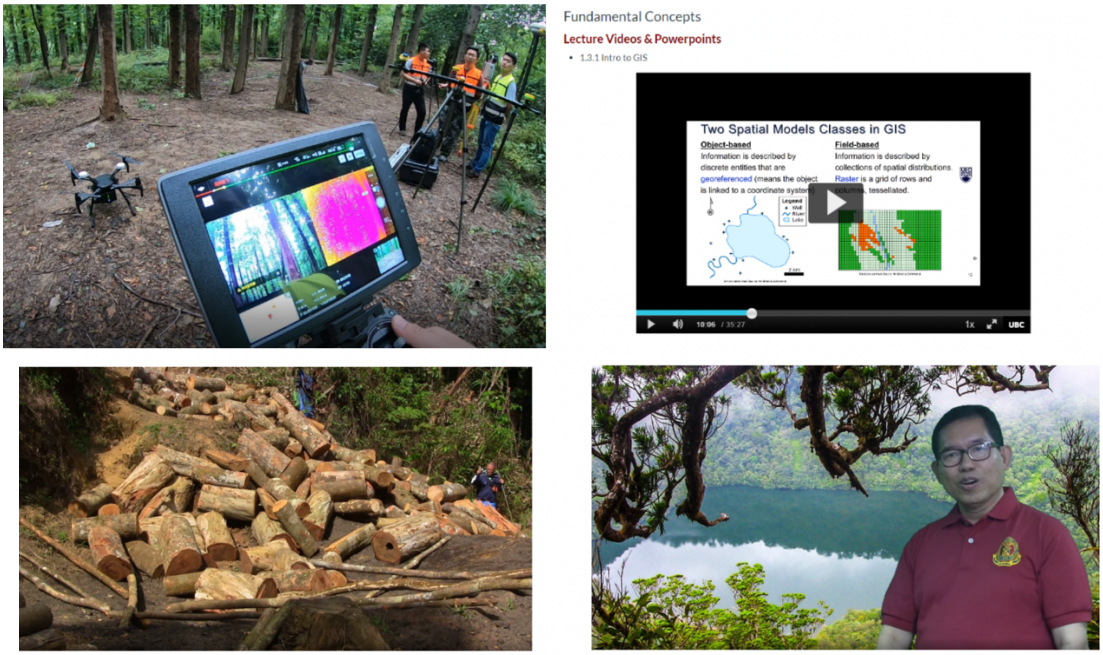

Fig 6. Top: Integration of drone, GIS, and satellite data into the Geomatic in Forestry course developed by Dr. Nicholas Coops. Bottom: Filming and recording in forest communities in Asia.

3.1.4 Output 4: SFM repurposed OER course implementation

The Executive Office of the AP-FECM established the following Course Operation Model for repurposed OER courses. The work completed in phase II, including establishing high course

quality and this successful operating model attracted global recognition and will provide a solid foundation for future credential programs.

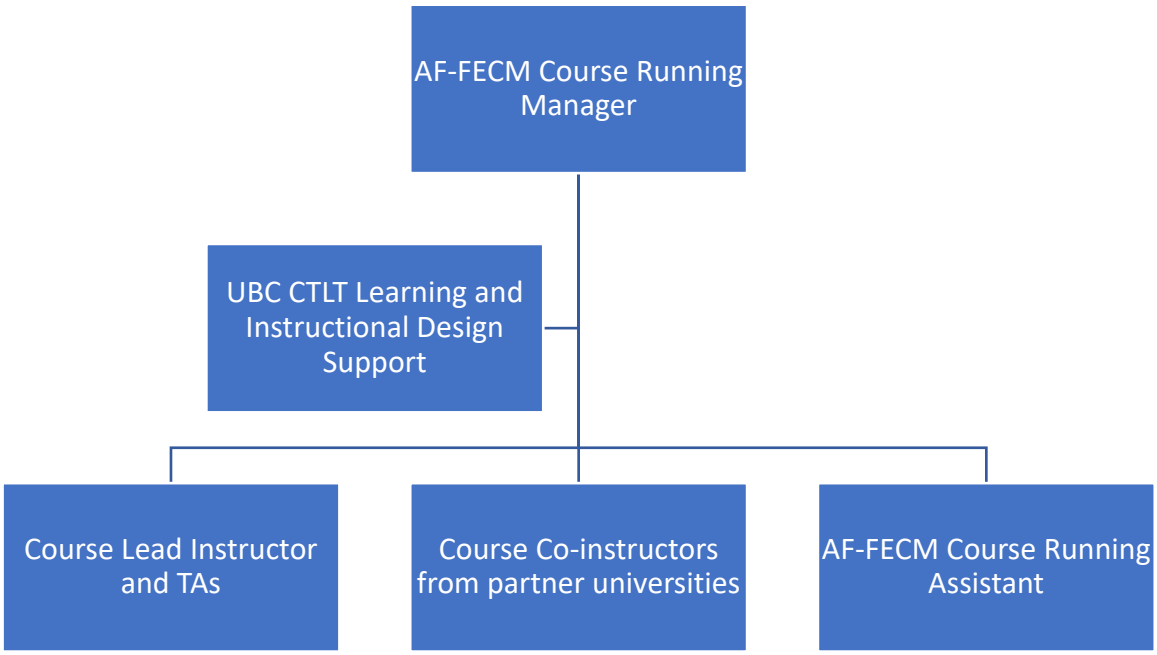

Fig 7. Team-based Course Operation Model

Using course content as open educational resources in combination with the creation of an online collaborative learning community has attracted a broad global audience of learners.

