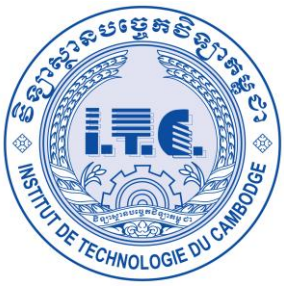
INSTITUTE OF TECHNOLOGY OF CAMBODIA

CONSORTIUM MEETING
INTERNATIONAL SUPPORT

Phnom Penh, 14 March 2022

REPORT OF ACTIVITIES

2021-2022



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Proposed Agenda of International Consortium Meeting at ITC
14 March 2022

14:00-17:30 in Cambodia / 08:00-11:30 in France / 16:00-19:30 in Japan

14h00-14h30:	Welcome Speech by President of the Board of Trustees and Minister of Culture and Fine Arts
14h30-15h15:	Presentation of Activities Report
15h15-15h45:	Q&A
15h45-16h00:	Break Time
16h00-16h30:	Presentation of Perspective Report
16h30-17h00:	Discussion and Q&A
17h00-17h30:	Closing Speech by the President of the Board of Trustees

MEMBERS OF CONSORTIUM 2022

I. Foreign Institutions

No	NOM ET PRÉNOM	NOM DE L'ÉTABLISSEMENT
1	Prof. Yves WACHE	Agro Sup Dijon (GCA et Formation de 3ème cycle)
2	Prof. TIVET Florent	Centre international de recherche agricole pour le développement (GCA et Centre de recherche et innovation)
3	Prof. DOSSANTOS-UZARRALDE Pierre	École Nationale Supérieure de l'informatique pour l'Industrie et l'Entreprise (GIC)
4	Prof. DEBASTE Frédéric	École Polytechnique de Bruxelles (GIM)
5	Prof. CHARLES Yann	Institut Galilée, Université Paris 13 (GIM)
6	Prof. ANDRE Françoise	Institut Mines –Télécom (GEE, option énergie)
7	Prof. Isabelle THIBON	Institut National des Sciences appliquées de Rennes (GCI et GIM)
8	Prof. LAURIAC Florent	Institut National Polytechnique, INP de Toulouse (GEE)
9	Prof. DARRACQ Bruno	Institut Universitaire de Technologie d'Orsay (GEE)
10	Prof. SIREE Chaiseri	KASETSART University (GCA)
11	Prof. KOTARO Yonezu	KYUSHU University (GGG)
12	Prof. JUN-ICHI Takada	Tokyo Tech (GEE)
13	Prof. VERLEYSEN Michel	Université catholique de Louvain (Programme Master et Doctorat)
14	Prof. Frédéric ROUSSEAUX	Université de La Rochelle (GIC)
15	Prof. LECLERCQ Pierre	Université de Liège (GCA/GCI)
16	Prof. COLIN Jean-Noël	Université de Namur (GIC)
17	Prof. CHABRIAT Jean-Pierre	Université de la Réunion (GEE)
18	Prof. Michel DEQUATREMARE	Université de Toulon (GEE et GIM)
19	Prof. Mathilde SESTER	Centre international de recherche agricole pour le développement (GCA)
20	Prof. GROS-MARTIAL Adèle	Institut de Recherche pour le Développement (GCA, GGG et GRU)
21	Prof. COLBEAU-JUSTIN Christophe	Université Paris-Sud
22	Prof. BOJAERT Jan	Université de Liège (GRU)
23	Prof. Philippe LOURS	Institut Mines-Télécom
24	Prof. PHALIP Vincent	Polytech Lille (GCA)
25	Prof. AVALLONE Sylvie	Montpellier SupAgro (GCA)

II. Entreprises

25. KhmerDev : M. Jeff LAFLAMME

III. Partenaires institutionnels

26. S.E. M. YUOK Ngoy, secrétaire d'État au Ministère de l'éducation, de la jeunesse et des sports (MEJS)
27. S.E. Madame PEN Chhorda, secrétaire d'État au Ministère des mines et de l'énergie

28. M. Christophe GIGAUDAUT, conseiller de coopération et d'action culturelle à l'ambassade de France au Cambodge
29. Prof. KOICHIRO Watanaba, Senior Advisor of JICA
30. M. Fabien MEHEUST, directeur adjoint de l'AUF Asie-Pacifique
31. Mme KAMEI Haruko, Chief Representative of JICA Cambodia
32. BOURHIS Ophelie, Directrice de l'Agence Française de Développement

IV. Membres invités

33. Prof. Murat YINDIZOGLU, conseiller du MEJS
34. Mme GIGAUDAUT Valentine, attachée de coopération pour le français, ADF
35. M. Thomas VALLEE, attaché de Coopération Universitaire et Scientifique, ADF
36. M. IM Kravong, responsable de l'Antenne AUF de Phnom Penh
37. Prof. AUBERT Pascal, directeur du collègue universitaire de l'Université Paris-Saclay (TC)
38. Prof. Bastien VINCKE, enseignant-chercheur à l'Université Paris-Saclay
39. Prof. DESPLANCHE Didier, directeur général de l'ECAM
40. M. André SPIEGEL, directeur de l'Institut Pasteur du Cambodge
41. SASAKI Chikako, Coordinator of LBE Project, JICA
42. Prof. BRISSON Martin, Chambre de Commerce et d'Industrie Française du Cambodge
43. Prof. LEROY Christine, Université catholique de Louvain
44. Prof. REMACLE Éric, Université catholique de Louvain
45. Prof. DASNOY Christine, Université catholique de Louvain
46. Prof. Kylie STRINGFELLOW, International Relations Officer, Griffith University
47. Prof. Karolien CASAER, country Representative, Global Green Growth Institute
48. Adeline CECCARELLI, ingénieur formation Agroalimentaire, SupAgro Montpellier

V. Équipe de direction de l'ITC

V. 1. Direction

49. S.E. PHOEURNG Sackona, présidente du Conseil d'Administration et ministre de la culture et des beaux-arts
50. S.E. OM Romny, directeur général de l'ITC
51. Prof. Ludovic PROTIN, directeur honoraire de l'ITC
52. Prof. Bruno DAGUES, conseiller de direction de l'ITC
53. Dr. CHUNHIENG Thavarith, directeur adjoint chargé des relations internationales
54. M. NUTH Sothân, conseiller chargé des affaires académiques
55. M. PO Kimtho, directeur adjoint chargé d'administration
56. M. SOY Ty, directeur adjoint chargé des affaires académiques
57. Dr. OEURNG Chantha, directeur adjoint chargé du planning et des projets
58. M. SIEANG Phen, responsable du bureau des relations internationales et chef de cabinet de bureau de directeur

V.2. Facultés, départements, et sections

59. Dr. OR Chanmoly, directeur du Centre de Recherche et d'innovation
60. Dr. SIM Tepmony, directeur de la formation de 3ème cycle
61. Mme SREY Malis, chef du département TC
62. Mme KHEMTRAN Krasel, responsable de la section de français
63. M. CHUM Tival, responsable de la section d'anglais
64. Dr. BUN Kim Gnun, doyen de la faculté de géoressources et géotechnique
65. Dr. HAN Virak, doyen de la faculté de génie civil
66. Dr. CHHUON Kong, doyen de la faculté d'hydrologie

67. Dr. IN Sokneang, doyenne de la faculté de génie chimique et alimentaire et responsable des relations avec les entrprises (UIL)
68. Dr. LIN Mongkolserey, vice-directeur du centre de recherche et d'innovation, coordinateur de l'ITC Tbongkhmum et doyen de la faculté des sciences appliquées et chef de département des mathématiques appliquées et statistiques
69. Dr. CHRIN Phok, chef du département électrique et énergétique
70. M. LAY Héng, vice-doyen de la faculté de génie électrique
71. M. KHIEV Samnang, responsable du service informatique
72. Dr. SRENG Sochenda, chef de département Télécommunication
73. Dr. KHUN Veng Kheang, professeur et coordinateur de la formation master de transport
74. M. KIM Vannada, responsable d'assurance de qualité
75. M. POV Keangse, chef de département Transport et Infrastructure
76. Dr. SRANG Sarot, Responsable du Génie Mécanique et des Systèmes de Contrôle au Département de Génie Industriel et Mécanique et coordinateur du programme international ECAM

1. Summary of activities – Current state

In 2021, a number of remarkable events have been organized in close cooperation with national and international stakeholders.

Moreover, different important meetings of ITC councils have been taken place online as follows:

- International consortium meeting at ITC, 30 March 2021 (Annex 1).
- 29th Board of Trustees meeting, 23 June 2021 (Annex 2).

An overview of the consortium opinions and CA recommendation in 2021 is presented in annex 3.

1.1. Remarkable events at ITC in 2021-2022

1.1.1. JICA President Awards to Dr. OM Romny, December 22, 2021

Dr. OM Romny, since taking position as Director of the Institute of Technology of Cambodia (ITC) in 2008, has spent his time and his strength in the development of the ITC.

Indeed, as far as campuses are concerned, ITC has four, for the moment, the first main campus is in Phnom Penh, the second is at Heng Samrin Tbong Khmum University, the third is next to the win-win monument and the fourth in Kampong Cham province.

As for human capital, the current ITC has more than 90 professors/303 with the title of doctor coming from abroad. This number represents 30% of the total number of professors at ITC compared to 7%, the percentage in other universities, according to the annual general assembly of the Ministry of Education, Youth and Sport.

Regarding faculties and departments, ITC has 5 faculties and 13 departments with 5844 students against 5 departments with 807 students in 1997.

In terms of training, ITC was able to launch its Master's and Doctoral training in 2017. This international training has dual degree and joint supervision programs. Therefore, it is internationally recognized. We have 51 doctoral students and 121 master's students.

As for research, it covers 101 research projects most of which are joint research and to make these above projects more operational, we employ 109 researchers.

As far as partnership is concerned, we have many but we mention 27 who are members of our international Consortium : 1) Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), 2) École Nationale Supérieure de l'Informatique pour l'Industrie et l'Entreprise (ENSIIE), 3) École Nationale des Ponts et Chaussées, 4) Institut de Recherche pour le Développement (IRD), 5) Institut National des Sciences Appliquées de Rennes (INSA Rennes), 6) Institut National Polytechnique de Toulouse (INP), 7) Institut Universitaire de Technologie, 8) Institut Mines-Télécom (IMT), 9) Institut National Supérieur des Sciences agronomiques de l'alimentation et de l'environnement (AgroSup Dijon), 10) INSA de Toulouse, 11) Institut Agro - Montpellier SupAgro, 12) Université Paris 13, 13) Université de Lille/Polytech Lille, 14) Université de la Réunion (UR), 15) Université Catholique de Louvain (UCL), 16) Université de Namur, 17) École Polytechnique de Bruxelles, 18) Université de Liège (Liège), 19) Université de la Rochelle, 20) Université Paris-Sud, 21) Université de Toulon, 22) Université de Pau et des pays de l'Adour, 23) Tokyo Tech Institute , 24) KYUSHU University, 25) Kasetsart University, 26) Chambre de Commerce et Industrie France-Cambodge, 27) KhmerDev. This testimony shows that we have 18 universities from France, 4 universities from Belgium, 2 universities from Japan and 1 university from Thailand.

Regarding infrastructure, since 2008, ITC got some new buildings such as a research and innovation center (3 floors, 10 rooms, 2014); an F building (4 floors, 33 rooms, 2008); a Samdech Akkak Moha Sena Padei Dekcho HUN SEN conference hall (2012 seats, 2012); a building I (6 floors, 56 rooms, 2015); a 7-storey building, "Knowledge Community Center for construction, manufacturing, electricity and electronics and a 3-storey workshop for civil engineering, in 2021, with ADB funding.

Based on these achievements, JICA Office in Tokyo gave, on December 24, 2021 a certificate of congratulations, (JICA President Awards) to Dr. OM Romny.

1.1.2. National and International Robot Contest

At the end of 2021, the ITC ROBOT team achieved great success. We participated in three robot competitions at national and international level:

First contest: Select team robot to compete in ABU Robocon 2021 at China (Pre-National)
Date: 06 November 2021
Place: Submit the video to TVK
Participants: 9 groups (ITC, NPIC, NUM, NTTI, CADT, RUPP)
Result: 2nd PRICE

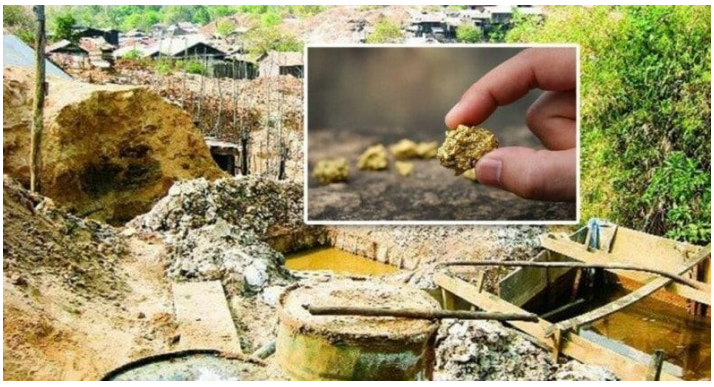
Second contest: ABU Robocon 2021 at China (International)
Date: 12 December 2021
Place: Video Conference (Online)
Participants: 21 groups, 11 countries
Result: 19th PRICE (The best idea Award)

Third contest: National Competition Robocon in Cambodia
Date: 26 December 2021
Place : RUPP, Phnom Penh
Participants : 11 groupes (ITC, PPI, NUM, NTTI, CADT, RUPP)
Result: 1st PRICE (The best idea award) et 2nd PRICE (Engineering Award)

1.1.3. Launch of the International ECAM LaSalle-ITC Program

With great effort, ITC and ECAM LaSalle were able to set up, on October 11, 2022, an international program within ITC. This program targets two training areas at the Master's level: industrial and mechanical engineering. The target students are first of all those of Cambodia and France, then those of neighboring countries of Cambodia.

1.1.4. Cambodia Gold Mine Tour in Mondulkiri Province



On October 28, 2022, a delegation led by His Excellency Dr. OM Romny visited the Okvao gold mine. Note that Renaissance Mineral Cambodia, owned by Emerald Resources, has the exclusivity to exploit gold from the Okvau mine located in the Mondulkiri region. This Australian group aims to produce around three tonnes of pure gold per year during the first eight years of operation. According to the Cambodian authorities, this country hopes to derive more than 180 million dollars from this production.

In terms of cooperation, Renaissance Mineral Cambodia has very good relations with the Faculty of Geo-resource and Geotechnical Engineering (GGG) of ITC. The main objective of this visit is to strengthen bilateral cooperation for mutual interests between Renaissance and ITC.

1.1.5. Inauguration of Laboratory for Nanostructure and Chemical Analysis

A new laboratory for the analysis of nanostructure and chemistry of approximately 1 million dollars was inaugurated on February 18, 2022, under the high presidency of his Excellency the Minister of Education, Youth and Sport and of the Japanese Ambassador to Cambodia. It is a donation from Japan, via JICA in Cambodia.

1.1.6. Inauguration of Science & Technology Experiments Center

A new Science & Technology Experiments Center was inaugurated on February 18, 2022, by His Excellency SAY Sam Al, Minister of the Environment. This center plays a very important role for the practical work of the first and second-year students in the Foundation Year. It should be noted that it is open to all audiences from different backgrounds, from high school or university. This expensive equipment allows pupils/students to understand the basic notions of science and especially physics and mechanics.

1.1.7. Inauguration of Biomedical Engineering Lab

The equipment handover ceremony for a biomedical engineering laboratory with the donation of the Czech Republic to the Institute of Technology of Cambodia and the University of Health Sciences was held on January 17, 2022.

The event was organized by the Institute of Technology of Cambodia in collaboration with the University of Health Sciences under the chairmanship of HE Martin VÁVRA, Ambassador of the Czech Republic, H. E. OM Romny, Director General of the Institute of Technology of Cambodia, and H.E. Professor Saphonn Vonthanak, Rector of the University of Health Sciences.

1.1.8. ITC-INDUSTRY OPENHOUSE 2022

The annual ITC-INDUSTRIES meeting took place on February 11, 2022, at the Institute of Technology of Cambodia. We organized this event with more than 60 companies present on site and around 40 companies by zoom. The objective was to make known all the laboratories of ITC and their capacities to all the companies. Those partners will contact ITC for any other possible cooperation, in the mutual interests. It should be noted that that day there were many foreign companies, mostly Japanese and French.

1.1.9. 1st International Conference on Earth Resources and Geo-Environment Technology (EraGET2022)

On February 18, 2022, at the Institute of Technology of Cambodia, "1st International Conference on Earth Resources and Geo-Environment Technology (EraGET2022)", was organized by the Faculty of Geo-resources and Geotechnical Engineering of this Institute, with the support of the Ministry of Mines and Energy of the Kingdom of Cambodia, Kyushu University, Hokkaido University, JICA in Cambodia and 12 international universities. This conference has 3 objectives: 1) to strengthen the capacity for learning and teaching and research in the field of mineral and petroleum resources, 2) To share experience of new discoveries, and 3) to strengthen and expand partnerships of research with business, community and international institutions.

1.1.10. Foundation stone at the STEM Workshop at ITC Kampong Cham Campus

On March 4, 2022, His Excellency OM Romny laid the foundation stone at the STEM workshop, located at the ITC campus, Kampong Cham province. It should be noted that the construction of this workshop is financed by the World Bank.

1.1.11. Honda Y-E-S Award

Honda Young Engineer and Scientist's (Y-E-S) Award Cambodia Program has been launched successfully in Vietnam in 2006, and in India in 2007. In 2008, this award has been introduced in Cambodia to promote future human resources of this country, and also reward excellent students in science and technology in South Asia via a balanced approach.

It is also important to note that since launching of this award for Cambodian young scientist, number of ITC students' awardee represented majority of total number of selected candidates. The following table illustrates ITC students' awardee since 2010.

Year	Name	Total number	Number of ITC students' awardee
2021	Ms. CHHUOR Sochan Vimul (GCA)	4 ITC/RUPP	1
2020	Mr. KEO Seiha (GCI) Ms. LAY Cheavita (GCA)	4 ITC/URPP	2
2019	Mr. KONG Rathaseyhak (GCA) Mr. CHHENG Ilay (GCI)	4 ITC/URPP	2
2018	Mr. SONG Vergenylundy (GEE)	4 ITC/URA/URPP	1
2017	Ms. NY Vourchnea (GCA)	4 ITC/RUA/RUPP	1
2016	Mr. KOUCH Keang Ang (GCI) Mr. THAI Sereyvuth (GCA)	4 ITC/RUA/RUPP	2
2015	Ms. EA Somuynea Ms. CHHIM Panchapor	4	2
2014	Mr. KOUCH Henghok Mr. PHON Bunheng	4	2
2013	Mr. SRENG Mengoing Ms. SROY Sengly	4	2
2012	Mr. RITH Monorom Mr. KHY Kimleng	4	2
2011	Ms. EK Pichmony Mr. SAY Vortana Mr. CHHOR Marady	4	3
2010	Mr. CHEA Ratha Ms. Rath Sovannsathya	4	2

1.1.12. Admission to Ecole Polytechnique

Since 2007-2008, Cambodian students from ITC has been presented among other foreign students in the most prestige school in France and the world, i.e., École Polytechnique. It is noted that ITC students have sufficient fundamental knowledge to pass the most difficult entrance exam of the school. Table below illustrates names of students who have been studying or had studied at École Polytechnique and their careers. Due to Covid-19 Pandemic, International Exam Committee of Ecole Polytechnique was not able to come to ITC for academic year 2020-2021. The recruitment starts again this year. One ITC student accepted.

No.	Name	Sex	Batch	Degree Earned	Working place	Role
1	MANG Chetra	M	2007-08	PhD	IRT SystèmeX (Paris)	Ingénieur R&D Sénior
2	MUY Sokseiha	M	2008-09	PhD	EPFL (Lausanne, Suisse)	Post-Doctorat
3	SVAY Angkeara	M	2009-10	PhD	LBL International (Phnom Penh)	Directeur Technique (CTO)
4	CHEY Sopheak	M		Engineer	ITC (Cambodge)	Enseignant à temps partiels
5	IM Seyha	M	2010-11	Master	Corsicasole (Paris)	Ingénieur, Chef de projet
6	HUY Seav Er	M		Master	AFD (Phnom Penh)	Ingénieur, Chef de projet
7	SE Dara	M		Master	Suez (Rennes et Phnom Penh)	Ingénieur de Projet
8	UCH Bunnarith	M	2011-12	Master	Suez (Rennes et Phnom Penh)	Ingénieur de Projet
9	KHOUN Ladya	M	2012-13	PhD	Naval Group	Ingénieur-Chercheur
10	SENG Sodarith	M		Master	Vinci Construction (Phnom Penh)	Ingénieur d'Etudes
11	IEA Bunthan	M	2013-14	Master	Ministère du Développement Durable (France)	Ingénieur Corps d'Etat
12	DIN Ratanak	M		Master	Vinci Construction (Paris)	Ingénieur d'Etudes
13	Heang Kitiyavirayuth	M	2014-15	Master	Ecole des Ponts ParisTech (Paris)	Etudiant Architecte
14	Khun Kimang	M		Master	INRIA (Grenoble)	Ingénieur Doctorant
15	Than Poseng	M		Master	Paris Partner (Paris)	Ingénieur Informaticien
16	EANG Chanpaya	M	2015-16	Resigned		
17	NOU Sithea	M		Master	Suisse	Ingénieur
18	CHAO Kimhong	M	2016-17	Engineer	Institut Polytechnique de Paris	Etudiant en Master
19	SAMBATH Vibolroth	F				
20	THY Vathana	M				
21	VENG Namchhoen	M	2018-19	Student		
22	Chhout Laychiva	M	2019-20	Student		
23	Norng Vannvatthana	M		Student		
24	MOK Yong	M	2021-22	Student		

2. Recruitment, Evolution of Number of Students and Others Activities

2.1. Recruitment in 2021-2022

Students of engineering program have been recruited through an online entrance examination. Three subjects of this exam are mathematics, physic/chemistry and logic.

2.1.1. Information Campaign

Due to Covid-19 Pandemic, Information Campaign to high school students could not be done on site. Online campaign and social network had been implemented.

2.1.2. Preparation of Entrance Exam

Due to community spread of Covid-19, especially new variants, an online Entrance Exam for Academic Year 2021-2022 was organized. Therefore, hundreds of questions (Question Bank) were prepared for every subject such as Mathematics, Physic, Chemistry and Logic. Lecturers of ITC were requested to propose questions based on curriculum in high school. The Direction of ITC was in charge of Final Selection of questions with confidential.

Date, question bank and all regulations of the online examination in both campuses (Phnom Penh and Tbong Khmum) are the same.