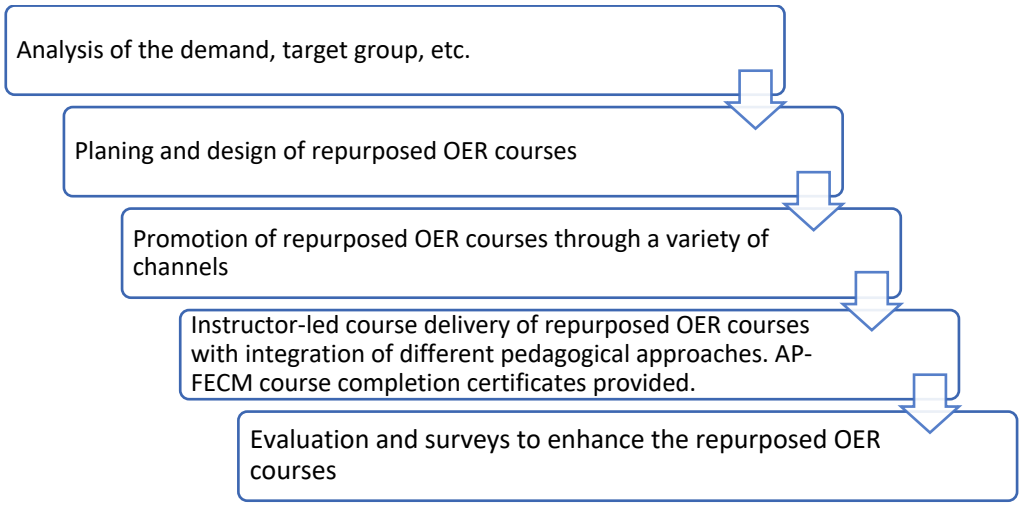

Fig 8. Repurposed OER Course Development and Implementation Model

- **3.1.4.1 Online Pedagogical Approaches**

To better engage and retain students in this type of open-access non-credit online courses, multiple facilitation and support approaches have been adopted, some of which are shown in the following figure. As a result, interactions between student-instructor, peer-peer, and student-content were rich and meaningful. Course analytics have been embedded in the system to track and monitor the course progress.

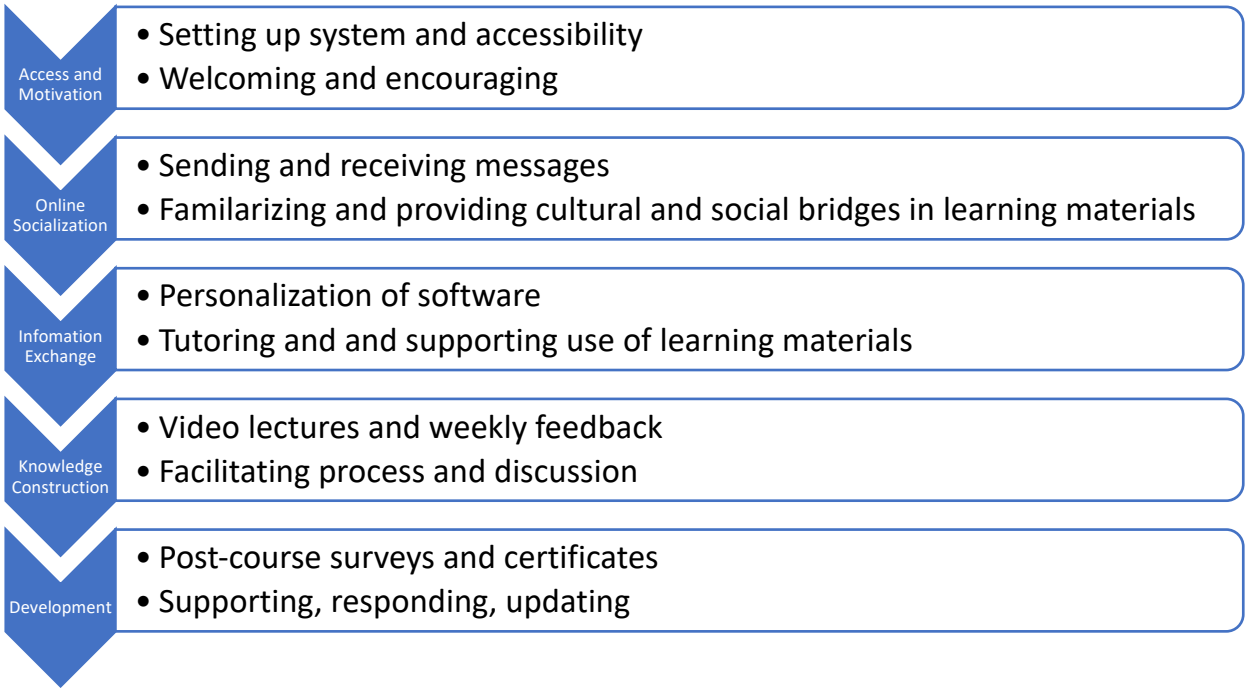

Fig 9. Online course facilitation and support model supporting active learning pedagogical concepts and approaches

- **3.1.4.2 Instructor-led sessions during 2019-2020**

Offering instructor-led repurposed sessions to compliment OER course material has been a key effort in establishing program success. There was one regular-size instructor-led session provided in 2019 and 8 large-scale instructor-led sessions being offered in 2020 amid the global COVID-19 pandemic. All these sessions have attracted over 1500 students from 32 Chinese partnering universities. In addition to our 5 previously existing courses, instructors led 3 new courses from February to April 2020. Other than delivering high quality education in SFM, an international collaborative teaching and learning community has been built through the course offerings in 2020 with more than 35 instructors from UBC and universities in China involved.

During the 2020 offerings, a pre-course workshop was prepared and offered by UBC Forestry and the AP-FECM Executive Office to instructors and teaching staff from Chinese partnering universities including Beijing Forestry University, Nanjing Forestry University, Northwest Agriculture and Forestry University, Fujian Agriculture and Forestry University and so on. This pre-course workshop focused on sharing pedagogical approaches to better engage and retain students in this type of open-access non-credit online courses. Active learning approaches were achieved by providing multiple opportunities for meaningful interactions between student-instructor, student-student, and student-content. Course analytics were embedded in the system to track and monitor the course progress and content engagement. The 8 courses ended in early May 2020 and a closing ceremony was organized to recognize the outstanding students and the contributions from the partnering universities, more importantly, to consult with the students and instructors for feedbacks and reflection, which will be valuable for improvement and future implementation.

Pre- and post-course surveys 2018-2019

A series of pre-course and post-course surveys have been designed to collect student feedback for program improvement and future development. The survey results are used to continuously update and enhance the course to ensure high student engagement and learning opportunities.

The 2018 post-course survey results show that 80% of respondents reported that the course significantly advanced their knowledge of SFM, over 90% of respondents reported a deeper understanding of SFM and that this knowledge can apply to their careers, 80% of respondent felt satisfied with the course and that online activities advanced their learning, and over 90% of respondents expressed interest in pursuing another e-learning course.

The survey results from 2019 showed that 63% of the students successfully passed the courses and more than 80% of the participants are quite satisfied with the quality of the courses. In addition, 88.5% of the respondents felt that the courses improved their understanding about the topics and 83.68% of the respondents thought the online discussions effectively helped learning in the courses. Together, these survey results showed that students of the SFM online program have had successful learning experiences and demonstrated the effectiveness of online learning as a platform for SFM education.

- **3.1.4.2 Instructor-led Sessions during winter term 2020-2021**

The COVID-19 pandemic has affected educational systems worldwide, leading to the cessation of normal practices at schools, colleges, and universities. As an immediate response to the globally spread virus, universities worldwide switched from their familiar and long-lasting mode of in-person based teaching into online learning. As mentioned above, in spring 2020, COVID-19 began in China, the AFRC and AP-FECM started offering 8 of their repurposed online OER courses in an effort to support online teaching during the pandemic. This online course offering served the critical needs for the 33 Chinese universities and more than 1500 students.

Due to the positive feedback received from the Chinese partnering universities, and with the generous support of APFNet, five SFM courses were extended to the broader Asia Pacific region in the fall of 2020. The project was a success on all fronts, with more than 1000 students registered for the courses. The course implementation has facilitated high quality education in SFM amongst a variety of universities during these extraordinary times. In addition, the delivery of these high-quality online courses also further raised the profile of APFNet and AP-FECM.

Five award-winning courses were selected, repurposed, and offered to all AP-FECM members. In the Fall of 2020, students enrolled from across the Asia Pacific including forestry universities and institutes from China, Vietnam, Indonesia, Philippines, Nepal, Japan, Malaysia, Thailand, Laos, Mongolia, Burma, Cambodia, and Chile. These courses were selected based on feedback from students and instructors, as well as from the experiences drawn from the previous implementation of open online courses. The five award-winning courses are as follows:

- Geomatics in Forestry (Data Collection and Measurement) (Phase II)
- Urban Forestry in the Asia Pacific Region (Phase II)
- Sustainable Forest Management in the Changing World (Phase I)
- Forest Governance, Public Relations, and Community (Phase I)
- Development Forest Resource Management and Protection (Phase I)

An effective teaching model that we learned from previous course offerings and feedback was to assign co-instructors from participating universities to assist the content experts and instructors in organizing and supervising the students. This novel collaborative strategy helped to improve students' completion rate and learning outcomes. Therefore, in the project reported here, the co-instructors were also recruited to secure the smooth-running of online teaching and learning.

Courses were delivered under the guidance of content experts and instructors using the online learning and management system, Canvas. The Canvas system allows us to incorporate the best practices in online teaching and learning, including advanced student support and analytics, user-friendly interfaces, and multiple tools for online discussions, assessments, and self-reflection. Following the recruitment of outstanding co-instructors, instructor/co-instructor training sessions were offered by the AP-FECM EO, and provided detailed instructions about the Canvas platform, teaching strategies, and communication strategies for course implementation.

The AP-FECM EO aimed instructor-led sessions and engagement activities at high student retention and engagement. During the program implementation, our practices have moved from content-based teaching to learning-centered with students' participation in course offerings and co-creation of course materials. In the previous course offerings, at the most basic level, students were encouraged to remember information in the course by completing self-test quizzes. They gained understanding of each topic with reading materials, then applied their knowledge in instructor-led discussions on generic questions. In the course offering here, more focus was placed on engaging students with peer interactions, such as group discussions, as an effective pedagogical approach to learning. This allowed students engage with their peers and compare

knowledge and experiences with their own, therefore gaining practical and applicable knowledge from other regions. Due to these high levels of student engagement (1224 students registered) and retention (727 active students), students were able to gain the knowledge and skills to remember, understand, apply, analyze, evaluate, and create.

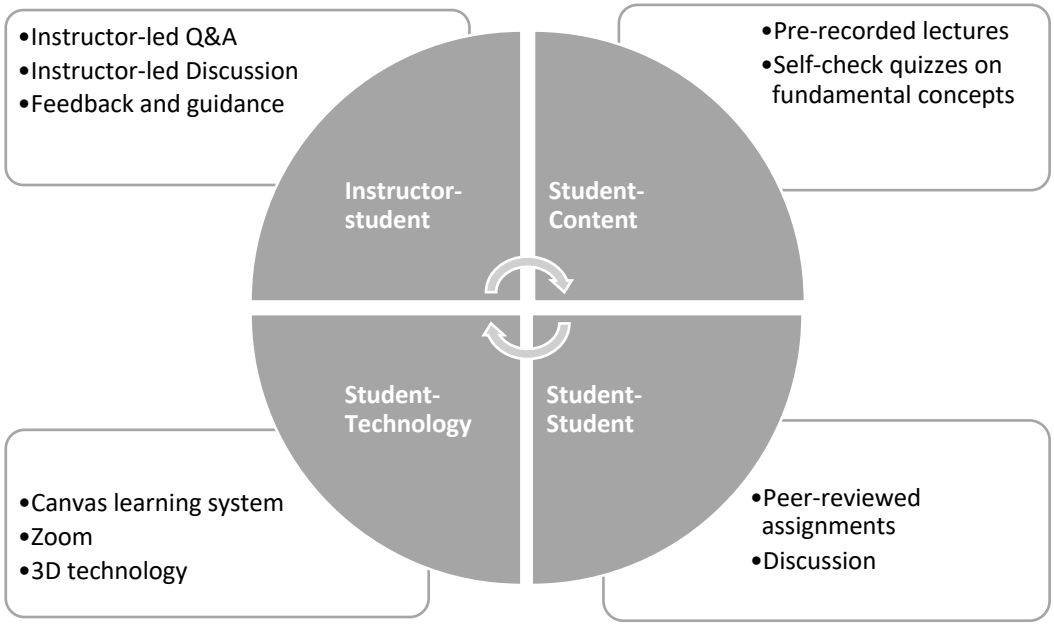

Fig 10. Examples of Interactions in an Online Course

After completion of the online course program, a virtual closing ceremony was convened on January 14th, 2021, and students were provided with their course completion certificates. On January 14th, 2021, the closing ceremony was successfully convened virtually over the Zoom platform. This session was started by Dr. John Innes (AP-FECM Director, Dean of UBC Forestry) and Mr. Zhongtian Zhang (APFNet Assistant Executive Director) for the opening remarks. After that, Prof. Guangyu Wang, the director of the AP-FECM EO, summarized the program with a short review. The instructor and facilitator team then granted the certificates for all the participating students. Finally, Ms. Xinxin Zhu, assistant director of the AFRC described the future offerings of the Virtual Summer Programs. The next virtual summer program has been organized for July 12th-August 12th, 2021 with three different course package offerings, and over 100 students from the AP region enrolled in these courses.