2.1.3. Enrolment to the exam

This year, due to Covid-19 spread in the community, the national exam of grade 12 students had been postponed to 27 December 2021. Therefore, the Entrance Exam to recruit 1st Year Engineer students was organized online on 7 February 2022.

Hybrid enrollment to the entrance exam (On site and Online) took place from 17 January to 04 February 2022. In total, there are 3392 candidates applied for this examination in which 3342 registered to ITC Phnom Penh and 50 registered to ITC Tbong Khmum Campus.

The online examination was held on 7 February 2022 under control of ITC management. It is noted that the system of online exam has been developed by a team from GIC department and collaborated by IT Service Center of ITC. The system features (based on Moodle) are such as: question bank, question category (3 levels: easy, medium and difficult), random questions, shuffle questions/answers, question display (1 by 1), autosave, auto submit, etc. Number of questions by subject is as following:

- Maths: 301 Questions (Easy = 103, Medium = 101 and Hard = 97)
- Logic: 284 Questions (Easy = 100, Medium = 100 and Hard = 84)
- Physic: 251 Questions (Easy = 105, Medium = 80 and Hard = 66)
- Chemistry: 170 Questions (Easy = 60, Medium = 60 and Hard = 50)

Figure 1 below shows that number of candidates is increased the last two years because the enrollment and the exam were organized online. Therefore, high school graduates can join the exam from their hometown.

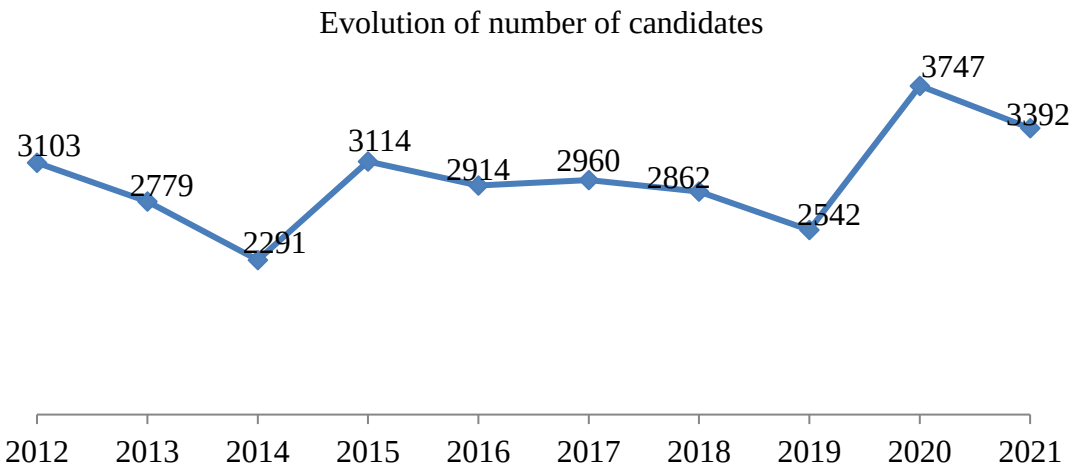


Figure 1. Number of Candidates enrolled in the entrance exam.

2.1.4. Result of Entrance Exam

Result of the Entrance Exam was announced on 8 February 2022. There are 1703 successful candidates (609 Females) and 392 candidates in reserved list (188 Females).

Figure 2 below shows that number of successful candidates increased slightly from 2011 to 2013. But it has remained stable until 2016. Due to new building and equipment, number of successful candidates were increased to 1002 in 2017, 1200 in 2018, 1361 in 2019 and about 1700 in 2020 and 2021.

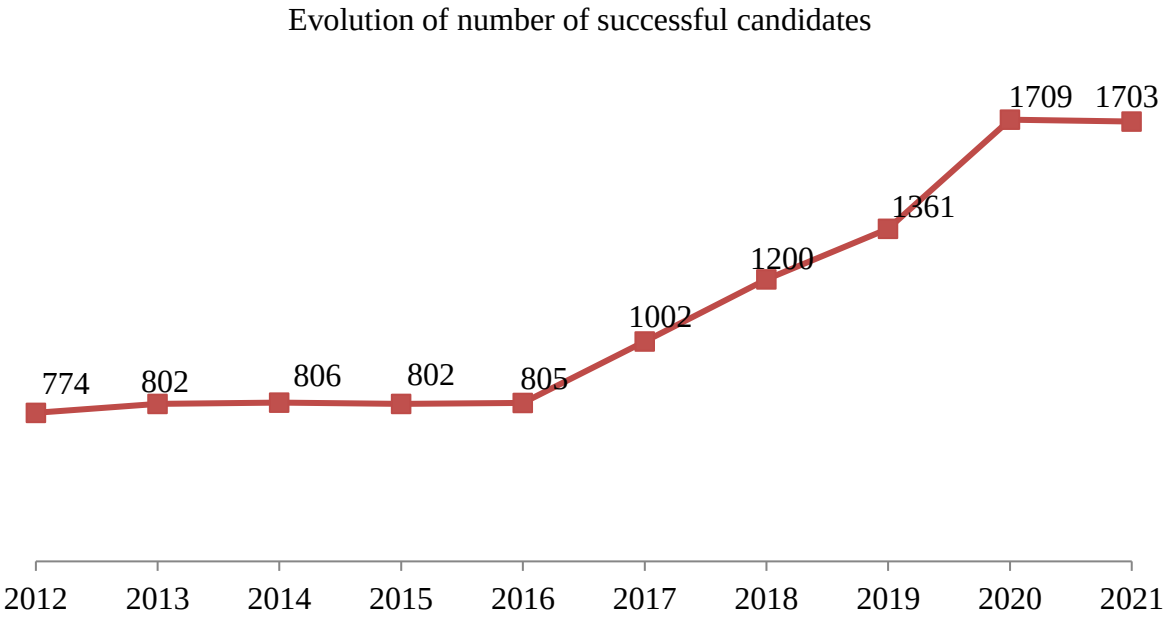


Figure 2. Evolution of number of successful candidates.

2.1.5. Enrollment in 1st Year

a) Engineering Program (ITC-Phnom Penh)

At the time of writing the report, enrollment of 1st year students is still going on. Therefore, number of students registered to 1st Year Program will be reported later.

b) Engineering Program (ITC-Tbong Khmum)

Table 1 below presents number of high school graduates registered in the entrance examination, number of successful candidates and the one enrolled in the first year of engineering program at the second campus in Tbong Khmum Province. It is noted that all students enrolled in Tbong Khmum Campus are scholarship holders.

Table 1. Number of students enrolled to 1st Year at ITC-Tbong Khmum.

	Total	**Female**
Candidate	**50**	21
Successful candidates	**25**	12
Waiting List	**11**	5

c) Technician Program

At the time of writing the report, enrollment of 1st year Technician students is still going on. Therefore, number of students registered to 1st Year Technician Program will be reported later.

2.1.6. Remark and Conclusion

Maintaining the entrance examination (on site or online) is very important in order to keep a positive impression and a very strong brand in mind and appreciation of teachers, students, public and society. It is noted that expense of this examination was fully covered by the Ministry of Education, Youth and Sports, and ITC.

The direction board of ITC should continue to strengthen recruitment strategy of 1st year student of both engineering and technician program by sending staffs to high school in some provinces for advertising and distributing brochures to show the importance and benefit of studying of STEM (Science, Technology, Engineering and Mathematics), especially studying at ITC. The promotion activities can be also implemented online in case of travelling difficulty due to Covid Pandemic.

2.2. Entrance Exam to 3rd Year Engineering Program

2.2.1. Passed from T2 to 3rd Year

The examination is for Technician graduates or equivalent degree. This year 2021-2022, 47 candidates applied for this exam. Candidates have to pass the following tests:

- Writing test on mathematics and physic,
- Interview by relevant department.

Based on result of writing test and interview, Selection committee decided to accept 35 candidates, about 74%. The others were not accepted because their performance is not qualified.

Table 2 indicates number of candidates and successful candidates to 3rd Year distributed by department over the last five years.

Table 2. Number of technician graduates accepted to 3rd Year Engineering Program.

Dept.	Number of candidates and successful candidates to I3									
	2017-2018		2018-2019		2019-2020		2020-2021		2021-2022	
	Candidate	Successful Candidate	Candi.	Succe. Candi.	Candi.	Succe. Candi.	Candi.	Succe. Candi.	Candi.	Succe. Candi.
GCA	18	11	24	15	29	10	27	10	27	15
GCI	17	7	34	16	18	12	16	9	12	10
GAR	-	-	-	-	-	-	-	-		2
GEE	4	2	12	5	12	10	4	1	6	3
GTR	-	-	-	-	-	-	-	1		3
GIM	9	6	6	3	5	3	7	5	2	2
GRU	4	4	6	3	5	5	-	-	-	-
GIC	-	-	1	1	-	-	1	1	-	-
Total	**52**	**30**	**83**	**43**	**69**	**40**	**55**	**27**	**47**	**35**

2.2.2. Entry into 3rd Year Engineering Program

Third year Engineering students may come from:

- Engineering students who finished successfully 2nd year of foundation year,
- DUT and technician graduates if they passed writing test and interview,

Table 3 shows actual number of 3rd year Engineering students.

Table 3. Actual number of 3rd year engineering students.

Department	I2 to I3	T2 to I3	Repeating year students	Total
GCA	150	15	3	**168**
GCI	250	10	11	**271**
GAR	74	2	2	**78**
GEE	121	3	5	**129**
GTR	39	3	4	**46**
GIC	78	0	9	**87**
GIM	91	2	8	**101**
GRU	73	0	1	**74**
GGG	34	0	2	**36**
Total	**910**	**35**	**45**	**990**

2.3. Total number of students and number of reorientations

2.3.1. Total number of students in November 2021

Table 4 presents total number of 2nd to 5th Year students in October 2021 (Starting of academic year). These numbers include students of Engineering and Technician Program. In total, there are 4434 students. It is noted that due to delay of the recruitment, 1st Year students will start their academic year from 14 March 2022.

Table 4. Total number of students in October 2021 (ITC-Phnom Penh).

Dept.	T-1	T-2	Total 1	I-1	I-2	I-3	I-4	I-5	Total 2	Total 1+2
DTC					1624				1624	**1624**
GCA		60	60			168	159	123	450	**510**
GCI		69	69			271	161	124	556	**625**
GAR	-	-	-			78	48	38	164	**164**
GEE		69	69			129	171	140	440	**509**
GGG	-	-	-			36	61	60	157	**157**
GIC	-	-	-			87	84	43	214	**214**
GIM		34	34			101	117	114	332	**366**
GRU	-	-	-			74	100	91	265	**265**
GTR	-	-	-			46	26	29	101	**101**
Total	**0**	**232**	**232**	**0**	**1624**	**990**	**901**	**733**	**4202**	**4434**

Below table presents total number of students in 2021-2022 at ITC-Tbong Khmum Campus.

Table 5. Total number of students in 2021-2022 (ITC-Tbong Khmum).

Dept.	I1		I2		I3		I4		I5		Total	F
	Total	F	Total	F	Total	F	Total	F	Total	F		
DTC			38	16							**38**	16
GCA					8	8	9	7	14	12	**31**	27
GCI					11	1	11	0	23	3	**45**	4
Total	**0**	**0**	**38**	**16**	**19**	**9**	**20**	**7**	**37**	**15**	**114**	**47**

2.3.2. Reorientation

The reorientation represents number of students who quitted ITC due to some reasons such as:

- Recipient of scholarship to study abroad
- Changing of institution

- Dropping out since beginning of academic year
- Etc.

At the time of report writing, number of reoriented students of Engineering and Technician Program is not yet available.

2.3. Final Exam (End of Semester)

Due to Covid-19 community spread, common on-site final exam can not be organized. The final exam has been done by each lecturer, mostly online.

It is noted that ITC management system has been developing under support of ARES-CCD project, Belgium. Score input is entered into this system by each lecturer.

2.4. Continuing Education

Continuing Education is designed for technician degree or equivalent degree holders who would like to continue their study in order to upgrade their degree to Bachelor Degree of Engineering.

This year, 139 students (55 females) have registered in this program. Among them, 45 students (35 females) enrolled in GCA Department, 36 (5 Females) in GCI, 46 (9 Females) in GEE and 12 (6 Females) in GIM department.

Table 6 below shows total number of students registered for the continuing education.

Table 6. Number of students registered for the continuing education.

Start	**Expected end**										
		GCA		**GCI**		**GEE**		**GIM**		**Total**	
		Total	**F**	**Total**	**F**	**Total**	**F**	**Total**	**F**	**Total**	**F**
2019	2022	24	22	53	7	48	5	19	2	**144**	**36**
2020	2023	45	41	58	9	35	10	23	6	**161**	**66**
2021	2024	53	48	32	5	45	11	24	2	**154**	**66**
2022	2025	45	35	36	5	46	9	12	6	**139**	**55**
Total		**167**	**146**	**179**	**26**	**174**	**35**	**78**	**16**	**598**	**223**

Figures 3, 4, 5 and 6 show number of students enrolled and graduated in GCI, GEE GCA and GIM departments respectively.

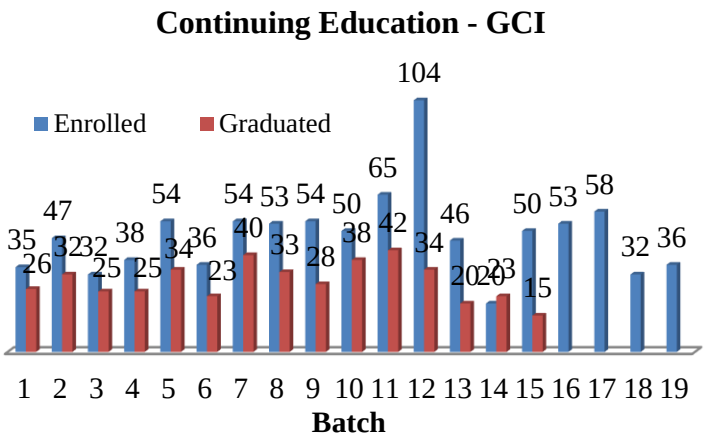


Figure 3. Number of students enrolled and graduated in continuing education (GCI).

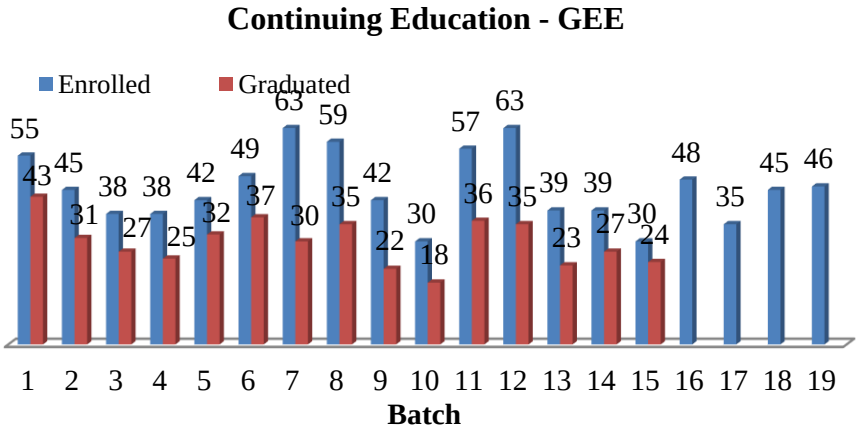


Figure 4. Number of students enrolled and graduated in continuing education (GEE).

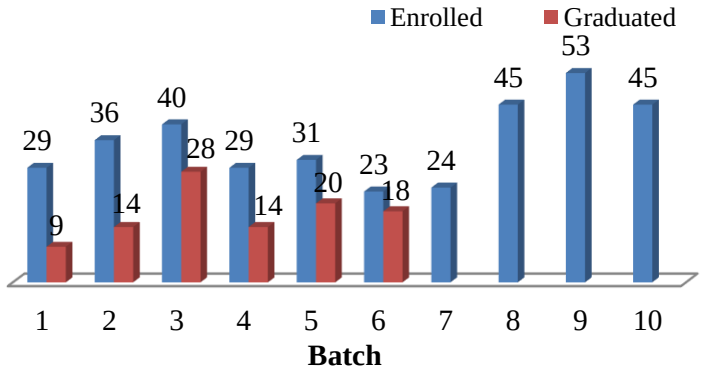


Figure 5. Number of students enrolled and graduated in continuing education (GCA).

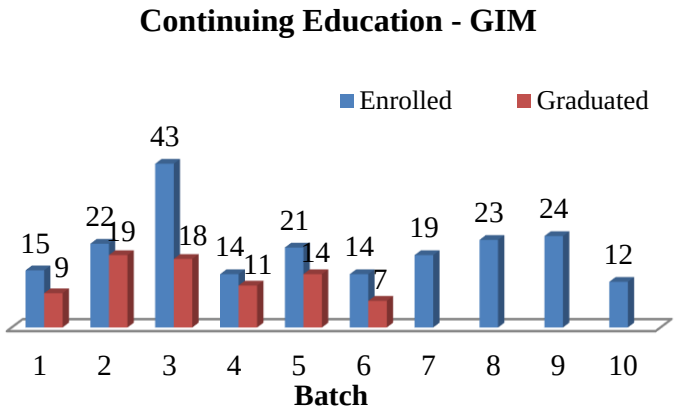


Figure 6. Number of students enrolled and graduated in continuing education (GIM).

2.5. Preparation of ITC students for exam of Grandes Ecoles in France

The cooperation between ITC and Ecole Polytechnique ParisTech was launched in 2007. It is mainly reflected by receiving at Department of Foundation Year long-term polytechnician trainees and organizing international exam of Ecole Polytechnique at ITC. A partnership agreement was signed between the two institutions on 30 October 2014.

An online intensive session of preparation for Institut Polytechnique de Paris (IP Paris) was set up from 15 to 28 October 2021 for 16 eligible ITC students. This online preparation has involved two French professors of preparatory classes of Grandes Ecoles (Olivier GRANIER and Catherine LAIDEBEURE).

Due to the outbreak of Covid-19, the exam conducted online from 30 October to 10 November 2021 by an International Committee of Institut Polytechnique de Paris. Finally, three candidates were accepted. One of them will study at Ecole Polytechnique and two at Ecole Nationale de la Statistique et de l'Administration Economique Paris (ENSAE).

After IP Paris entrance examination, 5 students were selected for online oral exams by École nationale supérieure d'informatique pour l'industrie et l'entreprise (ENSIIE). The oral exam was held on 12 December 2021, as a results, all 5 students were accepted

Since academic year 2007-2008, 50 ITC students integrated in one of the Grande Ecole in France:

- 24 at Ecole Polytechnique,
- 4 at Ecole Supérieure de Physique et de Chimie Industrielles (ESPCI),
- 3 at Ecole Nationale Supérieure des Techniques Avancées (ENSTA),
- 14 at Ecole Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise (ENSIIE),
- 1 at Ecole Nationale Supérieure des Mines d'Albi,
- 1 at Ecole Nationale Supérieure des Mines d'Alès,
- 1 at Ecole Telecom Sud Paris, and
- 2 at Ecole Nationale de la Statistique et de l'Administration Economique.

These students get systematically scholarships, usually Eiffel Scholarship from Government of France.

Figure 7 below shows number of ITC students integrated in an engineering school since beginning of cooperation.

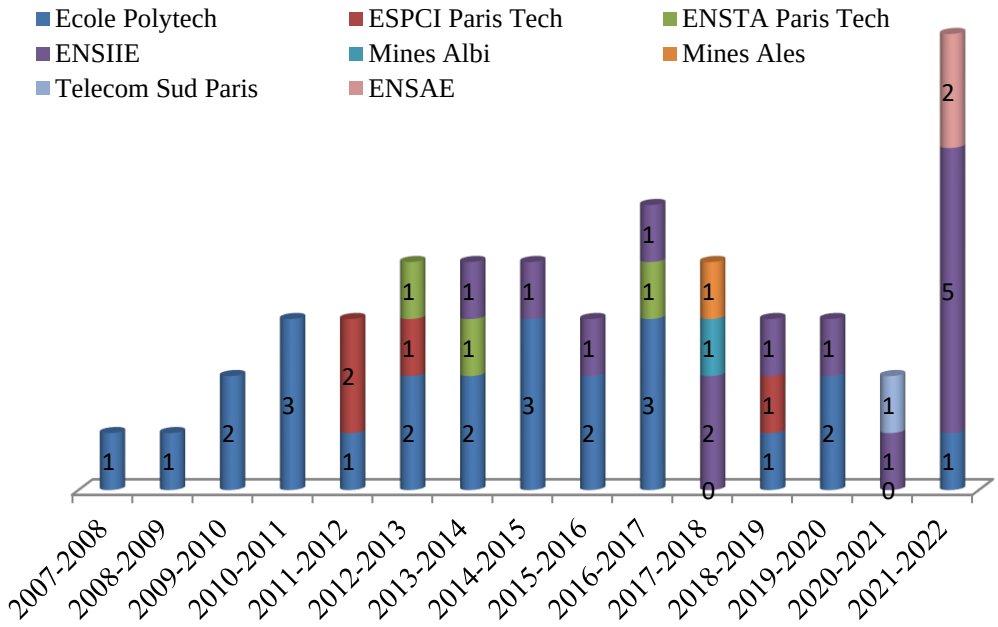


Figure 7. Number of ITC students integrated in an engineering school since 2007-2008.

2.6. Preparation for the exam of Japanese Government Scholarship

Table 7 shows the number of ITC students who passed successfully the exam of Japanese Government Scholarship. In 2021-2022, 19 students of ITC among 36 successful candidates won this Scholarship.

Table 7. Number of winners of Japanese Government Scholarship.

Year	Programs								Total (ITC)
	Research		Undergraduate		College of Technology		Specialized Training College		
	Total	ITC	Total	ITC	Total	ITC	Total	ITC	
2010-11	9	0	0	-	0	-	2	2	11 (2)
2011-12	11	0	2	1	8	8	7	1	28 (10)
2012-13	11	0	0	-	14	13	12	3	37 (16)
2013-14	11	0	1	0	16	15	9	3	37 (18)
2014-15	12	2	2	0	15	12	13	7	42 (21)
2015-16	12	2	1	1	6	3	7	3	26 (9)
2016-17	12	3	1	1	7	4	10	5	30 (13)
2017-18	12	1	2	1	5	4	3	3	22 (9)
2018-19	12	5	1	1	7	3	5	0	25 (9)
2019-20	10	5	0	0	11	8	8	4	29 (17)
2020-21	NA	NA	0	0	14	7	8	3	22 (10)
2021-22	12	1	1	1	14	11	9	5	36 (19)

2.7. Activities report of E-learning Center

2.7.1. Background

ASEAN Cyber University (ACU, http://aseancu.net) project was first proposed at the ASEAN – South Korea Summit in 2009. The project is expected to help establishing a foundation for sharing experiences, knowledge, and skills in higher education and long-distance education among ASEAN countries and South Korea. At the first stage, the project is designed to help the CLMV (Cambodia, Laos, Myanmar and Vietnam) countries acquire the technology and knowledge related to e-learning systems, to help students in remote areas access higher education.