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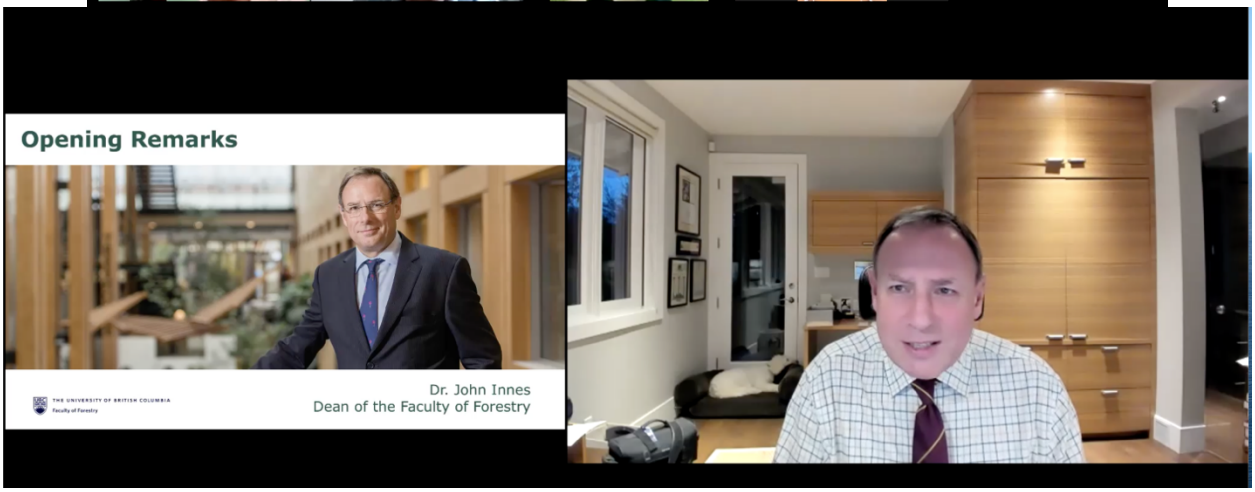
Faculty of Forestry



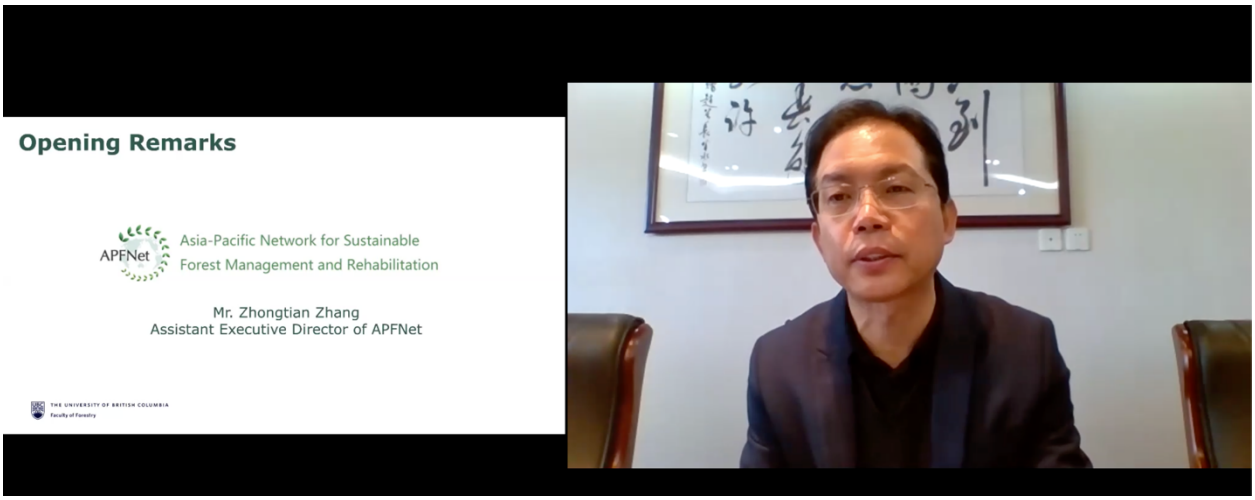


Fig 11. Sustainable Forest Management Online Courses 2021 Closing Ceremony

Pre- and post-course surveys 2020-2021

A series of pre-course and post-course surveys have been designed to collect students' feedback for program improvement and future development. The surveys covered the following topics:

- Effectiveness: the learning objectives were assessed by establishing learners' perceptions. The learners' opinions on the effectiveness of the course will indicate the relevance of the course to them. It will reveal the skills that they have learned and provide suggestions for improvement.
- Attractiveness: the overall look and feel were assessed as this affects the students' learning experience. The course multimedia components (e.g., video, audio, text) were rated. This will help build well-crafted multimedia resources, especially for self-paced asynchronous sessions.
- Engagement: learner engagement was a priority during the delivery of the courses. Specific learning activities and collaborative work were assessed by asking the learners to rate how engaging the activities were. This will help the development of future interactivity.
- Comprehension: the conciseness and clarity of content were assessed by asking whether the learners could follow and understand the subject matter. This will help identify any areas where learners need more support in future sessions.

The survey results for 2020 provided valuable insights into the project's effectiveness. It showed that among the students who attended the online course, 57.2% of the students have successfully passed the course, and more than 80% of the participants are quite satisfied with the online courses we offered. In addition, 89% of the respondents felt that the courses improved their understanding of the topics. 87.4% of the respondents thought that the learning activities have effectively helped to facilitating learning in the course.

3.1.5 Output 5: Building capacity for higher forestry education

One of the most fundamental goals of the project was to assist participating universities in improving forest education quality in order to build capacity in sustainable forest management in the Asia Pacific region. All of the outputs contribute to this goal through increasing access to high quality SFM education materials and increasing collaboration between students, educators, and professionals across the Asia Pacific. The following activities were organized and specifically aimed at building capacity for higher forestry education.