In 2011, ITC was selected by the selection committee from Korea for setting up ASEAN Cyber University (ACU) and also mandated by the Ministry of Education, Youth and Sport (MoEYS) of Cambodia to implement the ACU Project. In the project, an e-learning center and multimedia studio had been installed in May 2012 with a content development room, an operation room and learning management system (LMS) servers to host the e-learning course contents. The e-learning center is directly connected to the ACU hub center in Vietnam in order to share online courses among CLMV countries using TEIN (Trans-Eurasia Information Network) high speed network connection.

From January 2020, ASEAN Cyber University project have been finished. There is no support from ACU for course development and course operation. ITC have moved all the courses to our own LMS for course operating in ITC and course from our partners.

The goals of this center are the follows:

- Capacity building of staff and students for e-learning
- Increase access to higher education using ICT as the tool for learning, teaching, and sharin g information
- Promote Cambodia life-long learning
- Promote the collaboration on e-learning in CLMV countries
- Advocate best practice, strategy and policy for e-learning

2.7.2. Achievement in 2021

The activities of e-Learning Center can be summarized as following:

No	Activities	Timeline	Description
1	Capacity building for online content development	2012- 2019	61 staffs and certified skill persons (4 in 2019): 41 basic level, 12 pre-master level, 8 advanced level * All training conduct in Seoul, Korea
2	Content Development	2012-2021	40 (ITC) + 2 (partners) online credit courses 1 (partner) online non-credit course
3	Course Operation	Oct. 2020 – Sep. 2021	28 / 40 course (Semester 1: 12, Semester 2: 16) 3188 learners (ITC) * Not including partners contents
4	HEIP Course development orientation	Nov. 2020	Orientation to all lectures at ITC for courses development under HEIP project.
5	Course development for all courses of ITC	Nov. 2020	Develop all courses of ITC under HEIP to support online learning during Covid-19 pandemic. * first step 55 courses from all departments at ITC.

6	Install a new studio	Nov. 2020	Under HEIP project, there is a new studio installation to support course development for all ITC course
7	UNESCO-BEEP Content Operation	Jan. 2019 – Jun. 2020	ITC contributes to operate UNESCO-BEEP content on our local server
8	UNESCO-BEEP Learning Center Operation	Feb. 2019– Now	ITC is one among Learning Centers which operate UNESCO-BEEP contents for out-of-school youth (every Saturday and Sunday) (implement the blended learning model)
9	UNESCO-BEEP Orientation and Training	Feb. – Jun. 2020	ITC provided orientation and training to other Learning Centre (13) to operate UNESCO-BEEP contents
10	Hosting RUA contents	2019 - Now	Support CIRAD (French Agricultural Research Center for International Development) to operate their contents.
11	Development of Local LMS – Moodle	Jun. 2018 – Feb. 2020	With support from World Education and Moodle community, ITC start to develop / customize our local Learning Management System (LMS) using Moodle
12	Supporting the STEM Teacher Training Center of MoEYS (install inside ITC)	Sep. 2019 – 2020	The STEM Teacher Training Center aims to build capacity of secondary school on STEM subjects through online learning material. - ITC works with EMCAST to develop STEM Teacher Training online learning materials. - ITC works with World Best Friend to operate STEM Teacher Training Center
13	Content development for IT Passport Program	Nov. 2020 – Feb. 2021	ITC supported CIESF to develop the videos learning materials (77 contents) for IP Passport Program.
14	BEEP technical support	Sept. – Dec. 2020	Support to DIT for BEEP course operation and System.
15	Content development under the support from ARES	Jun – Dec. 2020	Develop videos teaching materials at ITC with the special supporting package from ARES during COVID-19.
16	Content development for MoEYS	2020	Develop video teaching and learning content of Math and Khmer grade 12 for MoEYS (during COVID-19 pandemic)
17	ITC Entrance Exam	Dec.2020 – Jan. 2021	Prepare system for ITC online entrance exam.
18	SmartEdu Scholarship Online Exam	Feb 2020	Support Smart Axiata to organize SmartEdu Scholarship Online Exam
19	MPWT Entrance Exam	Feb 2021	Support Ministry of Public Work and Transportation (MPWT) for Entrance exam to the Techo Sen Institute under MPWT
20	MoH Entrance Exam	May 2021	Support Medical Online Entrance Exam with 8800 candidates.
21	NIE Entrance Exam	Aug 2021	Support National Institute of Education (NIE) for Online Entrance Exam with 7500 candidates.
22	NIPES Final Exam	Aug 2021	Support National Institute P? Education and Sport for Online Final Exam with 150 candidates.

23	AUF moodle training to UHS	Aug 2021	Support the training of using Moodle for Intermediate level to University of Health and Science (UHS) with corporation with AUF.
24	TTD Final Exam	Oct 2021	Support Teacher Training Department (TTD) for Online Final Exam with 1900 candidates.
25	PD Entrance Exam	Oct 2021	Support Personal Staff Department/MoEYS for Online Entrance Exam with 150 candidates.
26	NIPES Entrance Exam	Nov 2021	Support National Institute P? Education and Sport (NIPES) for Online Entrance Exam with 2000 candidates.
27	TTD Entrance Exam for Secondary Teacher	Nov 2021	Support Teacher Training Department (TTD) for Online Entrance Exam of Secondary teacher with 30300 candidates.
28	TTD Entrance Exam for Primary and Preschool Teacher	Nov 2021	Support Teacher Training Department (TTD) for Online Entrance Exam of Primary and Preschool teachers with 37000 candidates.
29	ITC internal exam	Jan-Dec 2021	Support French Section, English sections, and other courses at ITC for Midterm and Final exam via Online.
30	ITC Entrance Exam 2021 - 2022	Feb. 2022	Prepare system for ITC online entrance exam 2022
31	Cambodia Cyber University Network (CCUN)	Feb. 2022	Prepare proposal and concept note of CCUN

2.8. Activities of library of ITC

Library has always been recognized as vital organizations in supporting the research, teaching, learning and outreach needs of their communities. As stewards of the human record, libraries are responsible for generating, making accessible, and preserving new knowledge and understanding over time. In support of the teaching, learning, and researching mission, the Institute of Technology of Cambodia has provided library which is committed to providing exceptional services to students and faculties; advanced learning, researcher and literacy; creating new knowledge, promoting the freedom of inquiry and enhancing access to recorded knowledge and other useful resources.

The library allows patrons to use 15 computer desktops to surf internet and research their work. Then the library space is increase to support patrons around 200 people, more than that, we also provide photocopy, printing and scanning services.

In the library, we currently have five librarians only, so we are working hard to support all library services and other services such as self-study and e-learning space, two symposiums for patrons, researchers to request discussion with their team/project work.

Due to community spread of Covid, especially new variants, only few students come to library and use facility at the library during first semester of 2021-2022.

3. Educational Report

3.1. Overview of teaching/research staffs at ITC

3.1.1. Number of lecturers

In 2021-2022, ITC has 342 (87 females) full-time, trainee and part-time lecturers, lecturer-researchers and full-time researchers. Table 8 shows the number of lecturers in different departments. Among these 342 lecturers, there are 93 PhD (27.2%), 180 Masters (52.6%) and 69 other degree (20.2%). They give lectures and also participate in research project, as well as other administrative tasks.

Table 8. Number of lecturers/researchers in different departments in 2021-2022.

Degree		GCA	GCI	GEE	GGG	GIC	GIM	GRU	GTR	MAS	DTC	SF	SA	Total
PhD	Full-time	10	14	7	6	1	8	10	5	2	0	0	0	**63**
	Trainee	5	2	0	6	1	2	5	0	0	0	0	0	**21**
	Part-time	3	2	0	0	0	0	3	0	0	1	0	0	**9**
Sub-total 1		**18**	**18**	**7**	**12**	**2**	**10**	**18**	**5**	**2**	**1**	**0**	**0**	**93**
Master	Full-time	2	3	9	6	7	12	9	4	4	10	5	3	**74**
	Trainee	15	7	6	3	11	14	6	0	0	1	0	0	**63**
	Part-time	8	7	1	0	1	0	6	4	7	3	3	3	**43**
Sub-total 2		**25**	**17**	**16**	**9**	**19**	**26**	**21**	**8**	**11**	**14**	**8**	**6**	**180**
Engineer /Bachelor	Full-time	1	2	1	1	1	0	0	0	0	3	4	0	**13**
	Trainee	0	0	1	0	0	1	0	0	0	0	0	0	**2**
	Part-time	1	11	4	0	0	0	3	0	0	1	21	13	**54**
Sub-total 3		**2**	**13**	**6**	**1**	**1**	**1**	**3**	**0**	**0**	**4**	**25**	**13**	**69**
Total		**45**	**48**	**29**	**22**	**22**	**37**	**42**	**13**	**13**	**19**	**33**	**19**	**342**

Number of lecturers/researchers increases slightly each year. The evolution of number of lecturers in the past 10 years is shown in Figure 8.

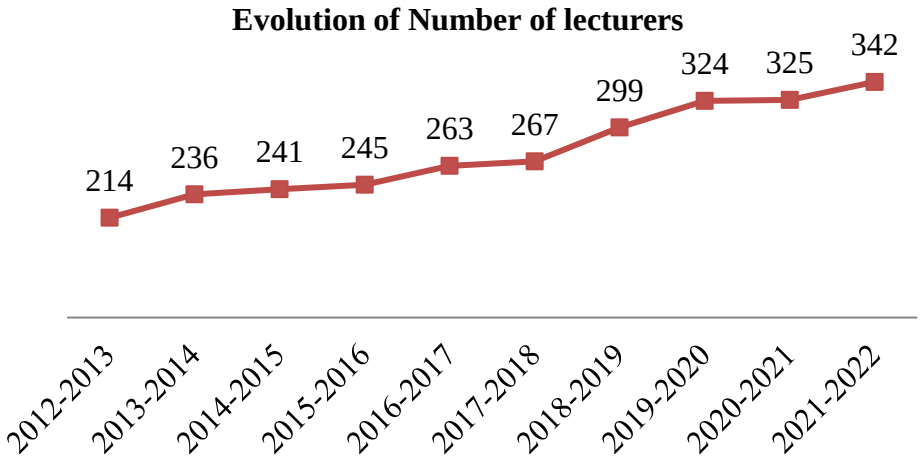


Figure 8. Evolution of Number of Lecturers.

Evolution of number of lecturers with PhD and Master Degree is shown on Figure 9. Through regional and international cooperation, number of PhD holders increases about 2.5 times over the past 10 years, from 40 in 2012-2013 to 93 in 2021-2022. Number of Master holders also increases from 100 in 2012-2013 to 180 in 2021-2022. They are potential human resources for teaching and research at ITC.

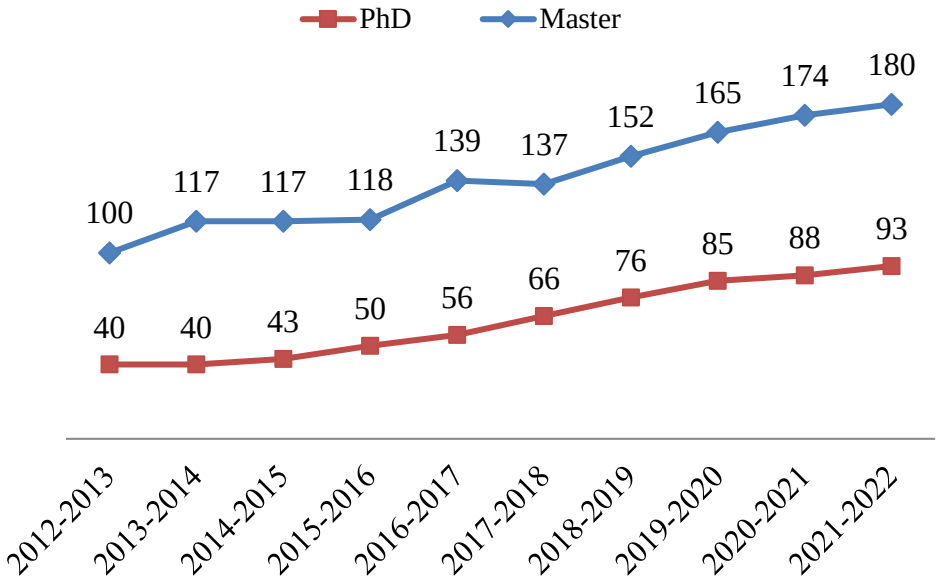


Figure 9. Evolution of number of PhD and Master Holders.

3.1.2. Lecturers graduated from different countries

Lecturers/Researchers of ITC were graduated from different countries and regions in the world:

- At local level in Cambodia (33.9%) in which most of them are lecturers in Department of Foundation Year, English and French sections.
- At regional level (23.7%) in 5 ASEAN countries: Thailand, Indonesia, Philippines, Malaysia, and Vietnam
- At international level (42.4%) in 12 countries: France, Japan, Belgium, South Korea, Russia, Canada, USA, Australia, China, Spain, India, and New Zealand.

Figure 10 indicates percentage by country that ITC lecturers/researchers were graduated from. Abroad, ITC lecturers/researchers graduated from France the most, followed by Japan, Thailand, Indonesia and Belgium.

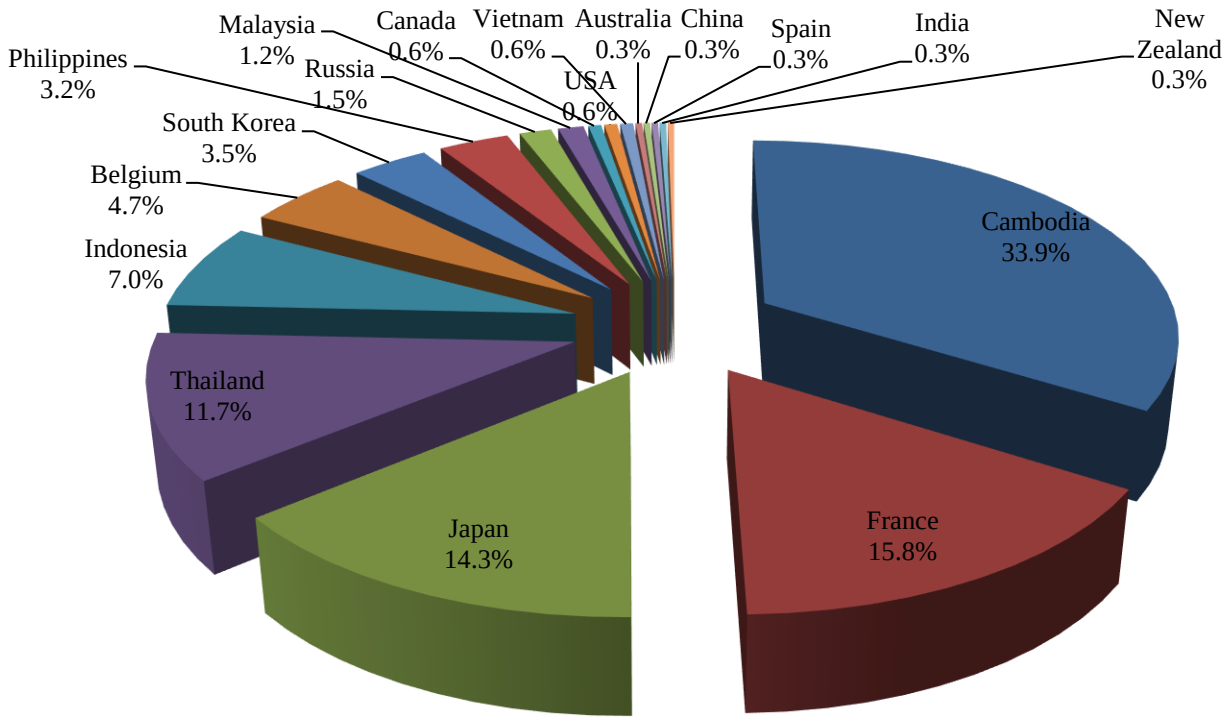


Figure 10. ITC lecturers graduated from different countries.

3.1.3. Conclusion

Human resources of ITC have increased in recent years with PhD's Degree holders. This year, number of PhD is 93 which is slightly higher than last year (88).

With strong collaboration with partners and through some projects, young lecturers and students have been sent to partner universities abroad to continue their PhD's Degree abroad and will come back in the upcoming year. To ensure quality of teaching and research, ITC needs to recruit and maintain young Master and PhD holders who are dynamic for both academy and research.

3.2. Student Employability

An online survey on student employability (google form) was conducted at the end of 2021. 319 students graduated in 2021 filled in the questionnaire which is about 56% of total graduates. Result of this survey is shown graphically on Figure 11.

Figure 11 shows that 76% of engineers graduated in 2021 are employed in different sectors (private, public, NGOs and own business). 17% are continuing their studies mostly in oversea. 7% are seeking employment or awaiting result of interview or could not be reached.

Among the employed, 90.8% works with private sector, 5.9% with public sector, 0.8% with NGO and 2.5% run their own business.

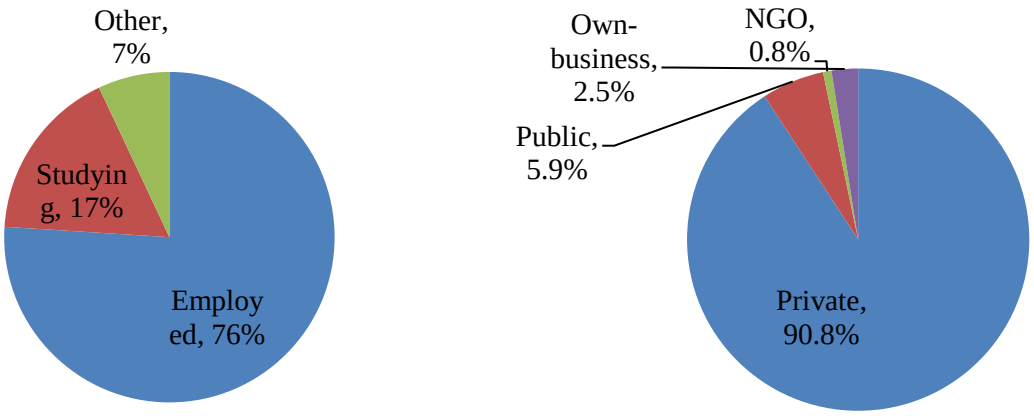


Figure 11. Engineering students graduated in 2020-2021.

3.3. Graduate School of ITC

3.3.1. Introduction

Graduate School of ITC (Bureau de 3ème cycle de l'ITC) plays an important role in supporting and providing services regarding the development of human resources at graduate (Master and Doctoral) levels at ITC. Its prime objective is to increase the number of highly qualified human resources in fields of Sciences, Engineering, Technology and Architecture, demanded by markets and the Cambodian society.

Vision

Excellence in graduate education in STEM so that graduates have full potentials and skills to meet the requirement of the Cambodia's 2030 vision.

Mission

The Graduate School of the Institute of Technology of Cambodia (GS-ITC) commits to achieving the long-term vision of ITC concerning graduate education by providing services to the campus community that maintain integrity and excellence in graduate education in STEM through clear and consistent policies, high standards, efficient procedures and direct student support. We seek to support and serve as a resource for all graduate students, and to support faculty and staff by fostering relationships, increasing communications and collaborations, and delivering comprehensive research and data resources to inform about graduate education. The graduate school:

1. Improve and develop graduate training programs in STEM to align with national, regional and international standards.

2. Educate graduate students to have full potentials and skills in STEM to meet the requirement of the Cambodia's 2030 vision.

Core Values

- Excellence in graduate education
- Recruitment and graduation of outstanding students
- Ethical conduct and integrity in graduate studies and researches
- Diversity among students, faculty and staff

- Communication and collaboration throughout the graduate community
- Accountability and transparency
- Graduate-student professional development
- Preservation of academic standards
- Maintaining accurate data and records.

Goals (2021-2030)

1. Improve and develop 10 graduate training programs in STEM to align with national, regional and international standards.
2. Educate 952 graduate students to have full potentials and skills in STEM to meet the requirement of the Cambodia's 2030 vision.

3.3.2. Summary of Realized Activities

No	Activities		Based line (2020-21)	Target (2021-22)	Realized (March 2022)	Plan 2022-23	Indicator
1	Increase number of partnerships	Academic institutions	**21**	21	**21**	21	Number
		Development agencies	**4**	4	**4**	4	Number
		Government/Private sectors/NGO	**3**	3	**3**	3	Number
2	Operate thematic programs (Master)		7	8	7 (Postponed due to Covid-19)	8	Number
3	Operate research-based program (Master)		5	7	7	8	Number
4	Launch joint Master's degree ITC-NUM		0	0	**0**	0	Number
5	Seek for funds/scholarships to support students	Master programs	**63**	70	**58**	30	Number
		Doctoral programs	**54**	60	**55**	55	
6	Increase promotional activities to prospective students (ITC)		-	600	**325**	600	Number, list of attendance
7	Conduct fresh graduate employment survey of master and doctoral graduates (annually).		**46**	48	**37**	65	Number of responses

8	Internationalize the programs through our regional and international partnerships.	**2**	4	**2**	4	Number
9	Increase communication among campus community, faculty staff and prospective students.	Leaflet, website, Telegram, Outlook email, meetings, study fair	Leaflet, website, On-line application, Telegram, Outlook email, digital governance	**Leaflet, website, On-line application, Telegram, Outlook email, digital governance**	Leaflet, website, On-line application, Telegram, Outlook email, digital governance	Means of communication
10	Fully implement Partnership programs of the HIEP projects.	5	5	**5**	5	Number
11	Increase number of research topics that respond to the societies needed through supporting from research fund institutions such as ministries, LBE/JICA project, WB project.	15	30	**15**	30	Number
12	Increase number of students' publications in journals/conferences	15	20	**67 (14 journal articles)**	35	Number
13	Enroll PhD students for academic year 2021-2022	54	64	**55 (8 students dropped)**	62	Number
14	Number of PhD students graduated by academic year 2021-2022 (accumulated)	0	14	**4 (2 students failed)**	15	Number
15	Enroll Master students for the full-time thematic master programs 2021-2022	92	112	**122**	136	Number
16	Number of Master students graduated by academic year 2021-2022 (accumulated)	229	294	**277**	340	Number
17	Implementation of EU-AFD project to support *Urban Supply and Sanitation Engineering* program	65%	100%	**85% (Delayed due to Covid-19)**	100%	Percentage

3.3.3. Master Programs

Currently, ITC offers 7 full-time thematic Master programs in the field of engineering and applied sciences. In general, the duration for each Master program is 2 or 3 years, classified as year 1 level (M1) and year 2 level (M2). For students holding ITC Engineer's degree, they are allowed to enter directly the M2 program, thus being able to spend only 1 year more in addition to 5 years in engineering program to complete the Master's degree (5+1 program). However, this opportunity is selective. The list of the Master programs is given in the following Table.

List of Thematic Master Programs

No	Program	Eligible student's background	Promo.	Descended from	Remark
1	Master of Materials and Structural Engineering (M-MSE)	GCI, GIM, GGG, GRU, others equivalent field	12	MGCI (+MGIM)	• In operation • Program Head: *Dr. LIM Sovanvichet* • Double diploma with INSA de Rennes
2	Master of Computer Science (M-ECS)	GIC, GEE, others equivalent field	8	MGIC	• In operation • Program Head: *Mr. HENG Rathpisey*
3	Master of Water and Environmental Engineering (M-WEE)	GRU, GCA, GCI, GGG, others equivalent field	8	MGRU	• In operation • Program Head: *Dr. KET Pinnara* • Financial support by EU-AFD project
4	Agro-industrial Engineering (M-AIE)	GCA, RUPP, RUA, others equivalent field	8	MAIE	• In operation • Program Head: *Dr. TY Boreborey*
5	Master of Energy Technology and Management Engineering (M-ETM)	GIM, GEE, others equivalent field	6	MGIM (+MGEE)	• In operation • Program Head: *Dr. KIM Bunthern*
6	Master of Mechatronics, Information and Communication Engineering (M-MIC)	GIM, GEE, others equivalent field	6	MGIM (+MGEE, +MGIC)	• In operation • Program Head: *Dr. PEC Rotna*

7	Master of Transport Engineering (M-TIE)	GCI, GIM, GIC, GEE	2	New program	• In operation • Program Head: *Dr. PHUN Veng Kheang*
8	Master of Data Science (M-DAS)	GIC, GEE, MATH	0	New program	• Not yet in operation • Program Head: *Dr. LIN Mongkolsery*

The number of graduated master students from the academic year 2010-2011 to 2020-2021 is in total 277 graduates (61 females). In the last academic year, there are 48 new graduates (female = 15) and 39 graduates (15 females) benefitted from partial and full scholarships. A list of Master Thesis is presented in Annex 4. The statistics of graduates in 2020-2021 is report in Table below.

Number of Students graduated in academic year 2020-2021

Program	Number of students graduated in 2020-2021						Cumulative graduated students from Promotion 1		
	Partial or Full Scholarship Students		Non-scholarship students		Total	Female			
	Total	Female	Total	Female			Number of promotions	Total	Female
M-MSE	1	0	5	0	**6**	**0**	11	**96**	**11**
M-ETM	-	-	-	-	-	-	6	**27**	**0**
M-WEE	30	12	-	-	**30**	**12**	7	**79**	**27**
M-AIE	-	-	-	-	-	-	6	**26**	**18**
M-ECS	4	2	1	0	**5**	**2**	7	**26**	**4**
M-MIC	1	0	3	0	**4**	**0**	6	**20**	**0**
M-TIE	3	1	-	-	**3**	**1**	1	**3**	**1**
M-DAS	-	-	-	-	**-**	**-**	-	**-**	**-**
Total	39	15	9	0	**48**	**15**	**Total**	**277**	**61**

Among 277 graduates, 33 graduates (3 females) pursue their study at PhD level (see Annex 5) and 8 PhD students (2 female) are registered in cotutelle programs at ITC and partner universities in France and Belgium.

Double-degree program M-MSE, ITC-INSA-Rennes. ITC and INSA Rennes, France, has established double-degree program since academic year 2010-2011. Up to now, there were 81 students (11 females) graduated from this program. Table below reports the statistics of the master graduates in this double-degree program from 2010-2011 to 2020-2021.

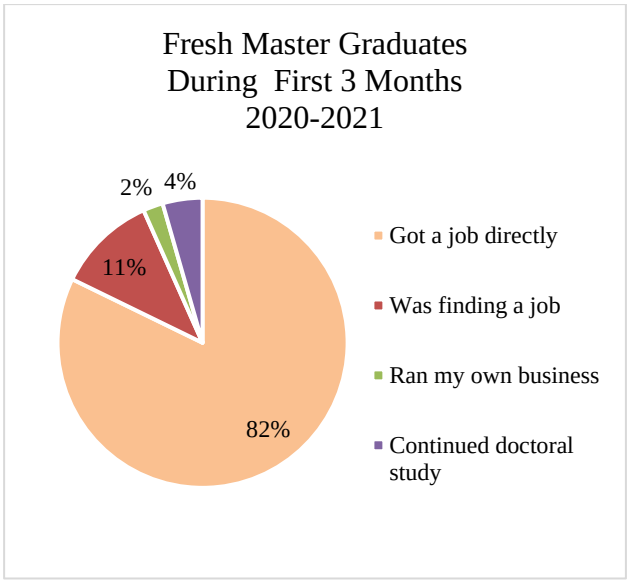
List of Graduates in Double-Degree Program M-MSE

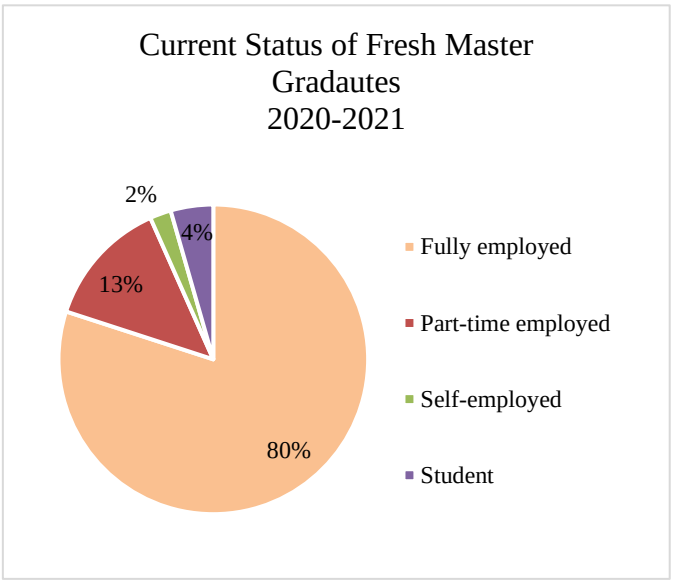
Year	Enrolment		Graduated		Graduated (double-degree)	
	Total	F	Total	F	Total	F
2010-2011	6	0	5	0	5	0
2011-2012	10	0	9	0	9	0
2012-2013	7	3	7	3	7	3
2013-2014	7	0	6	0	6	0
2014-2015	12	0	7	0	7	0
2015-2016	5	0	5	0	1	0
2016-2017	12	1	10	1	8	1
2017-2018	12	4	11	4	11	4
2018-2019	16	1	15	1	11	1
2019-2020	17	2	15	2	13	2
2020-2021	12	0	6	0	3	0
2021-2022	14	2	-	-	-	-
Total	**130**	**13**	**96**	**11**	**81**	**11**

Fresh Graduate Employment Survey

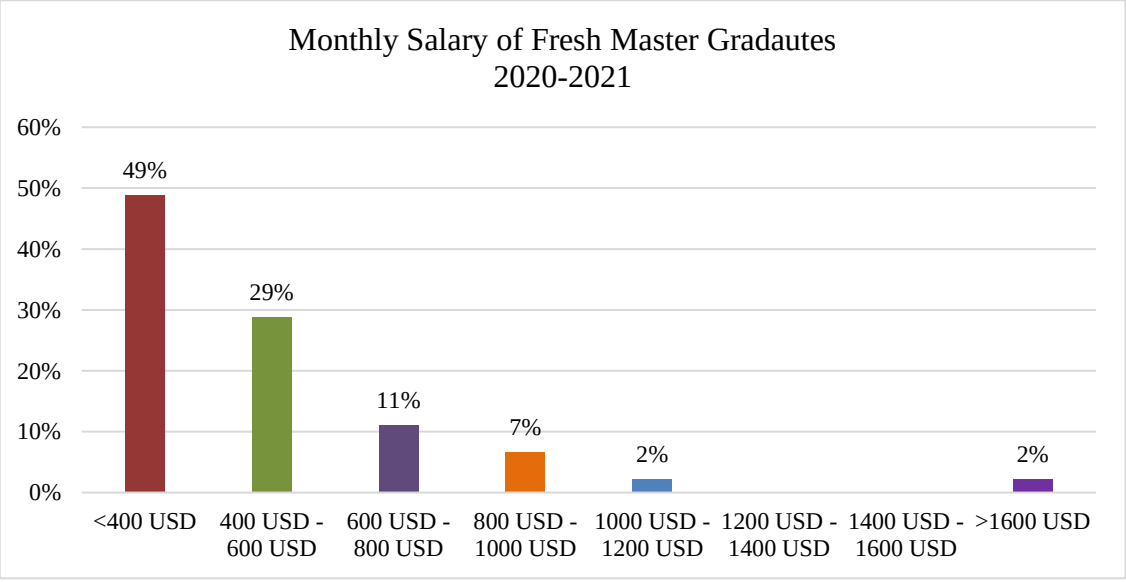
In the academic year 2020-2021, a fresh graduate employment survey was conducted via Microsoft form. The objectives of this survey are (1) to know if our fresh graduates had difficulties in finding a job and their current employment status, (2) to see if pursuing a master degree (via their salary/income and their current position) provides value adds, and (3) to know where the graduates are currently working. Out of 48 fresh graduates, 45 (or 94%) of them responded to the questionnaires, which is a good participation rate.

The result of the survey is described as follows. When asking the question "What did you do within the first 3 months just after graduation?", 82% of them said they got a job directly, while 11% of them said they were looking for a job, 2% (or 1 person) of them said he/she ran his/her own business, and 4% (or 2 people) of them said they continued to doctoral study. The following charts show a contrast between the situations of fresh graduates within a period of 3 months versus 6 months. From the survey, we conclude that most of the fresh graduates could easily find a job within 3 months after graduation, and all of them were employed within 6 months.

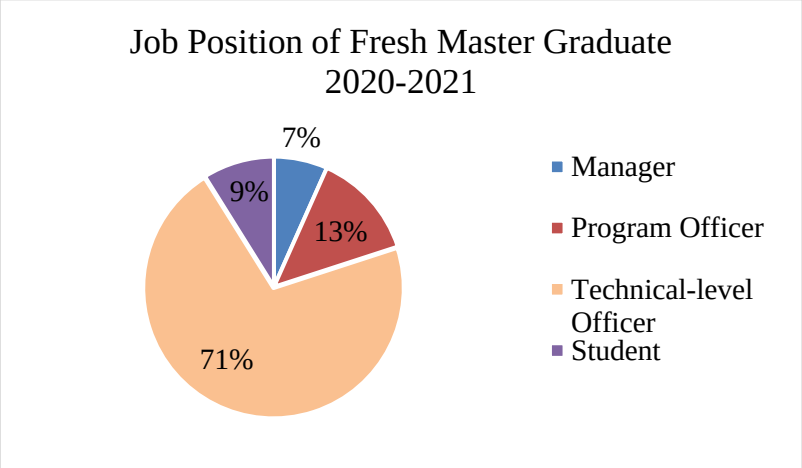


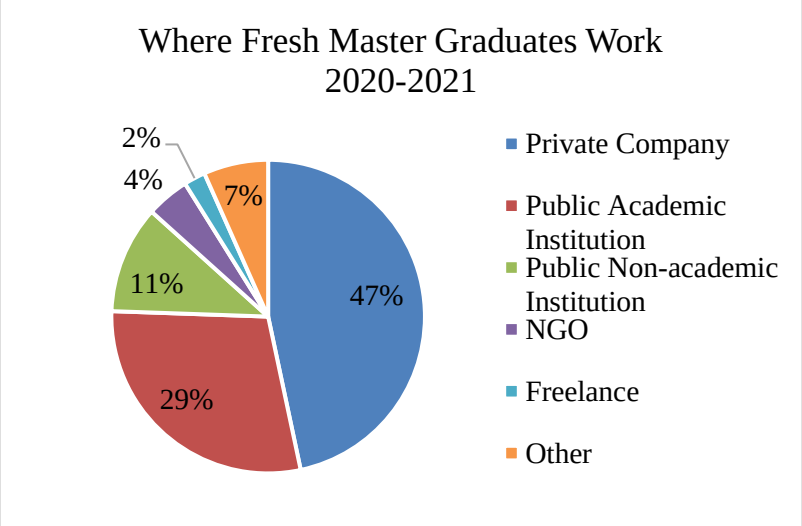


The employment status alone cannot reflect the value added (hence the added knowledge, skills, and quality) that fresh graduates obtained from spending 1 or 2 years more in the master program after their engineer's or bachelor's degree. In this regard, we need to investigate economically on how much fresh master graduates gain in terms of base salary or income, compared to those of undergraduates. The following chart shows the distribution of monthly base salary of fresh master graduates in 2020-2021. We see that 22% of master respondents have a base salary at least 3 times more than that of non-skill workers, 29% of master respondents have a base salary at least 2 times more than that of non-skill workers, while 49% of master respondents have base a salary less than 2 times of that of non-skill workers. However, this still scores better compared to the statistic 2020, which shows that 71% of undergraduate respondents had a base salary less than 400 USD (Survey in 2020, ITC Tracer Study). On average, the base salary of the fresh master graduates is between 440 USD to 590 USD.



When asking the question "What job position are you holding?", 7% of them said they had the role as manager, 13% said they had the role as program officer, 71% said they had the role as a technical-level officer, and 4% of them said they were students. Their workplaces share across private and public institutions: 47% in the private sector, 40% in the public sector, and 4% in NGOs. The complete statistics are shown in the following charts.





Program's Supports

The programs receive co-financial supports from various partners/projects, e.g., from ARES-CCD (R2) of Belgium, AUF, Erasmus+, EU-AFD Project and HEIP. The supports are mainly for student scholarships, staff's and student's mobilities, and student's research activities.

Enrollment and Scholarship Awards

The official announcement has been disclosed at ITC, at Graduate School and on ITC Facebook, and at the MoEYS page. For the academic year 2021-2022, there are in total 122 students (39 females) enrolled into 7 master programs and 61 students receive scholarships. In year 2 (M2), students are required to complete the coursework in Semester I (October-February) and to conduct their research/internship and produce their thesis report in Semester II (February-July). Table below shows the exact number of enrolled students and scholarship awards.

Number of Students enrolled in 2021-2022

Program	Partial or Full Scholarship Students				Non-scholarship Students				Total	Female
	M1		M2		M1		M2			
	Total	F	Total	F	Total	F	Total	F		
M-MSE	-	-	3	0	-	-	11	2	**14**	**2**
M-ETM	2	0	8	2	1	0	4	0	**15**	**2**
M-WEE	9	4	22	10	1	0	5	4	**37**	**18**
M-AIE	2	2	6	6	2	1	6	4	**16**	**13**
M-ECS	3	1	-	-	5	0	6	1	**14**	**2**
M-MIC	1	0	3	0	3	0	7	2	**14**	**2**
M-TIE	-	-	2	0	2	0	8	0	**12**	**0**
M-DAS	-	-	-	-	-	-	-	-	**-**	**-**
Total	**17**	**7**	**44**	**18**	**14**	**1**	**47**	**13**	**122**	**39**

Type and number of scholarships for this academic year are presented in the following Table.

List of Sources of Scholarships

Nº	**Type of Scholarship**	**Benefit**	**Number of beneficiaries**
1	HEIP-NUBB	1000 USD for tuition fee + monthly allowance	5
2	HEIP-SRU	1000 USD for tuition fee + monthly allowance	7
3	AFD-EU	1000 USD for tuition fee + 250 USD/month during 10 months for allowance	29
4	ITC 100%	100% Tuition Fee	2
5	HEIP-ITC	100% Tuition Fee/Monthly allowance	11
6	Others	Tuition Fees/Research Fund	4
Total			58

3.3.4. Doctoral Programs

ITC received permission from the Ministry of Education, Youth and Sport to run the PhD training programs by the **Prakas No. 909 AYK. BrK**, dated on the 29th September 2017. The document allows ITC to launch and run the PhD training programs in the five specialized fields:

1. Water and Environment (WAE)
2. Food Technology and Nutrition (FTN)
3. Mechatronics and Information Technology (MIT)
4. Materials Science and Structures (MSS)
5. Energy Technology and Management. (ETM)

The doctoral programs at ITC are full-time with the minimum period of study of 3 years.
Launching doctoral programs and recruiting PhD candidates. Launching doctoral training programs has been one of the focal interests of ITC. For the academic year 2021-2022, we successfully enrolled 55 PhD students (17 females). The statistics of PhD enrollments and graduates are reported in the following Table. (See Annex 6: List of Doctoral Student registered in 2021-2022 for the list of all PhD students.)

The statistics of PhD Enrollments and Graduates

	Program										**Total**	**F**
Name	**WAE**		**FTN**		**MIT**		**MSS**		**ETM**			
Number	Total	F	Total	F	Total	F	Total	F	Total	F		
Total number of PhD graduates	**2**	**0**	**1**	**1**	**1**	**1**	-	-	-	-	**4**	**1**
PhD Graduated in 2020-21	2	0	1	1	1	0	-	-	-	-	-	-
Total number of PhD enrolments by 2021-22	**-**	**-**	**6**	**5**	**2**	**0**	**2**	**0**	**3**	**0**	**13**	**5**
PhD Enrolled in year 1	-	-	6	5	2	0	2	0	3	0	**13**	**5**
PhD Enrolled in year 2	3	2	2	0	11	0	6	2	3	0	**25**	**4**
PhD Enrolled in year 3	2	2	1	1	2	0	-	-	3	2	**8**	**5**
PhD Enrolled in year 4	-	-	-	-	4	0	2	1	1	0	**7**	**1**
PhD Enrolled in year 5	-	-	1	1	-	-	1	1	-	-	**2**	**2**
Scholarship	**5**	**4**	**10**	**7**	**19**	**0**	**11**	**4**	**10**	**2**	**55**	**17**

Funding. GS-ITC benefits from co-financially supporting several projects: Higher Education Improvement Project (HEIP), ARES, … The projects finance international mobilities and research activities of doctoral students. The list of sources of funding is given below.

List of sources of Funding

Sources of Funding	Number of Beneficiaries	Number of Beneficiaries (Female)
ARES	6	0
ARES-COMBOdIA	2	2
BGF	4	0
BGF-ITC	13	9
CCCA	1	0
HEIP	10	2
IRD	1	1
ITC	3	2
ITC Erasmus+	1	1
KIT-ITC	1	0
MoE	1	0
NIPTIC	1	0
NPIC	11	0
Total	**55**	**17**

Cotutelle and Partnership Programs. Among these, 34 PhD students (15 females) registered in cotutelle (double-degree) programs with partner universities in France and Belgium. In the cotutelle programs, PhD students shall spend at least 10 months in each university in Cambodia (ITC) or in France or Belgium. The list of PhD students in cotutelle with partner universities is given in the following Table.

Number of PhD students in cotutelle with partner universities.

Partner Universities	2017-18		2018-19		2019-20		2020-21		2021-22		**Total**	Female
	Total	F	Total	F	Total	F	Total	F	Total	F		
INSA Rennes			2	1			2	0			**4**	1
Université de Nantes	1	1					1	0			**2**	1
Université Toulouse III-Paul Sabatier			1	0							**1**	0
INSA Toulouse									1	1	**0**	0
INP Toulouse			1	0	1	0	1	0	1	0	**3**	0
SupAgro Dijon									1	1	**0**	0
Montpellier SupAgro			1	1	1	1			2	2	**2**	2
Université de Montpellier									1	1	**0**	0
Université Grenoble Alpes			1	0					1	0	**1**	0
Sorbonne Université					1	1					**1**	1
ENSC Rennes					1	1					**1**	1
IMT Mines Albi					1	0					**1**	0

Université de Rennes 1									1	0	**0**	0
Université de Mons			2	0			1	0			**3**	0
Université de Namur			1	0					1	0	**1**	0
Université Libre de Bruxelles							1	1			**1**	1
Université de Liège							3	3	1	0	**3**	3
Total	**1**	**1**	**9**	**2**	**5**	**3**	**9**	**4**	**10**	**5**	**34**	**15**

Graduation. In the academic year 2020-2021, there were 6 doctoral students requested to have their doctoral defense. However, only 4 students, all were in cotuelle programs, met the criteria and defended successfully (see the list below). The other 2 students need to re-enroll for the next academic year and waiting for a new defense.

List of Doctoral students who successfully defended the thesis

Nº	Name	Sex	Field	Research Topic	Supervisor	Convention de cotutelle	Defense Promo.	Defense Date
1	SOK Ty	M	D-WAE	Dynamic transport of the sediment and nutrient in the Mekong River Basin and the role of the Tonle Sap Lake: Assessment coupling data and modelling approaches	1. Dr. OEURNG Chantha 2. Dr. SANCHEZ-PEREZ José Miguel	INP Toulouse, France	1	2021
2	SONG Layheang	M	D-WAE	Impact of land use on surface runoff and soil erosion: multi-scale assessment of teak tree plantation management in a tropical humid mountainous agro-ecosystem	1. Dr. OEURNG Chantha 2. Dr. BOITHIAS Laurie 3. Dr. RIBOLZI Olivier	Université Toulouse III-Paul Sabatier, France	1	2021
3	KONG Phutphalla	M	D-MIT	Visual Attention: Top-down and Bottom-up Information Relative Importance	1. Dr. PO Kimtho 2. Prof. GOSSELIN Bernard 3. MANCAS Matei	Université de Mons, Belgium	1	2021
4	SROY Sengly	F	D-FTN	Assessment of the nutritional value and contaminants of ten species of freshwater fish and fish powder from Tonle Sap Lake in Cambodia	1. Dr. IN Sokneang 2. Prof. AVALLONE Sylvie	Montpellier SupAgro, France	1	2021

PhD students in co-supervision with partner universities. There are also some PhD students co-supervised by ITC and partner-university professors yet registered only in partner universities (France and Belgium). They received financial supports from ARES-CCD, AUF, BFG, ITC and etc. By March 2022, there are 6 PhD candidates who finished such programs.

No	Name	Sex	Dept.	Receiving University	Since	Specialty	Year Finished
1	KET Pinnara	F	GRU	Uni. De Liège	2014	Agricultural Science	2019
2	LY Sokny	F	GCA	Uni. De Liège	2014	Agricultural Science and Biological Engineering	2020
3	DONA Valy	M	GIC	UCL	2015	Natural Language Processing	2020
4	KAN Kuchvichea	M	GCI	ULB	2015	Civil Engineering	2020
5	MORM Elen	F	GCA	ULB	2017	Food Engineering	2021
6	HOR Sivmey	F	GCA	Montpellier SupAgro	2017	Food Engineering	2021

3.3.5. Others Activities

Missions

None of mission can be completed due to the pandemic Covid-19.