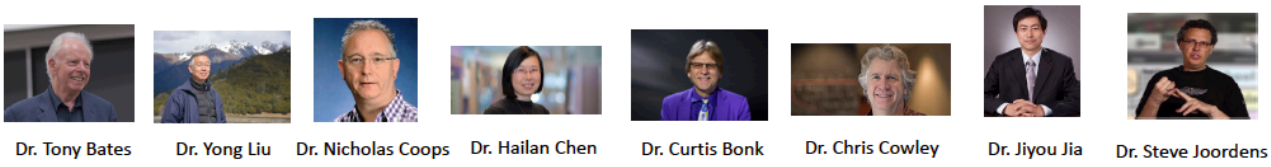
- **3.1.5.1 Virtual Lecture Series on Online Teaching and Learning**

As a result of the COVID-19 pandemic, the majority of universities across the Asia Pacific had to transition their in-person teaching to online formats. Now, online courses have emerged as one of the mainstream learning models in the region. To support this transition, while offering open-access online courses to students across the AP region, the AP-FECM also organized a virtual lecture series for instructors on online teaching and learning. The AP-FECM has gained invaluable knowledge and skills through our experiences in repurposed SFM online teaching over the past 5 years. We are well-equipped to educate and support those who are just entering the online teaching territory by enriching their skills and strategies and improving the quality of teaching that they can offer. To address the unique challenges faced by online teaching, the AFRC and AP-FECM led seven open lectures from September to November 2020. The AP-FECM member universities were encouraged to participate in the virtual series and explore opportunities to co-organize similar virtual lectures in 2021.

Eight world-class scientists on online teaching and learning including Prof. Tony Bates (Contact North), Prof. Cutis Bonk (University of Indiana), Dr. Chris Crowley and Dr. Hailan Chen (UBC), Prof. Nicolas Coops (UBC), Prof. Jiyou Jia (Peking University), Prof. Steve Jordens (University of Toronto) and Prof. Yong Liu (Beijing Forestry University) were invited to share their experience and expertise on the online teaching and learning with faculty members and students. The lectures in this series were focused on essential and emerging topics in the online learning field. Topics included online learning management systems, the application of Artificial Intelligence, the strategies for motivating and engaging learners, and experiences in SFM online course development. The 2020 virtual lecture series received a lot of attention and praise from our member and partner organizations.

Agenda for the Online Teaching and Learning lectures

Vancouver Time	Beijing Time	Presenters	Organization	Title
2020-09-15 Tuesday 5pm	2020-09-16 Wednesday 8am	Prof. Chris Cowley Prof. Hailan Chen	UBC CTLT (Center for Teaching and Learning Technology)	"Online Teaching Design, Development and Deliver: A case study from UBC CTLT"
2020-09-22 Tuesday 5pm	2020-09-23 Wednesday 8am	Prof. Nicholas Coops	UBC Faculty of Forestry	"High-techs Application in the Online Courses Development"
2020-10-01 Thursday 5pm	2020-10-02 Friday 8am	Prof. Tony Bates	Ryerson University Contact North	"Leveraging Online Learning Not Only to Increase Access but Also to Develop New Skills"
2020-10-13 Tuesday 5pm	2020-10-14 Wednesday 8am	Prof. Curtis Bonk	Indiana University	"How to Motivate and Retain Online Learners"
2020-10-20 Tuesday 5pm	2020-10-21 Wednesday 8am	Prof. Jiyou Jia	Peking University	"Applying Artificial Intelligence to Enhance Online Learning"
2020-10-27 Tuesday 5pm	2020-10-28 Wednesday 8am	Prof. Yong Liu	Beijing Forestry University	"Hybrid Teaching and Learning Mode During the Post Pandemic"
2020-11-03 Tuesday 5pm	2020-11-04 Wednesday 8am	Prof. Steve Joordens	University of Toronto Scarborough	"How to formally develop skills like critical and creative thought (and interpersonal communication) via online learning"



Dr. Tony Bates Dr. Yong Liu Dr. Nicholas Coops Dr. Hailan Chen Dr. Curtis Bonk Dr. Chris Cowley Dr. Jiyou Jia Dr. Steve Joordens

Fig 12. Agenda for the Online Teaching and Learning Lectures, 2020.

- **3.1.5.2 Establish a regional network for the development of online forestry education resources**

The numerous activities and efforts over the first and second phase of this project have actively brought together leading professors and experts in the forestry educational field on an ongoing basis. These collaborations have resulted in the establishment of a regional network for the development of online forestry education resources. This network will be beneficial for the further development of the SFM online courses by providing outstanding human resources and an exceptional knowledge base. This project has created innumerable opportunities for connections and relationships to be formed between students, educators, and professionals in the field. For example, the team-based course development process, the workshops online and at UBC, and the instructor-led sessions have included experts and students from more than 90 economies. In addition, the certificates and the final transcripts of all the participating students were shared by the AP-FECM EO to all the partner universities. This strategy could further advance the collaboration in course development and SFM course recognition among the AP-FECM members.

- **3.1.5.3 Dialogue with Educational Leaders (DEL) Series**

In response to COVID-19 and in support of the further development of the SFM open-access courses and related certificate programs, the AFRC and AP-FECM EO initiated dialogues with educational leaders in the Asia Pacific. During the summer of 2020, 58 educational leaders from twelve partnering universities participated in this DEL series. The DEL series has offered invaluable first-hand information about how higher forestry education has been influenced and has had to adapt to the new normal caused by COVID-19. A significant goal of the initiative was

to establish and continue to develop connections, build capacity, and invoke opportunities for future collaboration between partner universities in higher forestry education across the Asia Pacific region. A database of content experts and a new strategy for sharing resources and offering support among the AP-FECM members was initiated.

The series' discussions were mainly focused on three main themes: research and collaboration, new online course development, and virtual mobility. The discussions were conducted in research-interview style. A set of guided questions were provided to the participants prior to the virtual meetings surrounding the current situation of the COVID-19 pandemic in their area, enrollment status, teaching activities (online, blended, or in-person), contingency plans, and impacts on international programs. Discussions focused on identifying the most significant challenges presented by COVID-19, sharing strategies or programs that were successful under the new normal, and recognizing opportunities for collaboration between the partner universities. Some of the common challenges identified across the participating universities include adapting to the rapid transition to online teaching, lack of technological infrastructure, difficulties in providing experiential and international learning experience, and operational obstacles faced by administrators. To address the central issues that were identified through the DEL series, several continuous actions such as the SFM online course development and implementation, online learning lecture series, and virtual student mobility activities have been conducted. Moving forward, the AFRC and the AP-FECM will work closely with partner universities to further explore collaboration opportunities, offer knowledge and technical support, and take a leadership role to provide practical recommendations in supporting forest education in the AP region. Though the COVID-19 pandemic has presented significant challenges to higher forestry education, it has also provided opportunity to increase collaboration across the globe through harnessing the unique power of connecting people online.