Implementation of Partnership Program under HEIP

The Higher Education Improvement Project (HEIP) supports the Graduate School of ITC in terms of improving institutional management, improving curriculum and quality of Master programs, developing new Master programs, and improving human resources, via partnering with international universities. Under the HEIP, we have established 5 Partnership Agreements that support graduate programs at ITC with the following partner universities:

- Chulalongkorn University (CU), Thailand, supporting on the establishment of Master of Materials Science and Structures
- Kasetsart University (KU), Thailand, supporting on the improvement Master of Agro-industrial Engineering
- Institut Mines Télécom (IMT) and Ecole Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise (ENSIIE), France, supporting on the development of Master of Data Science and Master of Mechatronics, Information and Communication Engineering
- ENSEEIHT-INP Toulouse, France, supporting on improving management of Graduate School (doctoral program)
- Institut Teknologie Bandung (ITC), Indonesia, supporting on improvement of Master of Energy Technology and Management.

We also work on improv website and communication materials, and operational guidelines such as faculty manual, student manual, etc.

3.3.6. Difficulties and Challenges

In the academic year 2021-2022, we face several difficulties and challenges.

- Covid-19 mainly impacts all international mobilities of faculty staff and students. It interrupts almost all aspects of the training programs at both master and doctoral levels. As a consequence, a significant number of students cannot defend their thesis as scheduled and some needed to request for a delay for another year due to slow progress in research. Moreover, master program of Data Science cannot be launched due to impossibility and restriction of foreign and local mobilities.

- The fund to support research activities is inadequate.

PhD students in cotutelle programs have different schedules to come to ITC. This is difficult to arrange coursework for them.

3.3.7. Conclusion

For this academic year, 7 full-time master programs are operated (with five research-based programs). The number of enrollments increases by 32%, if compared to academic year 2020-2021. However, around half of our full-time master students are scholarship recipients (47% of them received full or partial scholarships). In academic year 2020-2021, 48 M2 students (among 70 M2 students) or 69% graduated successfully. From this academic year until 2024, we implement the 5 partnership programs under HEIP to improve institutional management, improve curriculum and quality of Master programs, develop new Master programs, and improve human resources.

For doctoral programs, the number of enrollments increases by 2% (54 to 55 enrollments), compared with academic year 2020-2021. Among these, 34 (15 females) doctoral students registered in cotutelle programs with French and Belgian partner universities. In academic year 2020-2021, 4 doctoral students (all in cotutelle) graduated successfully. However, we still face some challenges: the shortage of scholarships and research funds to support students, the laboratory is not yet fully capable for research uses, and different student's mobility's schedules, which complicates the course arrangement at ITC's side.

The sanitary crisis caused by Covid-19 complicates all operations, both at management and program levels. Almost all international mobilities have been postponed or cancelled due to travel restrictions. Master program of Data Science cannot be launched as planned.

3.4. Training Program during Covid-19 Pandemic

- Number and rate of graduates for the last 3 years is presented in below table:

Year		Technician (T2)	Engineer (I5)	Master (M2)
2020-2021	Number of students	243	603	71
	Number of graduates	190	572	48
	% of graduates	78.2%	94.9%	67.6%
2019-2020	Number of students	240	582	60
	Number of graduates	192	541	46
	% of graduates	80.0%	93.0%	76.7%
2018-2019	Number of students	275	576	48
	Number of graduates	220	538	39
	% of graduates	80.0%	93.4%	81.3%

According to above table, rate of graduates from the engineer program is not affected by the pandemic and that of technician program is slightly affected by the Covid-19 pandemic. This can be interpreted by the beneficiary of the final-year internship with industries. Most of final-year students were still able to do their internship during the pandemic.

However, graduation rate of M2 students is around 77% in 2019-2020 and 68% in 2020-2021. These rates are low compared to the rate before the pandemic (the reference year 2018-2019) which is approximately 81% of graduates. This can be translated by nature of Master program at ITC that needs laboratory or in-situ research data. But these activities were postponed or canceled by the closure of the institute and limitation of travel for field works/samples collection. In addition, the arrival of some research equipment was late or delayed.

- Academic Year 2021-2022 commenced on 11 October 2021 for senior students from 3rd to 5th Year. Second year students started their 1st semester from 1st November 2021, about 3 weeks late compared to other senior students.
- For the prevention of Covid-19 community spread, only small groups of students (Laboratory Practice) were allowed to enter ITC campus and the laboratories for the 1st semester. Lectures and tutorials were given online.
- The national exam of grade 12 students had been postponed to 27 December 2021. So the Entrance Exam to recruit 1st Year Engineer students was organized online on 7 February 2022. In total, there are 3392 candidates applied for this examination in which 3342 registered to ITC Phnom Penh and 50 registered to ITC Tbong Khmum Campus. It is noted that date, time, subject and exam system are the same for all candidates (Phnom Penh and Tbong Khmum Campus). Number of candidates, successful candidates and waiting list is presented in table below.

Number of	ITC-Phnom Penh		ITC-Tbong Khmum		Grand Total	Female
	Total 1	Female	Total 2	Female		
Candidate	**3342**	1308	**50**	21	**3392**	1329
Successful Candidate	**1703**	609	**25**	12	**1728**	621
Waiting list	**392**	188	**11**	5	**403**	193

– Enrollment of Successful candidates and waiting list is undergoing till 9 March 2022. So, first year students will start their 1st semester classes from 14 March 2022.

In conclusion, the implementation of the academic activities and other activities have been continuously working and progressing despite the Covid-19 pandemic.

4. Capacity Building and Professor Dispatch

4.1. Capacity Building (2021-2022)

4.1.1. Long-term overseas capacity building for lecturers and students

Year after year, the number of lecturers and students taking postgraduate training abroad increases remarkably. The academic year 2021-2022 is a proof of this. Indeed, the ITC has 25 lecturers (3 post-doc, 18 PhDs, 4 Masters) and 50 students (3 engineering degree, 35 Masters, 11 PhD students and 1 post-doc). They are located in different partner institutions around the world. For more information, please see annex 7 and 8.

4.1.2. Short-term overseas capacity building for lecturers and students

Within the framework of international cooperation, 19 lecturer missions and 11 student missions (a total of 30 missions) were carried out abroad. It is important to note, however, that this year's further training, due to the spread of Covid-19, was mainly carried out online. For more information, please see annex 9 and 10.

It is clear that further training missions for ITC lecturers are essential to ensure the quality of teaching. For students, they allow them to gain new scientific experiences with foreign professors.

4.1.3. Local capacity building for lecturers and students in the form of seminars

In addition to the training missions abroad, thanks to the cooperation with ministries, NGOs and other partners in Cambodia, our teachers and students from different departments have participated in 4 training courses in the form of local academic seminars organized by these different partners.

Such training would allow teachers and students to acquire new knowledge and to have exchanges with trainers. In addition, it is an opportunity for lecturers and students to interact with participants from different organizations. Details can be found in annex 11.

In addition, it should be noted that we have other seminars organized by the University Industry-Linkage (UIL) which are not included in above annex.

4.2. Professor dispatch at ITC (2021-2022)

For this academic year 2021-2022, we have only two mobilities of teachers from abroad, one from the University of Paris Sorbonne Nord (UP13) and the other from the University of Liège. Details can be found in annex 12

5. Research and Innovation

5.1. Background of Research and Innovation at ITC

Institute of Technology of Cambodia (ITC) contributes to maintain sustainable development and decrease the inequalities within our society through its internal functioning and opening-up to foreign countries and the way their students get admitted. ITC enjoys numerous cooperative agreements with European, Regional, and local Universities. These agreements help improve the quality of the educational program, create new degrees, and enable collaboration in new research projects and mobility of researchers, lecturers and students. ITC also enjoys privileged relations with a great number of Cambodian companies and multinationals which have branches throughout Cambodia.

Beside the education as engineer and technician, ITC also committed to promote the research activity by gathering the alumni, offering Master and PhD degree program locally and internationally through partnership programs, approaching the industries and local enterprises, and collaborating researches both local and international universities. To promote research activities, ITC has created 2 statuses, i.e., contracted lecturer-researcher with 50% of their time contributed to research (established on 31 May 2010) and full-time researcher (established on 18 June 2012). Further, ITC's first **Research and Innovation Center (RIC)** was established which is supported by JICA on July 14, 2015. In 2017, five research units have been established: (1) Energy Technology and Management (ETM), (2) Food Technology and Nutrition (FTN), (3) Mechatronics and Informatics Technology (MIT), (4) Materials Science and Structure (MSS), and (5) Water and Environment (WAE).

To sustain the research quality as well as to evaluate and orientate the research activities, RIC organizes the meeting of all lecturer-researchers/full-time researchers semi-annually at the beginning and at the end of academic year. In addition, the monthly meeting has been internally conducted by research unit and quarterly meeting has been conducted with participated by RIC management team. The main objective of the meeting is to recall the statuses, contracts, and evaluation criteria for researcher performance. At the same way, Head of research unit as well as RIC management team can solve the issue immediately as well can advise to researchers who have slow progress. In this academic year, under the constraint of covid-19 pandemic, the meeting has been conducted virtually. Prior to the meeting, all researchers are required to submit their research progress and challenges in the form of PowerPoint to their Unit Head followed by their presentations and new projects granted.

This chapter is made to report the information related to research and innovation that have been conducting, especially for academic year 2021-2022 to a very important scientific council of ITC. The scientific council composed of the Direction Board, Director and deputy directors of RIC, Deans of faculties and a representative from each Department chaired by Director General of ITC, is in charge of orientation and evaluation of scientific research and teaching program of the institute.

5.2. Research and Publication

5.2.1. Research Project and Researcher

With regard to the engineering field and commercialization of research, ITC has employed up to 113 researchers in this 2021-2022 academic year (this number includes also those who hold administration positions but also conduct research). This number as well as that of research project is constantly increased since 2010:

- 2010-2011 (12 researchers/12 projects),
- 2011-2012 (16 researchers/17 projects),
- 2012-2013 (18 researchers/23 projects),
- 2013-2014 (27 researchers/28 projects),
- 2014-2015 (36 researchers/28 projects),
- 2015-2016 (47 researchers/35 project),
- 2016-2017 (63 researchers including 14 fulltime researchers/51 projects),
- 2017-2018 (81 researchers including 14 fulltime researchers/53 projects),
- 2018-2019 (91 researchers including 14 fulltime researchers/77 projects),
- 2019-2020 (89 researchers including 22 fultime researchers/97 projects),
- 2020-2021 (109 researchers including 25 fulltime researchers/101 projects),
- 2021-2022 (113 researchers including 37 fulltime researchers/84 projects).

Figure 12 presents the evolution of researcher numbers between 2010-2011 and 2021-2022. Importantly, the number of fulltime researchers increased remarkely in 2021-2022 due to the support from HEIP projects, BGF and MoEYS, and others supports.

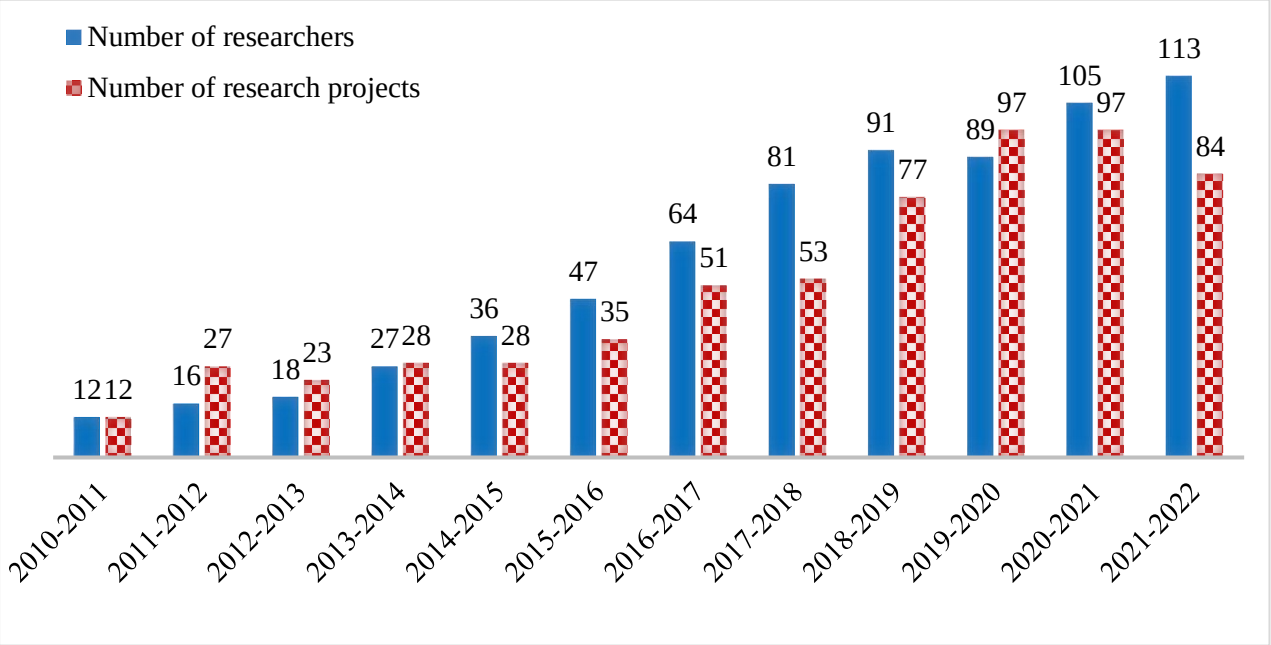


Figure 12. Number of researchers since 2010-2011 to 2021-2022 academic year

5.2.2. Research Project and Researcher by Research Unit for 2021-2022

This academic year (2021-2022), 84 projects are on-going and implemented by 113 Researchers classified into three categories.

- Energy Technology and Management-ETM (13 projects) : 18 Researchers including 07 Senior researchers[1], 05 Lecturer-Researchers, and 06 full-time Researchers.
- Food Technology and Nutrition-FTN (15projects) : 26 Researchers including 07 Senior researchers, 9 Lecturer-Researchers and 10 full-time Researchers.

[1] Senior researchers refer to those under management teams and group direction who have not been contracted as researchers but have been conducting researches on their own projects.

- Mechatronics and Information Technology-MIT (14 projects) : 21 researchers including 06 Senior researchers, 5 Lecturers-researchers, and 10 full-time researchers.
- Material Sciences and Structure-MSS (15 projects) : 23 Researchers including 13 Senior researchers, 05 Lecture-Researchers, and 05 full-time Researchers.
- Water and Environmental-WAE (27 projects): 25 researchers including 08 Senior researchers, 11 Lecturer-Researchers, and 06 full-time Researchers.

Figure below presents the number of projects and the number of researchers (senior researchres who conduct research but in admin positions are not included) by research unit (2021-2022). The fact that some unit (FTN), the number of researchers is higher than the number research projects is due to the number of full-time researchers (10 fulltime researchers in FTN) conducting their PhD under some research projects amount the 15 projects only.

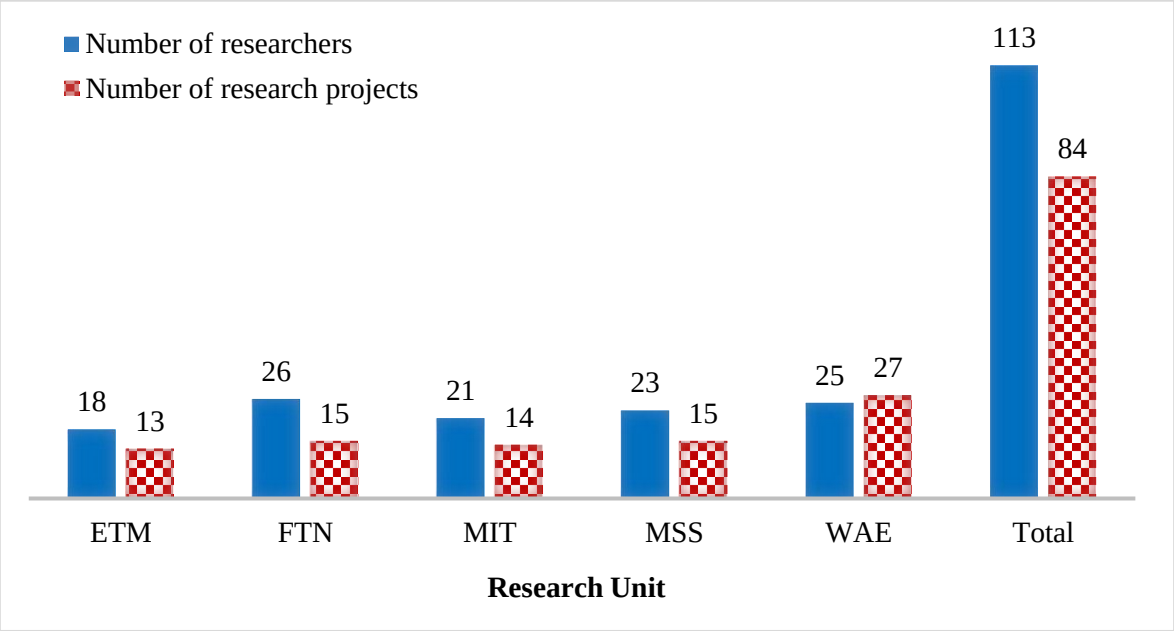


Figure 13. Research projects by each research unit (2021-2022)

Researches are conducted with the support and/or under the collaboration with ARES-CCD (Belgium), AgroSup Dijon (France), AUF, JST/JICA (Japan), Cambodia Climate Change alliance (Cambodia), AUN/Seed-Net JICA, JSPS (Japan), Kanazawa University (Japan), Ambassade de France, INSA de Rennes (France), ACIAR (Australia), CDRI (Cambodia), USAID (United States of America), US-Airforce (United states of America), Takashi Foundation (Japan), Kurita Foundation (Japan), United Kingdom Trust Fund, Pierre Fable (France), Researcher Institute of Development (IRD-France), Ministry of Environment (Cambodia) and Higher Education Improvement Program (Cambodia).

Through the collaboration with Japanese partners, a grand research project has been awarded to ITC entitled "*Establishment of conservation platform for Tonle Sap Lake, Cambodia*". This project requires a participation of 40 researchers in which 23 from GRU and GCA of ITC, and RUPP, and other 20 Japanese partners (Tokyo Institute of Technology, Yamagata University, Institute for Global Environmental Studies), in collaboration with Ministry of Environment, Ministry of Water Resources and Meteorology and Tonle Sap Authority. Under the support of JICA, totally 31 Laboratory Based Enducation-LBE (15 projects on-going, 16 projectes completed, and expected

10 new projects in 2022) projects for strengthening engineering education and research for industrial development in Cambodia have been awarded to implement from 2019-2022.

5.2.3. Classification of Research Project by Unit

Research projects have been classified according to the partners involved in the implementation of the project. Projects are classified into National, Regional and International cooperation levels (Figure below). National cooperation stands for collaboration and partners within local institutions and SMEs, whereas regional cooperation covers the cooperation within Asian countries, and International cooperation includes all other countries outside Asian.

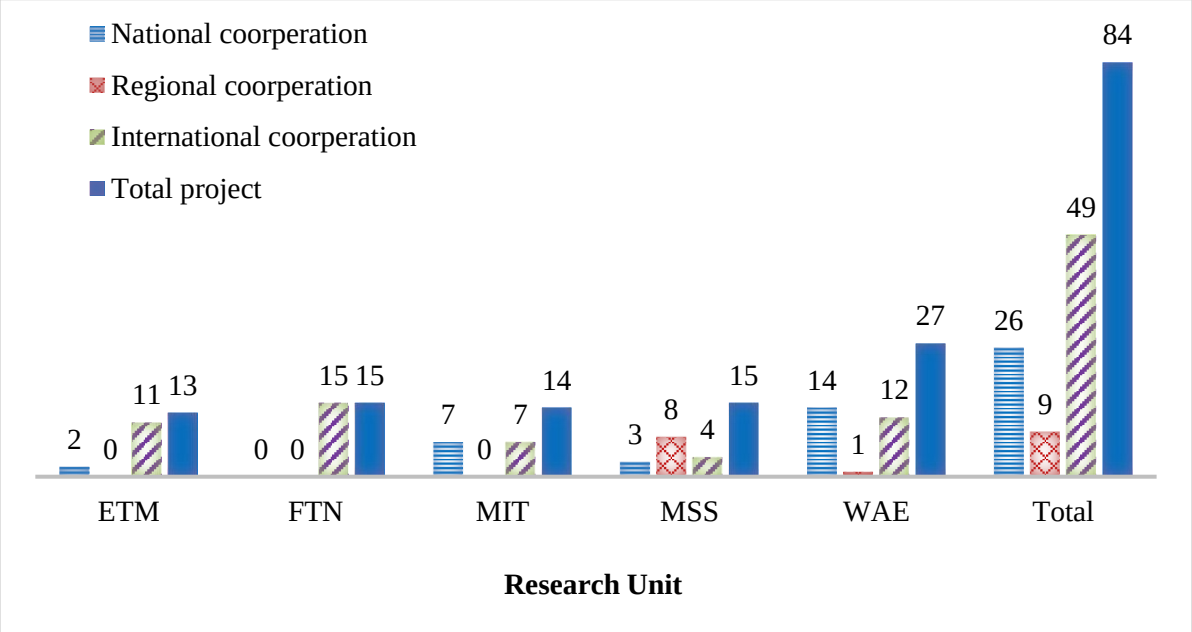


Figure 14. Classification of research project by research unit (2021-2022)

The projects are also classified into two types: Basic research project, Applied and development research, Start-up and Tech-transfer (Figure below). In our terms, Basic research is an approach to knowledge-specific that seeks to expand knowledge in a field of study. Applied and development research are those research activities, which focus on providing innovative or practical solutions to a specific problem and contribute to development at any scale. Among the 84 on-going projects, there are 25 Basic researches and 59 Applied and development researches. Start-up[2] and Tech-transfer[3] are under RIC development plan for 2030.

[2] refers to an organization or a process of forming or managing business that uses innovation as the core of its business model under uncertainty conditions and has risks, yet high potential to growth fast (source: Techo Startup Center).
[3] Tech-transfer projects refer to the research projects that could lead to the process of commercialization by technology licensing or Intellectual Property (IP) rights transferred.

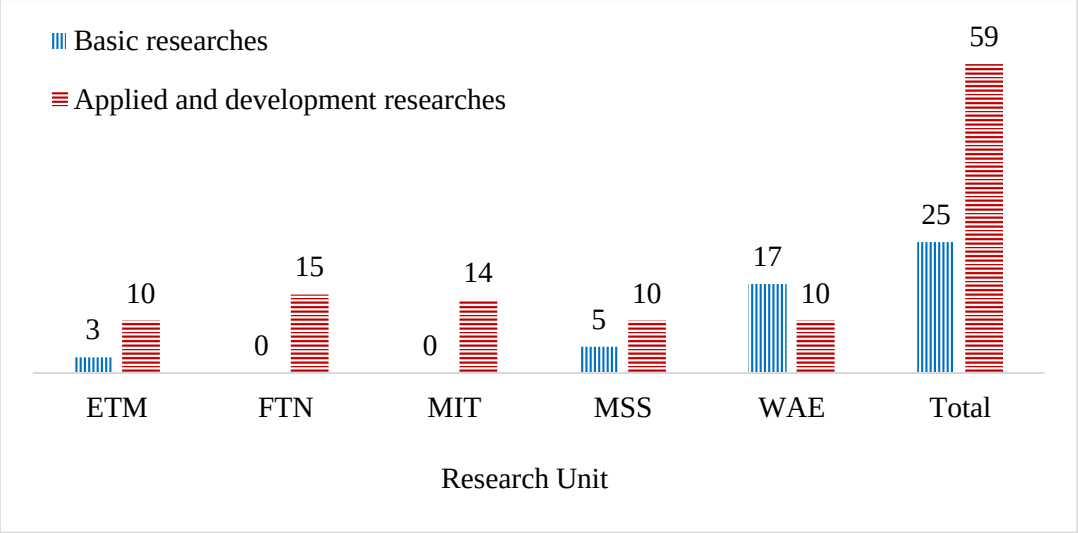


Figure 15. Classification of project types by research unit (2021-2022)

5.2.4. Publication

In term of scientific journal publication from 2010 to 2022, researchers published their research articles of 252 international published papers and 103 in local published papers (Figure below). Indexed papers refer to the publication in international journal and non-indexed papers refer to the publication in Techno-Science research journal of ITC.

Figure 16. Number of international and local publications from 2010.

5.3. High Impact Research and Innovation Projects

5.3.1. SATREPS Project: « Establishment of Conservation Platform for Tonle Sap Lake, Cambodia »

5.3.1.1. Introduction

SATREPS stands for Science and Technology Research Partnership for Sustainable Development. This project is funded by the Japan International Cooperation Agency (JICA) and Japan Science and Technology Agency (JST). SATREPS is a 5-year project starting from April 2016 to March 2021. However, it is extended to March 2022 due to COVID-19 pandemic. The main institutions of the projects are: (1) Tokyo Institute of Technology, Japan, and (2) Institute of Technology of Cambodia (ITC), Cambodia. Besides these, there are also Institute for Global Environmental Strategies (IGES, Japan), Yamagata University (YU, Japan), Tonle Sap Authority (TSA, Cambodia), Ministry of Water Resources and Meteorology (MOWRAM, Cambodia), Ministry of Environment (MOE, Cambodia), Ishikawa Prefectural University (Japan), Toyama Prefectural University (Japan), Iwate University, and University of Tokyo (Japan).

5.3.1.2. Objectives

The project aims to develop a water environment analytical tool for Tonle Sap Lake (TSL) and establish an environmental conservation platform through the elucidation of the lake and the tool development. The long-term project objectives (for the next 10 years, until 2025) are as follows:

- To establish state-of-the-art research-oriented structures and facilities in ITC
- To promote science-based management to the government of Cambodia
- To develop Platform for Aquatic Ecosystem Research (PAER) and make it one of the benchmarks in freshwater ecology and management studies in Southeast Asia

5.3.1.3. Research Participants

This project requires the participation from researchers and government staffs from various ministries. There are 56 members in Cambodia including :

- ITC : 23 Researchers (15 PhD, 8 Master) and 33 students (10 Master's students and 23 Bachelor students);
- Ministry of Environment: 5 persons;
- Tonle Sap Authority: 10 persons
- Ministry of Water Resources and Meteorology: 6 persons;

There are also 47 members (30 PhD, 1 Master, 3 PhD students, 3 Master's students and 10 Bachelor students) from Japan **(**Tokyo Tech, Ishikawa Prefectural University, Toyama Prefectural University, Shimane University, University of Tokyo, Yamagata University, Iwate University, Institute for Global Environnement Strategies).

5.3.1.4. Working Group

There are 7 working groups (WG) in this project as the followings:

- WG1: Hydrology and hydrodynamics
- WG2: Sediment and water quality

- WG3: Chemical pollution
- WG4: Pathogens and phytoplanktons
- WG5: Modeling and integration
- WG6: Risk assessment and scenarios analysis
- WG7: Social implementation

5.3.1.5. Outcomes for the Societies

- Development of Water Environment Analytical Tool of TSL
- Creation of Platform for Aquatic Ecosystem Research (PAER)
- Promotion of Science and Engineering
- Maintaining and updating the environmental database about TSL
- Quantification of environmental impacts on TSL and its marginal regions
- Quantification of the impact of global climate change in the region
- Support the establishment of environmental quality standards of the lake
- Making materials for environmental management and education.

5.3.1.6. The 6th International Symposium

The 6th International Symposium on Conservation and Management of Tropical Lakes, was jointly and virtually held with the 3rd International Conference on Tropical Limnology (TROPLIMNO III) from 25th -26th November 2021 (**Error! Reference source not found.**). The main theme was " Environmental Conservation Platform for Tropical Inland Waters: Science, Policy, and Impact".

The joint event was hosted and organized by the Platform for Aquatic Ecosystem Research, co organized with the Southeast Asian Limnological Network (SEALNet), Institute of Technology of Cambodia (ITC), Institute for Global Environmental Strategies (IGES), Tokyo Institute of Technology (Tokyo Tech), Research Center for Limnology – National Research and Innovation Agency of Indonesia (RCL-BRIN). Together, the event was collaborated with Ministry of Environment, Cambodia, Tonle Sap Authority, Cambodia, Ministry of Water Resources and Meteorology, Cambodia, Universiti Sains Malaysia, Malaysia, and International Lake Environment Committee Foundation (ILEC), Japan. The event was financially supported by JICA and JST through the Science and Technology Research Partnership for Sustainable Development (SATREPS) project entitled "Establishment of Environmental Conservation Platform for Tonle Sap Lake, Cambodia" together with some sponsors from IRD through WatHealth and 4C project, Campus France and IFC, and Shimadzu.

The main objective of this event was to bring together leading academics and scientists, policy makers, lake managers, students and other professionals in the field of tropical limnology to exchange information, share knowledge and their experience and lessons learned in integrated lake basin management. As a joint activity, the organizers aimed to expand and sustain the Platform for Aquatic Ecosystem Research in the tropical lakes of Southeast Asia, which is an outcome of the SATREPS Project in Tonle Sap Lake.

There were more than 100 participants coming from various institutions and countries such as Cambodia, The Philippines, Indonesia, Malaysia, Japan, France, etc. Forty-eight of presentations were presented by students, researchers, professors, and many researchers coming from various institutions.

Besides that, there were 6 parallel sessions covering 4 different topics included 1) Ecosystem and Biodiversity of Tropical Inland Water; 2) Ecohydrology, Biochemical and Physical Processes in Tropical Aquatic Ecosystems; 3) Data Mining, Knowledge Management, Decision Support System for ILBM, Including Remote Sensing, GIS, and Related Tools; 4) Information Sharing and Stakeholder's Engagement, Social Impact Assessment, and Nature-Based Solutions (Nbs).

The event was finished successfully with video/photo winner contestant announcement together with six best student presentations award. The event also brought multiple lake management stakeholders from Japan and other countries to discuss on the above topics, to provide science-based evidence, to address the challenges in the integrated lake basin managements as well as to urge all relevant stakeholders to work together, and to translate the research finding into a simple message that can be communicated in the communities, so that the effective measure can be done effectively to mitigate pollution and protect ecosystem and thus protect human health, animal, and environment.

Figure 17. The 6th International Symposium on Conservation and Management of Tropical Lakes.

5.3.1.7. Project Completion

Five project purposes have been set and achieved in the project such as monitoring points, monitoring variables, publication, scenario, and analytical tool. The project published 117 international journals which is almost double compared with original plan. However, the analytical tool has been completely developed but it has not been used by policy level yet. Furthermore, we have published two technical books and two policy guidelines.

We have created PAER platform (Platform Aquatic Ecosystem Research) which will play important role on research of Tole Sap Lake after the project ends. The platform will become the information hub which can be linked with the international researchers and collaboration partners for future research. In addition, we have two advance laboratories which one of them will be upgraded into ISO 17025.

5.3.2. SATREPS Project: « Establishment of Risk Management Platform for Air Pollution in Cambodia »

5.3.2.1. Introduction

Cambodia is a developing county which has the economic growth 7% of GDP for the last few years. Meantime, the transportation, factory, resident, and tourist are significantly increased in South-East Asia. Social infrastructure is often inadequate in these countries, environmental pollution being severe and hygiene being poor. Environmental stress, such as an increased number of traffic is evident, exceeding the allowable limit of the infrastructure, and deteriorating environmental pollution and causing sanitation problems.

Various social infrastructures as an excellent water supply system has been constructed in Cambodia. Because of the rapid growth of the urban areas as the capital city of Phnom Penh, have increase of environmental issues as noise, waste and air pollution. Air pollution is one of the global and local issue because all the urban, industrial and agricultural area have air pollutions from various sources as traffic, construction, fuel combustion and agriculture residue burning and forest fire. Because the pollutant spreads crossing borders, it is also a global issue. The airborne infection issues as COVID-19 also suggesting the importance of indoor air quality management. However, this actual situation is not being investigated
at this moment.

The proposal has been accepted on May 20, 2021 with the budget of 4.5 MUSD. The implementation period is expected to be 1 July 2022 – 31 June 2027.

5.3.2.2. Goal and Objective of the project

Overall goal: To contribute to the creation and establishment of safe and comfortable living environment for residents and tourists from the viewpoint of air pollution, which leads to sustainable economic growth of Cambodia. The objectives of the project aim:

- To establish the structure/system to evaluate the present status and characteristics of air pollution in Cambodia
- To build the online network of monitoring sites with data management system
- To establish the structure/system to evaluate environmental risks
- To develop human resource, which is necessary for operation of the risk management platform for air pollution

5.3.2.3. Research Participants

Japanese counterparts:

- Kanazawa University
- Nagasaki University
- Osaka Ohtani University
- Partical Plus Co., Ltd.

Cambodian counterparts:

- Institute of Technology of Cambodia
- University of Health and Science

- National University of Management
- Ministry of Environment
- Ministry of Education Youth and sport

5.3.2.4. Working groups

The 4 working groups are:

- Group 1: Overall management
- Group 2: Data sampling and monitoring setting up
- Group 3: Environmental risk assessment
- Group 4: social implementation

5.3.2.5. Activities work plan for five years

1. The structure/system to evaluate the present status and characteristics of air pollution in Cambodia

- Understand status and characteristics of air pollution in Cambodia.
- Understand transboundary influences of air pollution.
- List emission sources up and prepare emission inventory.
- Visualize emission sources.
- Develop a low-cost and less-maintenance PM monitoring technology that can provide advanced information

2. Online network of monitoring sites with data management system

- Fundamental information for building the online network is surveyed and summarized.
- Preliminary test of the online monitoring network is conducted.
- The online monitoring network is built and started.
- Manage the monitoring and related environmental data.

3. The structure/system to evaluate environmental risks

- Extract macroscopic potential health risk factors
- Extract microscopic potential health risk factors.
- Examine scenarios for the mitigation of potential health risk.
- Prepare a risk data base for air pollution

4. Human resource, which is necessary for operation of the risk management platform for air pollution

- Determine the management policy of platform and roles of each participating organization.
- Propose action plans of the risk management platform of air pollution.
- Propose measures to mitigate potential health risks caused by air pollutants.
- Conduct advanced researches under the international collaboration and expand the human network between researchers over the world.

5.3.3. Higher Education Improvement Projects

With the 7.92M USD grant from the Government of Cambodia for Higher Education Improvement Projects-HEIP (World Bank Loan Project), there are 23 research projects collaborated with industries and 2 research projects support policy. The research proposals are divided into two rounds:

- Round one consists of 11 research projects collaborated with industry (window 1) and 1 research project supports policy (window 2). There are 3 research projects collaborated with industry and led by female.
- Round two consists of 12 research projects collaborated with industry and 1 research project supports policy (window 2). Among the 13 research projects of round 2, there are 5 research projects led by female.

There are 12 research proposals approved (from December 2019 up to April 2020) for implementation in round 1 while 13 research projects in round 2 were approved in March 2021 (Table below). The budget for round one is about 4.72M USD due to the large projects and large equipment needed for laboratory capacity building purpose; however, the budget for round two is about 3.02M USD since the duration is short time of research activities.

Table 9. Proposals selected for World Bank loan of Cambodian government grant (HEIP)

No	PI	Sex	Unit	Win.	Research title	Remark
1	Dr. Kim Bunthern	M	MIT	1	Applied Control and Automation for Agriculture in Cambodia (ACAAC)	Implement
2	Dr. Pec Rothna	M	MIT	1	Toward Production Innovation via FabLab-ITC	Implement
3	Dr. Thoun Kosorl	M	MIT	1	Initiative towards electrical and electronic products testing and certification by EMC Lab	Implement
4	Dr. Suong Malyna	F	FTN	1	Biotechnology for Integrated Pest Management towards pesticide reduction in Cambodia	Implement
5	Dr. Tan Reasmey	F	FTN	1	Development of Fermentation Process of Cambodian Soy Sauce	Implement
6	Dr. Hin Raveth	M	MSS	1	Chemical strengthening of large-scale glass pieces for construction and other engineering applications	Implement
7	Dr. Vai Vannak	M	ETM	1	Development of a virtual Cambodian power system – Towards an Innovation Micro-Grid in Cambodia	Implement
8	Dr. In Sokneang	F	FTN	1	Valorization of high-value dry food products (agricultural products including herbal and spices) and other by-products in Cambodia	Implement
9	Dr. Mith Hasika	M	FTN	1	Improvement and development of rice-based products toward the growth of SMEs/Industries in Cambodia	Implement

10	Mr. Valy Dona	M	MIT	2	Ancient Manuscript Digitization and Indexation	Implement
11	Dr. Bun Kimngun	M	MSS	1	Development and optimization of ceramic tile using Cambodian clays incorporating with industrial wastes	Implement
12	Dr. Yos Phanny	M	MSS	1	Cambodian Natural Rubber Composites with Different Type of Minerals Fillers for Floor Mat Shock Absorbing Applications	Implement
13	Dr. Or Chanmoly	M	ETM	1	Applied geophysics for investigating hydrocarbon potential and study of depositional environment at Block VIII, Kampong-som Basin, onshore of Cambodia	Implement
14	Dr. Eng Chandoeun	M	ETM	1	Quality assurance of concrete pile integrity and soil properties investigation in Phnom Penh city using seismic and electrical resistivity tomography approaches	Implement
15	Dr. Bun Saret	M	WAE	1	Development of Eco-friendly and Low-cost Wastewater Treatment System as an On-site Product	Implement
16	Dr. Kret Kakda	M	ETM	1	Investigation the production potential of the Cambodian offshore reservoir considering effects of phase behavior and rock-fluid interaction	Implement
17	Dr. Houng Peany	F	FTN	1	Valorization of agricultural by-products in Cambodia through extractions and formulations of essential oils and bioactive compounds	Implement
18	Ms. Hang Leakhena	F	WAE	1	Development of a Biofilter System Model to Control of Air Pollution toward Industrial Application	Implement
19	Dr. Song Layheang	M	WAE	1	Development of Climate Data Information System for Cambodia	Implement
20	Dr. Peng Chanthol	F	FTN	1	Improvement and development of fish and meat products for better preservation using innovative technology	Implement
21	Dr. Oeurng Chantha	M	WAE	2	Strengthening flood and drought risk management and early warning system in lower Mekong basin of Cambodia	Implement
22	Dr. Ket Pinnara	F	WAE	1	Integrated approach of precise irrigation and sustainable Soil management to improve crop water productivity in Cambodia through ITC soil laboratory development: the focus on rice farming	Implement
23	Mr. Kong Sela	M	FTN	1	Development of cooking oil processes for commercialization	Implement
24	Dr. Doung Piseth	M	MSS	1	Development of a Biofilter System Model to Control of Air Pollution toward Industrial Application	Implement
25	Dr. Heu Rina	F	WAE	1	Development of Climate Data Information System for Cambodia	Implement

Most of the projects will be completed at the end of 2023. With HEIP project, there are 9 laboratories for research purpose will be created, and 10 prototypes will be developed from the research projects. Two laboratories will be upgraded into ISO 17025 (Physic-chemical and Chemical contaminant laboratory and Environmental Microbiology and Chemistry Laboratory). The expected papers to published at the end of the project is 39 international peer review journals. More important outcome of the project is the staff upgrading from bachelor to Master (7), from Master to PhD degree (11).

5.3.4. Laboratory-Based Education (LBE) Project

The LBE project for strengthening engineering education and research for industrial development in Cambodia at ITC is funded by JICA.

5.3.4.1. Project Goal and Purpose

Target universities enhance their education and research capabilities, which meet the needs of the industry sector in Cambodia. Institute of Technology of Cambodia (ITC) enhances its education and research capabilities as a national resource institution in the field of engineering.

5.3.4.2. Expected Outputs and Selected Projects

There are three main expected outputs as following description:

- Capabilities of ITC to implement Laboratory Based Education (LBE) are developed
- Capabilities of ITC strengthen capacities of other universities in LBE are developed
- University-Industry linkage is enhanced at ITC.

The 15 granted ongoing research topics of LBE project for 2021-2022 at ITC are presented in the table below. Indeed, we expected 10 new LBE projects granted to be announced in March 2022.

Table 10. LBE Research Project for 2021-2022

No.	PI	Sex	Dept.	Unit	Research title
1	Dr. VONGCHANH Kinnaleth	F	GIM	ETM	Investigation of Mixing Ratio of Biomass to Wasted Cooking Oil Used as Binder for Producing Solid Fuel for Community Use in Cambodia
2	Dr. VAI Vannak	M	GEE	ETM	Planning and Operation of Active Distribution Systems
3	Dr. ENG Chandoeun	M	GGG	ETM	Geological and Geophysical Studies of Hydrocarbon potential in Tonle Sap Basin, Onshore Cambodia
4	Dr. KRET Kakda	M	GGG	ETM	Integration of Landsat-8, ASTER, and Sentinel-2 for Mapping of Mineral Prospective Map, Hydrothermal Alteration and Geological

					Structures for Porphyry Copper and Epithermal Gold Deposits in the North Cambodia
5	Dr. TAN Rasmey	F	GCA	FTN	Development of Cambodian Fermented Cucumbers by using Freeze-Dried Lactic Acid Bacteria with their Potential Use as Aromatic and Bacteriocin-producing Starters
6	Dr. THOURN Kosorl	M	GEE	MIT	Non-intrusive Appliance Load Monitoring and Diagnostics in Residential Homes
7	Dr. TITH Dara	M	GIC	MIT	Proof-of-Concept of Applying Blockchain Technology for Decentralized Identification Management of Medical System
8	Dr. YOS Phanny	M	GGG	MSS	Geothermal Source and Reservoir Investigation in Te Teuk Pus Area, Phnom Te Village, Sangke Sap Commune, Oral District, Kampong Speu Province, Cambodia
9	Dr. SIV Easeng	M	GIM	MSS	Design and Built a Light Weight of Mini Electric Vehicle
10	Dr. SEANG Sirisokha	F	GGG	MSS	Hydrothermal alteration, Mineralization, Fluid inclusion, Geochemistry, and Geochronology of Porphyry Cu-Mo-Au Prospect, Ratanakiri, Cambodia
11	Dr. SRY Vannei	M	GIM	MSS	Composite 3D Printing based on Filament Developed from Natural Fiber
12	Dr. BUN Saret	M	GRU	WAE	Addressing Water Scarcity in a Rural Community of Cambodia through Groundwater Use
13	Dr. CHAN Rathborey	M	GRU	WAE	Development of Electrocoagulation Reactor Integrated Sedimentation for Turbidity and Color Removal from Industrial Wastewater
14	Dr. KET Pinnara	F	GRU	WAE	Prototype of Low-cost and Smart In-vessel Composter for converting Spent Mushroom Substrates to Bio-Organic Fertilizer
15	Dr. EANG Khy Eam	M	GRU	WAE	Study of Acid Mine Drainage (Amd) In Cambodia And Its Countermeasures

5.3.5. AFD/EU Projects

This project was to support Master Program of Urban Water and Sanitation Engineering and was implemented with the financial support of the European Union and administered by AFD (Table below). There were in total 9 projects (8 from WAE and 1 from FTN) implemented from January 2020 to December 2021. Moreover, two papers have been accepted and 10 papers are preparing for publication in international journal. Furthermore, more than 10 papers were published and presented in regional conference. Approximately 10 papers were presented in the 10th Scientific day 2021.

Table 11. AFD Research Project for 2021-2022

No.	PI	Sex	Dept.	Unit	Research title
1	Dr. TY Boreborey	F	GCA	WAE	Arsenic Removal from Groundwater using ECAR Technology: Case Study at Koh Thom, Kandal, Cambodia
2	Dr. DOUNG Ratha	M	GRU	WAE	Impact of Climate and Land use Change on Hydrology Pattern in the Coastal Zone of Cambodia
3	Dr. Khoeurn Kimleang	F	GCA	WAE	Application of Low-cost Adsorbents in Wastewater Treatment
4	Mr. LUN Sambo	M	GRU	WAE	Formulizing the Design Criteria for the Piped-water System in Cambodia
5	Dr. CHAN Rathborey	M	GRU	WAE	Spatio-temporal Assessment of Surface Water Quality Affected by Urban and Aquaculture Wastewater: Case Study in Tamouk Lake Area
6	Dr. PENG Chanthol	F	GCA	WAE	Antibiotic-Resistant Bacteria in Water Environment
7	Dr. HEU Rina	F	GRU	WAE	Assessment of Silicon (Si) in Water and Surface Sediment in Tonle Sap Lake: an Implication for Highly Productive Ecosystem
8	Mr. KIM Lengthong	M	GRU	WAE	Assessment Flood Risk on Urban Areas due to Flow Alteration of Lower Mekong River Urban Development
9	Dr. TAN Reasmey	F	GCA	WAE	Micropollutant Removal by Powdered Activated Carbon Injected at the Flocculation-coagulation-settling Step in Drinking Water Treatment Plants

5.3.6. Capacity Building Project Linked to Innovation (FoodSTEM)

5.3.6.1. Introduction

FoodSTEM (Training a new generation of entrepreneurs in sustainable agriculture and food engineering**)** is an EU co-funded project by Erasmus + Capacity Building in the field of Higher Education program designed to build partnership between Cambodian and European universities, and to create a favorable condition in the 4 Cambodian partners universities for the emergence of student entrepreneurship and micro or small enterprises. This project is coordinated by the Institute of Technology of Cambodia, a higher education institution (HEI) in Cambodia that trains students in science, technology and engineering.