3.1.6 Output 6: Promotion and management of the project

- **3.1.6.1 Project Management**

The project in Phase II followed a hierarchical management format as in Phase I. The project steering committee consisted of 10 Steering Committee members of AP-FECM and a liaison from APFNet. The responsibility of the Steering Committee is to monitor the project management and report to APFNet. The Executive Office of the AP-FECM is responsible for the operation, implementation, and management of the project. Student enrolment, TA supervision, certification, and course implementation is monitored and overseen by the Executive Office. The EO is responsible for communication with APFNet and with the leading institutions who coordinate with participating contributors. The Executive Office of AP-FECM makes administrative and financial arrangements with all participants. The Executive Office of AP-FECM is responsible for preparing and submitting annual project plans, progress reports and completion reports to APFNet.

In the second phase, there were 10 new courses created with the collaboration of over 20 lead professors and content experts. This posed a significant project coordination and management challenge that has been successfully executed by the AP-FECM EO. All participating institutions were responsible for the successful implementation of the project. A team-based approach was used for the course development process, consisting of lead professors, regional content experts, project management and instructional design professionals. Each course had a lead professor designated to take responsibility for developing the course, and they worked with their course development teams to decide on the overall learning outcomes, course structure, course content, course materials, learning activities, and assessment strategies. The AP-FECM acted as a focal point to support and coordinate the overall progress of each course and to connect with UBC CTLT for support.

UBC CTLT was responsible for providing learning and instructional design support in course development, organization of workshops, and Canvas course site authoring. An IT manager was assigned by the AP-FECM EO and UBC CTLT to lead daily operation and maintenance of the open resource courses on the Canvas platform. The manager was also responsible for responding to requests from course leading professors and users regarding technical problems. On canvas, user statistics were tracked, and all interactions and feedback were kept for analysis later.

Since January 2020, the COVID-19 pandemic has posed a significant challenge to the project operation and management. Fortunately, all partners in the project have remained healthy and safe. UBC has been in contact with partners to maintain effective communication and progress for the project. The partners report uncertainties and have made to make many unforeseen changes during this time, but continued to work on the course content development. Likewise, UBC CTLT continued to support course development teams in a timely manner. The AP-FECM has been deeply touched and motivated by the commitments from the educational leaders in the AP region. Their dedication and determination in carrying out teaching activities, looking for support, and hoping to provide the best learning experience for their students during the pandemic was radiated and sincerely felt.

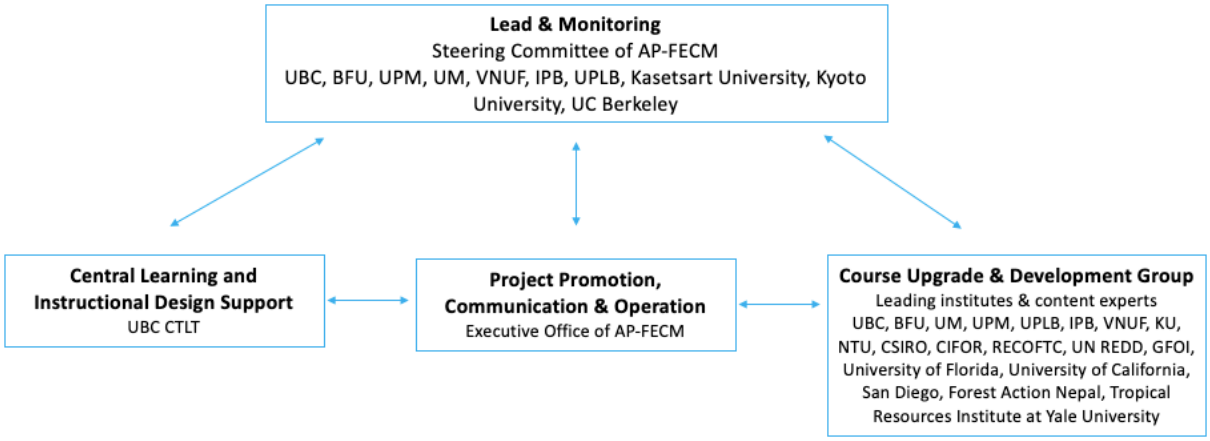


Fig 13. Project Management Structure

- **3.1.6.2 Project Promotion**

The publicity and promotion of the project has been mainly handled by the Executive Office of AP-FECM with support from the participating institutions. Intensive and on-going promotional activities have maintained publicity of the program, increased course enrolment and promoted the reputation of APFNet and AP-FECM. Firstly, the project running continuously as open-access educational resources and the creation of credential programs has attracted a wide range of learners. Beneficiaries of the project are forestry students, faculty members, practitioners, and policy makers in the Asia-Pacific region. Since 2016, the AP-FECM has promoted the developed courses to a global audience. Currently, the SFM courses have attracted 15 000 students from over 130 economies and have been viewed more than 72 000 times. Promotional activities in the second phase included instructor-led sessions for global learners, attendance of international and regional events, visiting universities and forestry-related organizations in the region, promotion through partner universities, preparing e-news, social media publications, etc. In the second year of the project, the program presented during the World Congress 2019, IUFRO in Brazil and the World Conference on Online Learning 2019 in Ireland. Further, a case study of the SFM online program was published during the 6th International Conference on Higher Education Advances (HEAd'20).

Fig 14. IUFRO World Congress 2019

Through the SFM course development and implementation process a global learning community has been formed for the co-creation of SFM teaching materials, for collaborative learning, and experience sharing. Surveys and interviews with global learners and partners have been conducted periodically to further identify needs of learners and larger society. The efforts on increasing access to high-quality forestry education led us to win the IUFRO Award for Best Practices in Forest Education- Tertiary, the top recognition in forestry education worldwide. It lays a solid foundation for the project's future development.

The results and outputs of the project are presented on AP-FECM's website with links to the Canvas course sites, and will continue to be updated as results become available. AP-FECM's website and AFRC WeChat Account also contain news and progress reviews for the project. The project has produced brochures, project fact sheets, short videos, and press articles throughout the implementation of project. These materials have been delivered at forestry and education related conferences, relevant newspapers, and new media channels such as YouTube, and other social media. For example, as a result of the tremendous efforts that we have made in improving SFM education in the Asia Pacific region, the AP-FECM EO was invited to attend the "Silver Lining for Learning" TV show to share our achievements on the innovative sustainable online course development and implementation. Hosted by the world-renowned education experts, "Silver Lining for Learning" is an ongoing conversation on the future of learning with leaders in education from across the globe. On this show, our team shared the story of how our project successfully used a team-based approach to develop a high-quality OER learning program and a credited certificate package, and how we are working towards a future Master's degree program in Forestry (Fig. 14). The Executive Office of AP-FECM will continue to plan to arrange promotional

activities to publicize the project to global audiences, increase course enrolment and promote the reputation of APFNet and AP-FECM. The table below describes the project promotional activities that we undertook in 2020.