5.3.6.2. Goals

With the support of 3 European HEIs, FoodSTEM project aims at building the capacity of 4 major public universities in Cambodia in order to create a new generation of food chain entrepreneurs, with a strong emphasis on safety, quality and sustainability.

5.3.6.3. Partners

- 4 Cambodian Universities: Institute of Technology of Cambodia (ITC), Royal University of Agriculture (RUA), Royal University of Law and Economics (RULE), University of Battambang (UBB).
- 3 European partners: Institut Agro/Supagro Montpelleir, Toulouse INP (Purpan and ENSAT), and Université de Liège.

5.3.6.4. Project's Activities

With the aim of "FoodSTEM" project in building the higher education capacity in order to train **a new generation of entrepreneurs in sustainable agriculture and food engineering**, the project was organized into 8 work packages (WP):

- **WP1:** Project preparation
- **WP2:** Improve academic programs through e-learning courses development in 4 Cambodian partner university (ITC, RUA, UBB, and RULE)
- **WP3:** Create a new pathway of Master program "Project Management and Entrepreneurship" at RULE university
- **WP4:** Upgrade management skills and technical facilities for pre-incubation of students' projects "Agri-foods Innovation Challenges" in ITC, RUA, and UBB
- **WP5:** Provide capacity building on food safety management by creating Food Safety Labs in ITC, RUA, and UBB
- **WP6:** Project management
- **WP7:** Project quality monitoring
- **WP8:** Dissemination and exploitation

5.3.6.5. Expected and Achieved Outputs

FoodSTEM project is expected to have four main outcomes as the followings:

- **8 E-learning courses** dedicated to the Agri-Food chain are developed at bachelor/engineering/master level and included in the curriculum of the Cambodian partner Universities. These courses are focused on entrepreneurship, product development, food market, factory design, sustainable processing, supply chain management, etc.
- With the e-learning courses developed during the project, a new pathway of the Master program **"Project Management and Entrepreneurship in Agri-Food"** will be implemented at RULE by early 2022.

- The project will organize **3 innovation challenges** in the agri-food sector for students and young entrepreneurs. The winners of the challenges will earn some prices and be pre-incubated in one of the partner universities in Cambodia to develop their idea.
- **A capacity building program**: during the project the Agri-food and food safety labs, and 4 e-learning classrooms will be set up in Cambodian partner universities. Various training session for e-learning courses development and labs management will be organized for Cambodian lecturers, researchers, technicians, and students.

To date, under the framework of the F-STEM project, some of the activities were achieved as the following:

i) Preparation (set up the project and committees), this working package activity has already been completed. The project management unit (PMU) is recruited, and well structured. A kick-off meeting was organized with the principal stakeholders of the field of agriculture and food sectors (20-23/01/2021).

ii) Improvement of academic programs through e-learning courses development, which response to the current health sanitation crisis due to Covid-19.
- E-learning equipment and e-learning classrooms were set up at 4 Cambodian University partners: the Institute of Technology of Cambodia (ITC), the Royal University of Agriculture (RUA), the Royal University of Law and Economics (RULE), and the National University of Battambang (NUBB).
- 4 e-learning courses (i.e. Entrepreneurship, Food Market, Food Product Development, and Agri-Food supply chain) are at the finalization stage of the course content.
- 18 of Cambodian lecturers from Cambodian university partners (ITC, RUA, RULE, and NUBB) have been building their capacity in e-learning course development for higher education (i.e engineer degree, and Master degree).

iii) Upgrade management skills and technical facilities for pre-incubation of student projects in ITC, RUA, and NUBB.
- 2 Innovation Challenge has been carried out at ITC, and RUA.
- 3 Agri-Food Processing laboratory has been set up at ITC, RUA, and NUBB to support the students in prototyping their food product, and the practical work in the Food product development course.

iv) Provide capacity building on food safety management in ITC, RUA, and NUBB (Food Safety laboratory): 3 Food safety laboratories was set up at the 3 Cambodian universities (ITC, RUA, and NUBB).

v. Project management: Grant management guide has already been written (Attachment 6) and shared with all partners through the F-STEM Drive and Website. 18 Operational committee and 4 steering committee meetings between PMU and all involved partners.

vi. Dissemination and exploitation: communication plan of the project, logo, stickers, leaflet, press articles of the project, Facebook page, and website are developed were conducted.

5.3.6.6. Impact to Society

- The project improves the quality of higher education and enhance its relevance for the labor market and society.
- The project is strongly connected to the needs to raise agriculture and food transformation to the best international standards by providing qualified and innovative work force to the market.
- The project includes the development of e-learning classes and the Quality and Safety Lab to control products all along a food chain.

5.4. Research Promotion and Collaboration

Creation of Research Unit

Based on the approval from the council administration 2015-2016 ITC has clustered the researchers in different units according to field of expertise and research. The researchers in each unit have been discussed and below is the way forward for each research unit.

5.4.1. Energy Technology and Management (ETM Unit)

Cambodia Context

Cambodia has enjoyed an average rate of economy growth of about 7% per annuum during the last decade. To insure sustainable and inclusive high growth, the country has set to promote industrial development for economic diversification, strengthening competitiveness and promoting productivity. Consequently, the country has experienced steep increases in energy demand and consumption. For sustainable development of the country, Energy Security is extremely important, requiring the development of energy sector infrastructure and human resources to match the pace of socio-economic progress. The Rectangular Strategy-Phase IV pointed out that one of the remaining challenges of diversification and value creation in industry and service sector is high energy price (electricity rates) compared to neighboring countries. Until recently, Renewable Energy cost has drastically decreased within short period of time, especially for solar photovoltaic and onshore wind energy. Expanding the share of renewables in the country energy mix, along with diversification and utilization of locally available resources, implementing energy efficiency and energy conservation measures; would be key for the advancement of energy sector in Cambodia.

The Research Unit

The research unit, dedicated to energy technology and management of energy, brings an expertise with international recognition in specific areas in connexion with Cambodian needs, contributing to the exploration of conventional energy resources and the development of new and renewable energy and energy efficiency and conservation; through researches, collaborations with international partners, private sectors and relevant government agencies and development of competent human resources. The prioritised areas of research and collaboration including but not limited to the conversion of biomass and agricultural waste and by-products into energy, solar PV and thermal energy, Wind energy, innovative smart grid, micro-grid for remote area, energy consumption measurement and analysis, energy management system, simulation of large energy system, and the exploration of conventional energy resources.

Vision

To be leading contributor in supporting national energy security through research and innovation, knowledge creation and technology transfer with focus on energy sources diversification, efficient use of energy and environmental friendliness.

Mission

- Producing competent human resources in energy related fields.
- Conducting researches in new and renewable energy, energy conversion and recovery, energy conservation, saving and management, and exploration of conventional energy resources to address local and regional issues.
- Closely collaborating with related Ministries, national and international partners and private sectors.
- Disseminate research findings and transfer technologies to the society

Research Topics

The multidisciplinary team addresses scientific issues in the following sectors:

- New and Renewable Energy: Biomass, Solar PV, Solar PV/T, and Wind Turbine with a focus on design and modelling of processes, fuel and emissions measurements, lab and pilot scale equipment;
- Energy Efficiency and Conservation: Heat recovery, Waste to energy, thermal systems optimization, energy consumption measurement and modelling;
- Smart grid: connexion from renewable sources and optimization of grid electricity distribution and micro-grid for remote areas.
- Energy Management: energy management system, modelling and optimization of large energy systems.
- Exploration of conventional energy resources: depositional environment and reservoir characterization, mapping of hydrothermal alteration, geological mapping and investigation of hydrocarbon potential

Projects and Research Topics

The list of projects and research topics that are implementing in ETM unit shows in the table below. For more detail information refers to a table in Annex 13.

Table 12. Research topics in ETM unit for the academic year 2021-2022

No.	**Name of PI (FAMILY First name)**	**Sexe**	**Project/Research Topic**	**Funding source**	**Period**	**Collaboration scale *** N = National R = Regional I=International	**Project Type*** 1= Basic 2 = Applied & Development 3 = Start-up 4 = Tech-transfer
1	Dr. Or Chanmoly	M	Applied geophysics for investigating hydrocarbon potential and depositional environment of sediments at onshore prospect, southern Cambodia	HEIP	2021-2023	I	1

2	Dr. Thourn Kosorl	M	ASEAN Factori 4.0	Erasmus +	2020-2022	I	2
3	Dr. Vai Vannak	M	Design and Installation of Off-Grid PV System for Clean Water and Electricity Supply in Ta Mat Primary School, Cambodia	JASTIP	2021-2022	I	2
4	Dr. Vai Vannak	M	Development of a Virtual Cambodian Power System-Towards an Innovation Micro-Grid in Cambodia	HEIP	2020-2024	I	2
5	Dr. Kret Kakda	M	Integration of Landsat-8, ASTER, and Sentinel-2 for mapping of mineral prospective, hydrothermal alteration and geological structures for porphyry copper and epithermal gold deposits in the north Cambodia.	JICA-LBE	2021-2023	I	2
6	Dr. Vongchanh Kinnaleth	F	Investigation of mixing ratio of biomass and wasted cooking oil used as binder for producing solid fuel for community use in Cambodia	JICA-LBE	2020-2022	N	2
7	Dr. NGO Ichhuy	M	Investigation on Source and Reservoir of Geothermal, Te Tek Pos Hot spring, Kompong speu Province	JICA-LBE	2020-2022	I	2
8	Dr. Ngo Ichhuy	M	Investigation the production potential of the Cambodian offshore reservoir considering effects of phase behavior and rock-fluid interaction	HEIP	2021-2023	I	2
9	Dr. Vai Vannak	M	Planning and Operation of Active Distribution Systems	JICA-LBE	2021-2023	N	2
10	Dr. Chan Sarin	M	Pushing Energy Efficiency in Cambodia	CCCA3	2020-2022	I	2
11	Dr. Eng Chandoeun	M	Quality Assurance of Concrete Pile Integrity Soil Properties Investigation in Phnom Penh City using Seismic and Electrical Resistivity Tomography Approaches	HEIP	2021-2023	I	2
12	Dr. Vongchanh Kinnaleth	F	Study on impact of heat stress to human productivity and economic in Cambodia	CCCA3	2020-2023	I	1
13	Dr. Vai Vannak	M	Study on the Impact of Phase Reconfiguration in Unbalanced Distribution System	ZE	2021-2022	I	1

Researchers

Dr. CHAN Sarin (Head of ETM Research Unit), Ph.D. in Engineering, Institute of Technology Bandung, Indonesia and Keio University, Japan
Renewable energy, waste heat recovery and heat-activated cooling system

Dr. OR Chanmoly (Deputy-Director of RIC), Ph.D. in Petroleum Production Engineering, Kyushu University, Japan
Enhanced oil recovery; reservoir engineering; CO_2 sequestration; biomass to energy

Dr. AM Sokchea, Ph.D in Energy Engineering, France
Energy Power System

Dr. VONGCHANH Kinnaleth, Ph.D. Institute of Technology Bandung (ITB) and Hokkaido University (HU)
Energy Efficiency, Renewable energy, Biomass energy, Drying, Heat Stress

Dr. BUN Long, Ph.D. in Electrical Engineering, INP Grenoble, France
Power system, renewable energy system, fault diagnosis

Dr. CHRIN Phok, Ph.D. in Electrical Engineering, Université Paul Sabatier, Toulouse, France
Renewable energy, frugal engineering, asynchronous generator

Dr. VAI Vannak, Ph.D. in Electrical Engineering, Université Grenoble Alpes, France
Power distribution system planning, Rural electrification, Optimization

Dr. ENG Chandoeun, Ph.D. in Geophysics, Kyushu University, Japan
Biomass Energy, Oil and Gas Energy and Mineralogy

Dr. KRET Kakda, Ph.D in Geophysics, Kyushu University, Japan
Geophysical exploration: to explore physical proprieties of the subsurface of the Earth for exploring fossil fuel and ore mineral, which uses physical methods including seismic, magnetic, electrical and resistivity methods.

Dr. CHEA Samneang, Ph.D, Kyushu University
Enhanced oil recovery (EOR), Carbon capture and storage (CCS), Sedimentology and stratigraphy, Geological mapping

Mr. ETH Udaya, Master degree, Chulalongkorn University, Thailand
Renewable energy, Power system analysis, Energy efficiency, Rural electrification, control system

Mr. KHON Kinsrornn, Ph.D student, Power system, University of Toulouse III
Power System, Microgrid, Optimization, Planning

Ms. HENG Muoy Yi, Ph.D student, Geophysics, ITC
Geophysical exploration

Ms. PECH Sopheap, Ph.D student, Geophysics, ITC
Petroleum geology

Mrs. SIO Sreymean, Ph.D student, Geophysics, ITC
Applied Geophysics, Mineral and Petroleum Exploration, Characteristic of Mineral Deposit and Petroleum System

Mrs Eng Samphors, Master degree, Institut Teknologi Sepuluh November (ITS)
Distribution Management System, Renewable Energy Micro grid planning & Energy Storage, Distribution automation & Real time monitoring system

Mr. Heang Latin, Master degree, Institute of Technology of Cambodia
Biomass to energy, Mechanical design, Heat Stress

Mr. CHHLONH Chhith, Master degree, Institut Teknologi Sepuluh Nopember (ITS)
Fault detection, reconfiguration, restoration, load balancing on LV system, Motor drive, Renewable Energy

Academic and Research Partners

Universiti Teknologi Malaysia (UTM)
University of Liège
Université Claude Bernard Lyon 1
Kyoto University (KU)
Université Grenoble Alpes (UGA)
Kyushu University
National University of Singapore (NUS)
The Hong Kong Polytechnic University (PolyU),
Kyoto University (KU)

Non-academic partners

Ministry of Mines and Energy, Cambodia
Ministry of Education, Youth and Sports, Cambodia
Ministry of Industry, Science, Technology and Innovation, Cambodia
Cambodian Climate Change Alliance
APSARA Authority
The Energy Conservation Center Japan (ECCJ)
Asean Center of Energy (ACE)
JICA
G2Elab

Industrial Partners and NGOs

Electricité du Cambodge
GERES
ORBIT P. A Co.,Ltd
Health & Environment International Trust (HEIT)
Institut Francais pour la Performance du Batiment (IFPEB)
EnergyLab
GGGI
ATS
Sevea Consulting
EnerCam Co.,Ltd
Samnang Angkor Development Co Ltd
IMECS (CAMBODIA) CO.,LTD
SMEs involved in Solar Energy development
Angkor Resources Corp
Matlab Co., LTD

Publications of ETM researchers since 2010

From 2020 to 2021, there are in total 61 research outputs from ETM unit classified into three categories: International publications, Local publications, and Conference and Proceedings as shown in the table below.

Table 13. Summary of number of research publications by year from 2010 to 2021

Publication classification/year	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**Total**
International publications	10	6	1	4	10	11	1	4	0	0	3	1	**51**
Local publications	0	2	0	0	0	0	0	0	0	0	0	0	**2**
Conference/ Proceedings	2	1	1	4	0	0	0	0	0	0	0	0	**8**
Total	**12**	**9**	**2**	**8**	**10**	**11**	**1**	**4**	**0**	**0**	**3**	**1**	**61**

List of International publications

1. V. Vai, « Design of AC Microgrid Topology with Photovoltaic Uncertainties in a Rural Village, » Makara Journal of Technology, 2021, https://doi.org/10.7454/mst.v25i1.3759
2. K. Yon, M. -C. Alvarez-Herault, B. Raison, K. Khon, V. Vai and L. Bun, « Microgrids planning for rural electrification, » 2021 IEEE Madrid PowerTech, 2021, pp. 1-6, doi : 10.1109/PowerTech46648.2021.9494966. (International peer review)
3. S. Suk, V. Vai, R. Lorm, C. Chhlonh, S. Eng and L. Bun, « Modifying Switch Opening and Exchange Method for Distribution Network Reconfiguration with Distributed Generations, » 2021 9th International Electrical Engineering Congress (iEECON), 2021, pp. 85-88, doi : 10.1109/iEECON51072.2021.9440343. (International peer review)
4. S. Suk, V. Vai, R. Lorm, C. Chhlonh, S. Eng and L. Bun, « Network Reconfiguration in Distribution Systems Based on Modified Sequential Switch Opening Method, » 2021 11th International Conference on Power, Energy and Electrical Engineering (CPEEE), 2021, pp. 143-146, doi : 10.1109/CPEEE51686.2021.9383247. (International peer review)
5. V. Vai et al., « Optimal Design of LVAC Distribution System Topology for a Rural Village, » 2021 9th International Electrical Engineering Congress (iEECON), 2021, pp. 93-96, doi : 10.1109/iEECON51072.2021.9440289. (International peer review)
6. V. Vai, S. Suk, R. Lorm, C. Chhlonh, S. Eng, and L. Bun. « Optimal Reconfiguration in Distribution Systems with Distributed Generations Based on Modified Sequential Switch Opening and Exchange » Applied Sciences, 2021, 11, no. 5 : 2146. https://doi.org/10.3390/app11052146. **IF:2.679**
7. K. Khon, V. Vai, M. . -C. Alvarez-Herault, L. Bun and B. Raison, « PLANNING OF LOW VOLTAGE AC/DC MICROGRID FOR UN-ELECTRIFIED AREAS, » CIRED 2021 – The 26th International Conference and Exhibition on Electricity Distribution, 2021, pp. 2674-2678, doi : 10.1049/icp.2021.1518. (International peer review)
8. R. Lorm, V. Vai, S. Suk, C. Chhlonh, S. Eng, L. Bun, « Service Restoration in Distribution Systems under Different Load Levels, » 2021 11th International Conference on Power, Energy and Electrical Engineering (CPEEE), 2021, pp. 122-126,

doi : 10.1109/CPEEE51686.2021.9383358. (International peer review)

9. R. Lorm, S. Eng, S. Suk, C. Chhlonh, L. Bun and V. Vai, « Service Restoration in Distribution System Using Modified Sequential Opening Branches, » 2021 9th International Electrical Engineering Congress (iEECON), 2021, pp. 69-72, doi : 10.1109/iEECON51072.2021.9440266. (International peer review)

10. T. Nozaki, T. Nagase, Y. Takaya, et al., « Subseafloor sulphide deposit formed by pumice replacement mineralisation, » Scientific Report 11, 8809 (2021). https://doi.org/10.1038/s41598-021-87050-z. **IF: 5.134**

11. K. KHON, S. FICHTNER, M. ALVAREZ-HERAULT, V. VAI, L. BUN, B. RAISON, ‘’Optimal design of low voltage AC/DC microgrid’’ SYMPOSIUM DE GENIE ELECTRIQUE (SGE 2020), 30 JUIN – 2 JUILLET 2020, NANTES, France

12. B. Kim, E. Boulaud, E. Boisaubert, S. Am, P. Chrin, “Study of the control of an AC voltage stabilizer using lqr and anti-windup”. 22nd European Conference on Power Electronics and Applications 7-11 September 2020, Lyon (France). Doi:10.3390/en13102410

13. Cravioto, J.; Ohgaki, H.; Che, H.S.; Tan, C.; Kobayashi, S.; Toe, H.; Long, B.; Oudaya, E.; Rahim, N.A.; Farzeneh, H. The Effects of Rural Electrification on Quality of Life: A Southeast Asian Perspective. Energies 2020, 13, 2410. https://doi.org/10.3390/en13102410

14. Kret, K., Tsuji, T., Chhun, C., and Takano, O., 2020. Distributions of gas hydrate and free gas accumulations associated with upward fluid flow in the Sanriku-Oki forearc basin, northeast Japan. Marine and Petroleum Geology. https://doi.org/10.1016/j.marpetgeo.2020.104305

15. M. Pietrzak-David, B. Kim, P. Maussion, C. Phok “Frugal Innovation for Sustainable Rural Electrification.” 22nd European Conference on Power Electronics and Applications 7-11 September 2020, Lyon (France). (Accepted)

16. Sok Chea AM, Phok CHRIN, Bunthern KIM, Menghorng BUN, Phing LIM, “High Isolated Transformer for a Serie Connected IGBTs Power Supply”.iEECON 2020, The international Electrical Engineering Congress, Thailand. (Accepted)

17. Vannak Vai and Long Bun, “Study on the Impact of Integrated PV Uncertainties into an Optimal LVAC Topology in a Rural Village”, ASEAN Engineering Journal, Vol. 10, No. 1, pp.79-92, March 2020

18. Vannak Vai, Long Bun and Hideaki Ohgaki, “Integrated Battery Energy Storage into an Optimal Low Voltage Distribution System with PV Production for an Urban Village”, International Journal on Advanced Science, Engineering and Information Technology, Vol. 10, No. 6, pp.2458-2464, December 2020

19. Vannak Vai, Marie-Cécile Alvarez-Hérault, Bertrand Raison and Long Bun, “Optimal Low-Voltage Distribution Topology with Integration of PV and Storage for Rural Electrification in Developing Countries: A Case Study of Cambodia”, Journal of Modern Power Systems and Clean Energy, Vol. 8, No. 3, pp.531-539, May 2020

20. Tongsa Lan, Chandoeun Eng, and Vuthy Horng., 2019. Design of 71ontiguous pile wall and lateral support system for deep excavation at Chroy Changva, Phnom Penh, Cambodia. International Symposium on Earth Science and Technology, pp. 413-418

21. B. Kim, M. Pietrzak-David and P. Maussion, “Novel Configuration of a Three-phase Induction Generator for Single-phase Load: Simulations and Experimentations,” IECON

2019 – 45TH ANNUAL CONFERENCE OF THE IEEE INDUSTRIAL ELECTRONICS SOCIETY, Lisbon, Portugal, 2019, pp. 5807-5813.