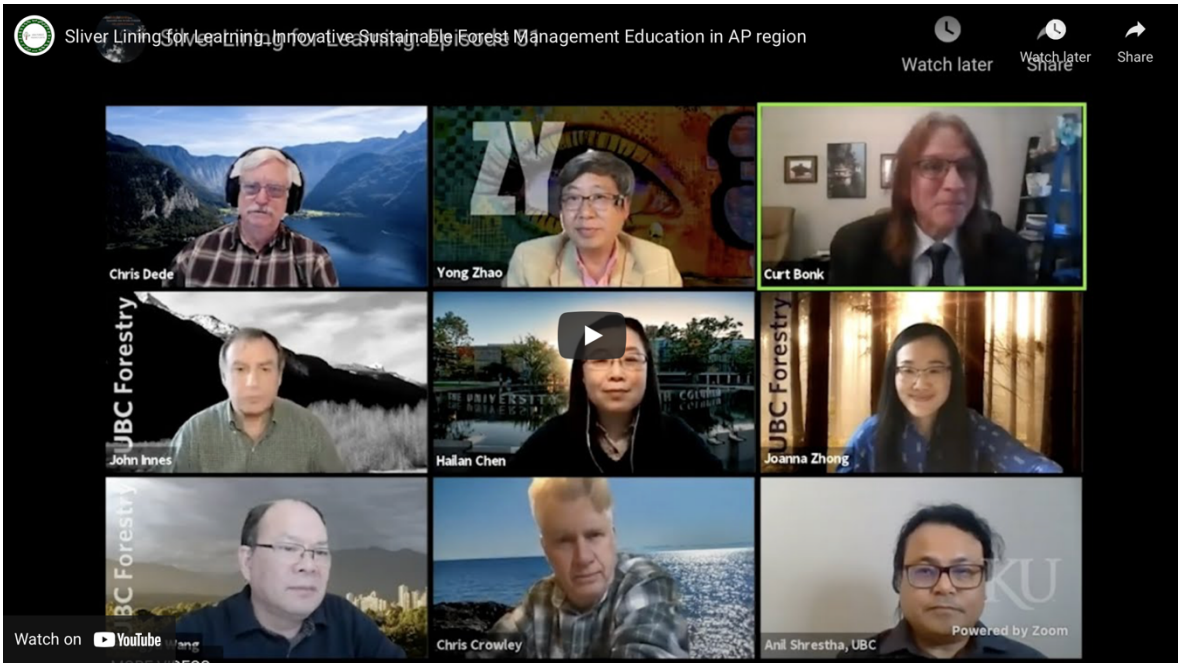


Fig 15. Silver Lining for Learning TV Show Appearance. Links for the TV Show: https://v.youku.com/v_show/id_XNTEyNjU0ODAxNg==.html

https://www.youtube.com/watch?v=yeEZrUkDiIc

Table 3. Project promotion activities in the year of 2020-2021

Activities	**Promotion Platforms**	**Date**	**Funding Source**
Promotional brochures for SFM course offering and the Online teaching lectures	APFECM EO has disseminated the brochures to all the APFECM members and related partners	2020 July-August	APFECM
Webinars	Open Virtual Lecture Series on Online Teaching and Learning to Profs and Students in the Asia Pacific region (https://apfecm.forestry.ubc.ca/news-events/2020-2/open-virtual-lecture-series-on-online-teaching-and-learning/)	2020 Sep-Nov	UBC
Social media platform promotion	WeChat News on WeChat Account (亚州森林研究中心) https://mp.weixin.qq.com/s/cRz2cdQ0E1ma5yO-MhkBJQ https://mp.weixin.qq.com/s/EKlnvbOvGNfEFHZ8Ojjjcg https://mp.weixin.qq.com/s/i4Reoa_dlMjNSYQgZl1OmQ https://mp.weixin.qq.com/s/NDzOTPmgkcTsEeY0fMsyDw https://mp.weixin.qq.com/s/567E6Q3QOf74iZCvFqJjoA https://mp.weixin.qq.com/s/uYpDHZtg8OlIf9HIBGw4Sw https://mp.weixin.qq.com/s/c3Lz0n3LIp0Ug6gOVFDv5Q	2020 January-Now	APFECM & AFRC
Social media platform promotion	APFECM website (https://apfecm.forestry.ubc.ca/news-events/2020-2/five-sustainable-forest-management-online-courses-will-be-open-in-september-2020/) https://apfecm.forestry.ubc.ca/news-events/2020-2/open-virtual-lecture-series-on-online-teaching-and-learning/	2020 August-now	APFECM
Social media platform promotion	AFRC Twitter https://twitter.com/afrc_ubc/status/1351636766600491010	2020-2021	AFRC

	https://twitter.com/afrc_ubc/status/1319730946946465792 https://twitter.com/afrc_ubc/status/1318577249889611776 https://twitter.com/afrc_ubc/status/1314422141878562818 https://twitter.com/afrc_ubc/status/1294394495174287361 https://twitter.com/ubcforestry/status/1278440775337074696		

3.2 Project Impacts

Since 2016, due to the immense efforts of leading educators and experts from top universities around the world, the only SFM online program of its kind has provided world-class forestry education resources to more than 15 000 learners from over 130 international economies. This project provided the opportunity for learners around the world to have open access to high quality education without constraints on geographic location and time. This allows learners the flexibility to pursue this knowledge whether they are a new graduate or a forestry professional or decision makers wishing to improve their skillset about diverse aspect of sustainable forest management. Moreover, instructor led sessions of these sustainable forest management (SFM) online courses also significantly improved critical thinking, evidence-based discussions, effective communication, maintaining academic integrity and writing skills among the learners. These skills sets are key for new generations of foresters for science based SFM. This project has contributed to promote equity in forest education around the world. Through promoting and improving access to high quality education opportunities in forestry and improved knowledge in sustainable forest management, this program has contributed to a reduction in observed difference in education between economies in the Asia-Pacific region.

In Phase II of this project, we have generated long term impacts that benefit the entire forestry sector in the Asia Pacific region and globally. The new SFM course collection covers a wide range of important topics in sustainable forest management. Course curriculums have emphasized the sustainable management of tropical forests because they are particularly threatened in the AP region. Tropical forests are diminishing in response to climate change in areas where local communities are highly reliant on forest ecosystems for food, fuel, and other resources. In order to conserve tropical forest resources, there is a clear need for high quality education and training in sustainable forest management. The new SFM courses provide a

systematic knowledge and skill set for forestry professionals to understand plantation forests planning, decision-making for tropical forests management and utilization, geospatial technologies in environmental management, climate modelling tools for forestry applications, REDD+ forest measurement and reporting, as well as contextual factors that influence conservation and livelihood outcomes in tropical forest areas. This knowledge will contribute to the improved management of plantations and natural forests which are essential to the well-being of regional and global environments, communities, and economies.

In addition to the cultivation of high-quality forest learning materials, the workshops, resources, and support provided during this project will introduce new technologies and pedagogies to various institutions to improve their long-term teaching quality and to advance the learning of an entire generation of new graduates. This project has created a platform for learning, sharing, relationship-building and collaboration between students, educators, and professionals in the forestry sector spanning across the globe. It has promoted student mobility, faculty exchange, mutual course articulation and recognition, and joint educational and research cooperation in the future. The success of the project demonstrates the importance of multi-national and multi-university collaboration in order to enhance global awareness of sustainable forest management practices and to ensure that the future generation of scientists, policymakers, practitioners is well-equipped in an ever-changing and complex world.

4. CONCLUSION, LESSONS LEARNED AND RECOMMENDATIONS

4.1 Conclusion

Due to the strong partnerships and great collaborative efforts between APFNet, AP-FECM-EO, UBC, and AP-FECM member universities, excellent achievements have been made during the second phase of this project. The first output was the establishment of the AP-FECM and UBC's Graduate Certificate program. A major incentive for students to pursue academic programs is the opportunity to get certified for their qualifications. The developed and upgraded courses were all modified and extensively reviewed to ensure that they meet the requirements of a Master's level course. These courses can be combined to provide the foundation for a new certificate or Master's program for any of our partner universities. A 15-credit SFM online Certificate Program was developed by UBC during this second phase and includes a series of online courses, instructor-facilitated learning activities and student assessments. The second output was the development of ten SFM courses and the upgrade of five existing courses. Using a team-based approach, courses were developed by content experts following detailed guidelines with the strong support of the AP-FECM EO and UBC CTLT. This phase of course development was focused on tropical forests and how to manage forests in a changing environmental and social context. The third output was the integration of emerging educational technologies and pedagogies into the online courses and the establishment of the courses on the Canvas platform. This output strongly improves engagement, interactions, and learning outcomes for the students and facilitates the exchange of experiences and technologies to better

educate a new generation of foresters in the APR. The fourth output was the course implementation, which was achieved through implementation as open educational resources, promotion to AP-FECM universities, and various instructor-led sessions. Students evaluated the instructor-led sessions, and their feedbacks were incorporated to modify learning activities for effective student engagement and learning. Through the fifth output, the AP-FECM aimed to continuously seek and create opportunities to build capacity for higher forestry education in the Asia Pacific. During the COVID-19, the AP-FECM was able to use their online educational materials and strong collaborative community to adapt to the challenges of the pandemic and provide resources and support to universities across the region. Through the virtual lecture series, DEL series, and establishment of a regional network for forestry institutions, and other efforts, the AP-FECM is able to consistently provide the academic, pedagogical, technical, and human resources to support the improvement of global higher forestry education. Finally, through effective promotion and management of the project, the AP-FECM EO has been able to ensure that the SFM course material can be accessible to as many learners across the APR as possible.

4.2 Lessons learned and recommendations

The team learned valuable lessons throughout the project duration. In phase II, with the new courses developed and updated, global learners have been freely accessing high quality SFM educational resources to meet the needs of a changing environment and society. This project showed that a team-based approach with online pedagogy, technology, and content can be successfully integrated to produce an effective teaching and learning model for higher forestry education. This strategy ensures the enriched learning experiences of students, wide public access, supports the interaction of peers and professionals around the globe, and provides the necessary information for the next generation of foresters to sustainably manage the world's forest resources. This project has set a baseline and an excellent example for future course articulation and mutual recognition regionally, which will further promote student mobility and research collaboration, thus contribute to significant improvement in forestry education quality and accessibility. A team-based approach, sufficient preparation for course development and implementation, and ongoing financial, instructional and technical support are critical components for the success of the international collaborative forest education program. Another important lesson learned during the phase II course development was how to work and collaborate during the pandemic, which brings both new challenges, opportunities, and new learnings. For instance, some of our professors from Partner University experienced the COVID19 causing delay in completion of the course. However, by being flexible and companionate from APFNET, we were able to achieve the success even during this uncertain time. During the pandemic, many of our partner universities in Asia-Pacific region were struggling with the lack of online learning resources during the pandemic and thanks to online courses such as this, which played crucial role to fulfill disruptive university education and create opportunities to collaborate beyond the boundary.

Student-centered pedagogical model and learning activities are the key for developing and implementing innovative online courses. The pedagogical model used in this project is based on

open pedagogy featuring modules broken down to topics, and consisting of background information, video lectures, readings, self-reflection, and discussions. With a module-based format, instructors can easily repurpose and incorporate the necessary content into their courses, and institutions can integrate and combine these courses to fit their curricula and programs. This pedagogy facilitates both self-directed and instructor-led learning to improve flexibility and student engagement. With the implementation of the open online courses, and the feedback received from students, we learned that various learning activities and diverse content could increase student engagement but would also be affected by credit recognition and time management. Throughout phase II, students asked for more practical experiences to be integrated onto the online platform, which stimulated us to increase peer-to-peer interaction and instructor-led live sessions. Moreover, efforts dedicated to helping students address technical and accessibility challenges that they may face during online learning should never be neglected. Adaptive teaching and learning approaches based on student feedbacks, instructor experience and changing situation play critical roles for effective teaching. Since these courses rely heavily on technology and online management systems, it is important to always consider the accessibility of students to these technologies, such as access to computers with good sound performance and high-speed broadband.

Now that we have developed 15 state-of-the-art online courses, we have learned that there are still lacking of key courses in this pool of course due to changing context to name a few: ecological economics, forest mensuration, hydrology, watershed management, non-timber forest products to name a few. Hence, we suggest developing these courses to adapt to changing context and need of forestry education.