22. B. Kim, M. Pietrzak-David and P. Maussion, "Novel Configuration of an Inverter-based Three-phase Induction Generator for Single-phase Load: Comparison to TSCAOI Setup," 2019 INTERNATIONAL SYMPOSIUM ON ELECTRICAL AND ELECTRONICS ENGINEERING (ISEE), Ho Chi Minh, Vietnam, 2019, pp. 318-322.
23. Chantra Chhorn and Chandoeun Eng., 2019. Geological mapping and interpretation of Wild Boar prospect area in Ratanakiri province, Cambodia. International Symposium on Earth Science and Technology, pp. 531-536.
24. K. Vongchanch, S. Chan (2019) Preliminary study on investigation of the heat stress affecting the labor productivity, A Case Study: garment factory Phnom Penh, Icorer conference
25. Kakda Kret, Tatsunori Ikeda, Takeshi Tsuji (2019) Grid-search inversion based on rock physics model for estimation of pore geometry and grain elastic moduli: Application to hydrothermal ore deposits and basalt, Exploration Geophysics, 50, 1-11
26. Porchaing CHOENG, Lan HEANG, K. Vongchanch, S. Chan (2019) Investigation on Applica on of Fish Oil as Binding Material in Biomass Briqueting Process, The 10th RC MEManuE 2019
27. Vannak Vai, Long Bun, Marie-Cécile Alvarez-Hérault, and Bertrand Raison (2019) Design of LVAC distribution system with PV and centralized battery energy storage integra on-A case study of Cambodia, ASEAN Engineering Journal, Vol 9, No 2, 1-16
28. Inthavideth X., Vongchanh, K., and Trichanh P. (2018) Testing and Investigation of Proper es of Composite Biomass Briquettes, the 10th RCEneE
29. Porchaing CHOENG, Kinnaleth VONGCHANH, Chanmoly OR, Latin HEANG, and Sarin CHAN, (2018) Investigate Briquette's Proper es of Biomass having Fish Residue as a Binder, TSME-IcoME2018
30. V. Vai, L. Bun, M.-C. Alvarez-Herault, B. Raison, "LVAC Distribution System Design with PV and Centralized Battery Energy Storage Integration", in Proc. RCEEE 2018
31. V. Vai, L. Bun, M.-C. Alvarez-Herault, B. Raison, "Optimal Design of LVAC Topology Considering Load Demand Uncertainties", in Proc. RCEneE 2018
32. Vongchanh K., Chan S., Sok P. (2018) A survey on energy consumption and appliances of households in urban and sub-urban Cambodia, RCEneE2018
33. Vongchanh K., Chan S., Sok P., A survey on energy consumption and appliances of households in urban and sub-urban Cambodia, 11th AUN/SEED-net regional conference on Energy Engineering, September 27-28, 2018, Manila, Philippines
34. Chan, S. (2017): Current Development of Cambodia Energy Sector and Draft of Energy Efficiency Policy, The 3rd BELDA Symposium, Tokyo, Japan
35. Inthavideth X., Vongchanh, K., and Trichanh P., Testing and Investigation of Properties of Composite Biomass Briquettes, The 10th AUN/SEED-net regional conference on Energy Engineering, November 9-11, 2017, Yagon, Myanmar.

36. V. Vai, E. Gladkikh, L. Bun, M.-C. Alvarez-Herault, B. Raison, “Low Voltage Distribution System Planning under Load Demand Uncertainty: Growth Rate with Connection of New Loads”, in Proc. iEECON 2017

37. V. Vai, E. Gladkikh, L. Bun, M.-C. Alvarez-Herault, B. Raison, “Planning of Low Voltage Distribution Systems with Uncertainty on Load Demand in Urban Areas”, in Proc. IEEE-EEEIC / I&CPS Europe 2017

38. V. Vai, E. Gladkikh, L. Bun, M.-C. Alvarez-Herault, B. Raison, “Study of Low Voltage Distribution System with Integration of PV-Battery Energy Storage for Urban Area in Developing Country”, in Proc. IEEE-EEEIC / I&CPS Europe 2017

39. V. Vai, L. Bun, M.-C. Alvarez-Herault, B. Raison, “Study of Low Voltage Distribution System with Decentralized PV-BES and Centralized BES for Rural Village in Developing Country”, in Proc. iEECON 2017

40. Or, C., Sasaki, K., Sugai, Y., Nakano, M., Imai, M., 2016, Preliminary numerical modelling of CO2 gas foaming in heavy oil and simulations of oil production from heavy oil reservoirs, Can. J. Chem. Eng. 94, 576–585.

41. Chrin, P., Dagues, B., David, M., Maussion, P., Bun, L. (2016), Improvements on experimental modeling of the losses in induction machine with Taguchi orthogonal plan, IECON 2015 – 41st Annual Conference of the IEEE Industrial Electronics Society, 4836-4841.

42. Chrin, P., Maussion, P., Pietrzak-David, M., Dagues, B., Bun, L. (2016), Modeling of 3-phase induction machine as single-phase generator for electricity generation from renewable energies in rural areas, Proceedings – 2015 IEEE International Electric Machines and Drives Conference, IEMDC 2015, 405-411.

43. Heng,M., Sio,S., Seang,S., (2016) Geological Logging and XRD Investigation on Altera on of One Core Logging in Epithermal Low Sulfidation Au-Ag System, Chhep District, Preah Vihear Province, Cambodia, International Symposium on Earth Science and Technology., N/A, 418

44. Or, C., Sasaki, K., Sugai, Y., Nakano, M., Imai, M. (2016), Swelling and viscosity reduction of heavy oil by CO2 gas foaming in immiscible condition, SPE Reservoir Evaluation and Engineering, 19(2), 294-304.

45. V. Vai, E. Gladkikh, L. Bun, M.-C. Alvarez-Herault, B. Raison, “Planning of Low Voltage Distribution Systems with Uncertainty on Load Demand”, in Proc. RCEnE 2016

46. Vongchanh K., Chan S., Development of Household Solar Dryer for Using in Cambodia, 4th AUN/SEED-Net Regional Conference Energy Engineering, November 24-25, 2016, Phnom Penh, Cambodia

47. Vongchanh K., Current Energy consumption and barrier on energy efficiency in MECON Hosehold in Laos, Development of the platform on Energy Demand Structure and Forecasts in Asian Residential and Commercial Sector, January 26, 2016, Tokyo, Japan

48. Nanthavong K., Kythavone S. and Vongchanh K., Trend of Final Energy Intensity Changes in Lao PDR, Journal of Energy and power Engineering 9, 2015, 265-268. Doi: 10.17265/1934-8975/2014.03.005

49. Or, C., Sasaki, K., Sugai, Y., Nakano, M., Imai, M., 2014, Experimental study on foamy viscosity by analysing CO2 micro-bubbles in hexadecane. Int. J. Oil Gas Coal Eng. 2, 11–18.

50. Sasaki K., Sugai Y., Or C., Kono H., CO2 Solubility Characteristics of Crude Oils related to Carbon Capture and Utilization (CCU), Journal of Novel Carbon Resource Science Newsletter, Vol. 8, February 2014, pp. 5-8

51. V. Vai, D. Frey, "Study of EMC Impact of Power Electronic Converters in Industrial Networks in the Frequency Range of 2kHz-150kHz", in Proc. RCEE 2014 (Best Paper Award)

52. Vongchanh K., Suyavong S., Nanthavong K., Kithavone S., Household Energy Consumption Perspectives for MECON group in Laos, 5th International Conference on Sustainable Energy and Environment (SEE 2014): Science, Technology and Innovation for ASEAN Green Growth, November 19-21, 2014, Bangkok, Thailand.

53. Chan, S., Astina, I M., Suwono, A., Fukushima, T., Sato, H. (2011): Solar Powered Ejector Cooling Cycle, Transactions of the JSRAE, 28.

54. Chan, S., Fukushima, T. and Sato, H. (2011) : Experimental Study on Ejector Air-Conditioning System using R-134a as Working Fluid, Proceeding of the 3rd Regional Conference on Mechanical and Aerospace Technology, Manila

List of Local publications

1. Latin Heang, Porchaing Choeng, Kinnaleth Vongchanh, Sarin Chan. Experimental Investigation on Sawdust and Tree Leaf Briquette Using Fish Residues Oil as a Binder. Techno-Science Research Journal 8 (2020)
2. Porchaing Choeng, Latin Heang, Kinnaleth Vongchanh, Sarin Chan. Experimental Investigation on Rice Husk and Bagasse Briquette Using Fish Oil as Binder. Techno-Science Research Journal 8 (2020)

List of Conferences/Proceedings

1. K. Vongchanh (2021), Alternative of biomass waste to energy sources as biomass briquettes in Cambodia, 11th Annual International Conference on Industrial Engineering and Operations Management
2. K. Vongchanh (2021), Development of home solar dryer for drying of fish in Cambodia, International Symposium on Environment/Eco-technology and Policy (EETP) in East Asian
3. L. Heang, K. Vongchanh, S. Chan (2020) Investigation on Application of Fish Oil as Binding Material in Biomass Briquetting Process, The 10th RC MEManuE 2020
4. K. VITHEAN, K. Vongchanch, S. Chan (2019) Study on heat stress impacting to Labor productivity in Phnom Penh: Case study on Rebar workers, 9th Scientific day
5. Chan Oussa SUNG, Or Sopheap, Kinnaleth VONGCHANH (2018), Improve Solar Hybrid Dryer System and investigation of moisture content of dried fish, The 8th Scientific day
6. Kinnaleth VONGCHANH (2018) The need of Energy Saving in Cambodia, The 8th Scientific day
7. Sam BAN, Kinnaleth VONGCHANH, Sarin CHAN (2018) Household survey energy consumption in Cambodia, The 8th Scientific day
8. Sokhim KEO, Chanlin PHANG, Kinnaleth VONGCHANH, Sarin CHAN (2018) 3D design of biomass briquetting machine, the 8th Scientific day

5.4.2. Food Technology and Nutrition (FTN Unit)

Cambodian Context

Although Cambodia is still mainly a rural country with 58% of the population being farmers, the processing of agricultural products is generally family-based or within informal industrial structures, with a low added value and a low level of technology, thus limiting their ability to compete in international markets. Only 10% of the industrial workers are in the food-beverage sector, a great majority (97%) of them working in micro-enterprises with no foreign investment. Besides the need of training technicians and engineers with a focus on agricultural products transformation and quality control, research centres with high level faculty staff are needed to do research on food processes, develop original and innovative products adapted to Cambodian tastes and habits (dry or fermented products), and assist the growing industrial sector in the quality and safety assessment of the food chain.

The Research Unit

The research unit Food Technology and Nutrition is established to enhance the development of food and beverage industries in Cambodia through cost-effective collaborative research and innovation programs between a diverse range of economic partners and the researchers of the Institute of Technology of Cambodia. The Research Unit promotes technical platforms and research projects to support the sectors of food and feed processing, food storage and preservation, and innovative products from agriculture and forestry. Other aspects as product design, cost-effectiveness, waste and by-products minimization, energy consumption reduction or valorisation of Cambodian biodiversity are also studied in the Research Unit. The main goal of this unit is to become a reliable center for research, training and consultancy services in food processing improvement, food fermentation, food product development and innovation, value addition of agricultural products, food nutrition, food safety, food quality analyses and food preservation in order to sustain the development of Cambodia.

Vision

To be an excellent unit for research, innovation, training and consultancy services in the field of food science and technology for sustainable development of Cambodia.

Mission

- To increase the visibility of FTN research unit
- To strengthen the researchers' capacity in food related fields to be nationally and regionally recognized
- To create standardized laboratories for research and hall technology for pilot scale
- To boost the research activities through local and international collaborations (Universities, Government, SMEs, NGOs)
- To promote technology transfer and to provide training and consultancy services to food industries and relevant stakeholders

Research Theme

- Food technology development in the Cambodian context (Solid-state and submerged fermentation, drying)
- Food product development and innovation
- Food quality and safety

- Nutritional, aromatic and antimicrobial properties of Cambodian biodiversity
- Sustainability issues of Cambodian food technology: minimization of waste and by-products, chemicals-free preservation, low energy consumption
- Volatile compounds analysis in wines and essential oils
- Contaminant analysis: pesticides, heavy metals, mycotoxins

Projects and Research Topics

The list of projects and research topics that are implementing in FTN unit shows as shown in the table below. For more detail information refers to a table in Annex 14.

Table 14. Research topics in FTN unit for the academic year 2021-2022

No.	Name of PI (FAMILY First name)	Sexe	Project/Research Topic	Funding source	Period	Collaboration scale * N = National R = Regional I = International	Project Type* 1= Basic 2 = Applied & Development 3 = Start-up 4 = Tech-transfer
1	Dr. OR Chanmoly	M	Pathogens and Phytoplankton (SATREPS Project on Establishment of Environmental Conservation Platform of Tonle Sap Lake)	JICA-JST	2016-2022	I	2
			Risk assessment (SATREPS Project on Establishment of Environmental Conservation Platform of Tonle Sap Lake)				
			Heavy metals and pesticides (SATREPS Project on Establishment of Environmental Conservation Platform of Tonle Sap Lake)				
2	Dr. SUONG Malyna	F	Biotechnology for Integrated Pest Management towards pesticide reduction in Cambodia	HEIP	2019-2023	I	2
3	Dr. IN Sokneang	F	Valorization of high-value dry food products (agricultural products including herbal and spices) and other by-products in Cambodia	HEIP	2019-2023	I	2
4	Dr. MITH Hasika	M	Improvement and development of rice-based products toward the growth of SMEs/Industries in Cambodia	HEIP	2019-2023	I	2
5	Dr. TAN Reasmey	F	Development of Cambodian Soy Sauce by Fermentation Method	HEIP	2019-2023	I	2
6	M. KONG Sela	M	Development of Cooking Oil Processes for Commercialization	HEIP	2021-2023	I	2
7	Dr. PENG Chanthol	F	Improvement and development of fish and meat products for better preservation using innovative technology	HEIP	2021-2023	I	2

8	Dr. HOUNG Peany	F	Valorization of agricultural by-products in Cambodia through extractions and formulations of essential oils and bioactive compounds	HEIP	2021-2023	I	2
9	Dr. SUONG Malyna	F	Sustainable Rice Production within an Agroecology Framework (HEALTHYRICE)	IRD	2019-2022	I	2
10	Dr. PO Kimtho	M	FOODI (MSc course in Food Processing and Innovation)	Erasmus + KA2	2019-2022	I	2
11	Dr. IN Sokneang	F	Training a new generation of entrepreneurs in sustainable agriculture and food engineering (FoodSTEM)	Erasmus +	2019-2022	I	2
12	Dr. HOUNG Peany	F	Agroecology and Safe Food System Transitions (ASSET)	EU/AFD and GRET	2020-2025	I	2
13	Dr. PENG Chanthol	F	Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement	USAID	2020-2024	I	2
14	Dr. TAN Reasmey	F	Development of Cambodian Fermented Cucumbers by using Freeze-Dried Lactic Acid Bacteria with their Potential Use as Aromatic and Bacteriocin-producing Starters	LBE-JICA	2021-2023	I	2
15	Dr. YOEUN Sereyvath	M	ASEAN Network for Green Entrepreneurship and Leadership/ ANGEL	Erasmus +	2021-2024	I	2

Researchers

Dr. PHAT Chanvorleak (Head of FTN Research Unit), Ph.D in Food Chemistry, Chung-Ang University, Anseong, South Korea
Food chemistry, Food Contaminant Analysis, Agrochemical Analysis, Mycotoxin Analysis

Dr. CHUNHIENG Thavarith (Deputy Director of ITC), Ph.D in Food and Biotechnology Engineering, INPL, France
Food Technology

Dr. TAN Reasmey (Deputy Director of RIC), Ph.D in Bioengineering, Tokyo Institute of Technology, Japan
Food Biotechnology (Vegetable and cereal fermentation), Food Product Development and Innovation, Food and Water Microbiology, Anaerobic Digestion

Dr. SUONG Malyna (Deputy Director of RIC), Ph.D in Bioengineering, University de Montpellier II, France
Plant Biodiversity, Microbiology, Genetic Engineering

Dr. IN Sokneang (Dean of Faculty of Chemical and Food Engineering), Ph.D in Science and Processes of Food and Bio-products, AgroParisTech, Paris, France
Food Safety and Risk Assessment, Nutrition, Food Processing

Dr. MITH Hasika, Ph.D in Food Science, Université de Liège, Belgium.
Plant's Essential Oils/Extracts, Antimicrobials, Antioxidants, Food Microbiology, Food Preservation and Processing, Agro-Food Industry Management

Dr. YOEUN Sereyvath, Ph.D in Science, Chonnam National University, South Korea
Biotechnology, Organic Compounds Analysis (Pesticides and others)

Dr. HOR Sivmey, Ph.D in Biochemical and Physicochemical of Food, SupAgro Montpellier, France
Post-harvest Quality, Transformation of Tropical Fruits

Dr. HOUNG Peany (Deputy of UIL), Ph.D in Chemical Science and Engineering, Tokyo Institute of Technology, Japan
Chemical Engineering

Dr. SROY Sengly, Ph.D candidate in Nutrition and Food Science, Montpellier SupAgro University, France
Food Nutrition, Food Processing and Food Development

Dr. MORM Elen, Ph.D candidate in Chemical Engineering (Transfer, Interfaces and Processing), Free University of Brussels, Belgium
Drying of Agricultural Crops and Herbal, Bioethanol

Mrs. HENG Soukim, Master in Food Science, Kasetsart University, Thailand
Food processing, nutrition in food, food safety and microbiology in food

Mrs. MOM Vattana, Master in Food Science, Kasetsart University, Thailand
Food processing, Food product development

Mr. KONG Sela, Master in Chemical Engineering, Gadjah Mada University, Indonesia
Chemical Engineering

Ms. SIENG Sreyvich, Master in Chemical Engineering, Gadjah Mada University, Indonesia
Chemical Engineering

Ms. NAT Yukleav, Master in Chemical Engineering, Sirindhorn International Institute of Technology, Thammasat University, Thailand
Chemical Engineering

Ms. LORN Da, Ph.D candidate in Agrofood Biotechnology, AgroSup-Dijon/UBFC, France
Aroma Extraction, Lactic Acid Fermentation, Food Enzymes

Ms. YIN Molika, Ph.D candidate in Agro-food Industry, Institute of Technology of Cambodia, Cambodia
Food Product Development and Sensory Evaluation

Mr. NGET Sovannmony, Ph.D candidate in Meat Preservation, Ecole Nationale Vétérinaire Oniris, France
Meat Preservation, Chemical Contamination in Food, Nutrient Analysis in Food

Ms. CHIN Lyda, Master in Agro-Industrial Product Development, Kasetsart University, Thailand
Food processing, Food product development

Mrs. THANH Channmuny, Master in Health and Food Science, University of Montpellier, France
Food science, Food microorganism

Ms. PHAL Sivchheng, Master in Environment Design, Kanazawa University, Japan
Environmental Design

Mr. LY Luka, Master in Agro-Industrial, Institute of technology of Cambodia, Cambodia
Food processing, Quality control

Mr. SAY Manith, Master of Science in Food Technology, Khon Kaen University, Thailand
Snacks production, Frying process

Ms. OEUM Kakada, Master of Science in Basic Science, Chungnam National University, South Korea
Cell Biology, Microbiology, Cancer Biology, Cell cycle, Immunology, and Entomology

Ms. MAO Socheata, Master in AgroFood Chain, UMR LEREPS/ENSFEA, France
Volatile compound analysis

Academic and Research Partners

Tokyo Institute of Technology, Japan
Yamagata University, Japan
Université de Liège, Belgium
Université de Bruxelles, Belgium
SupAgro-Montpellier, France
AgroSup-Dijon, France
Polytech Lille, France
Institut National Polytechnique deToulose (INP Toulouse), France
French Agricultural Research Centre for International Development（CIRAD), France
Institut de recherche pour le développement (IRD), France
Aix-Marseille Université, France
Université Claude Bernard Lyon 1, France
Kasetsart University, Thailand
Hanoi University of Science and Technology (HUST), Vietnam
Chung-Ang University, South Korea
Chonnam National University, South Korea

Non-academic partners

Ministry of Education, Youth and Sports, Cambodia
Ministry of Industry and Handicraft, Cambodia
Ministry of Commerce, Cambodia
General Secretariat of the National Science and Technology Council, Ministry of Planning
National Productivity Centre of Cambodia (NPCC), Cambodia
Ministry of Environment, Cambodia
Tonle Sap Authority, Cambodia
Department of Agro-industry, Ministry of Agriculture, Forestry and Fisheries, Cambodia
Ministry of Rural Development, Cambodia

Industrial Partners and NGOs

LyLy Company Co. Ltd
Cambodia Brewery Limited
Baca-Villa Productions Co Ltd
Cambodia Beverages Company
Mee Chiet
Eche Ngov Heng Food Production of Kampot Co., Ltd
Kang Soseda Enterprise
Phnom Penh Safe Food
Healthy Food Enterprise
Dara Food Enterprise
DKSH
Indochina Rice Mill Limited
Food Enterprise
Confirel
Golden Silk
Rosmeric Paper
Chaktomuk Pest Services Co., Ltd (Orkin Cambodia)
Ringacam
Khmer Fresh Milk Co., Ltd
Bodia Spa

Selected publications of FTN researchers since 2010

From 2020 to 2021, there are in total 108 research outputs from FTN unit classified into three categories: International publications, Local publications, and Conference and Proceedings as shown in the table below.

Table 15. Summary of number of research publications by year from 2010 to 2021

Publication classification/year	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**Total**
International publications	3	4	6	6	1	6	6	2	5	3	1	1	**44**
Local publications	7	9	1	1	1	2	2	3	0	0	0	0	**26**
Conference/ Proceedings	8	14	7	9	0	0	0	0	0	0	0	0	**38**
Total	**14**	**27**	**14**	**16**	**2**	**8**	**8**	**5**	**5**	**3**	**1**	**1**	**108**

International publications

1. Lorn, D., Ho, P. H., Tan, R., Licandro, H., & Waché, Y. (2021). Screening of lactic acid bacteria for their potential use as aromatic starters in fermented vegetables. *International Journal of Food Microbiology, 350*, 109242. (**IF: 5.277**)
2. Rodriguez, C., Mith, H., Taminiau, B., Bouchafa, L., Van Broeck, J., Soumillion, K., ... & Daube, G. (2021). First isolation of Clostridioides difficile from smoked and dried freshwater fish in Cambodia. *Food Control, 124*, 107895. **(IF: 5.548)**

3. Sroy, S., Arnaud, E., Servent, A., In, S., & Avallone, S. (2021). Nutritional benefits and heavy metal contents of freshwater fish species from Tonle Sap Lake with SAIN and LIM nutritional score. *Journal of Food Composition and Analysis*, *96*, 103731. (**IF: 4.556**)
4. Anal, A. K., Perpetuini, G., Petchkongkaew, A., Tan, R., Avallone, S., Tofalo, R., ... & Waché, Y. (2020). Food safety risks in traditional fermented food from South-East Asia. *Food Control*, *109*, 106922.
5. Hor, S., Léchaudel, M., Mith, H., & Bugaud, C. (2020). Fruit density: A reliable indicator of sensory quality for mango. *Scientia Horticulturae*, *272*, 109548.
6. Morm, E., Ma, K., Horn, S., Debaste, F., Haut, B., & In, S. (2020). Experimental Characterization of the Drying of Kampot Red Pepper (Piper nigrum L.). *Foods*, *9*(11), 1532.
7. Sroy, S., Arnaud, E., Servent, A., In, S., & Avallone, S. (2021). Nutritional benefits and heavy metal contents of freshwater fish species from Tonle Sap Lake with SAIN and LIM nutritional score. *Journal of Food Composition and Analysis*, *96*, 103731.
8. Song, M., Chapuis, E., Leng, V., Tivet, F., De Waele, D., Thi, H. N., & Bellafiore, S. (2019). Impact of a conservation agriculture system on soil characteristics, rice yield, and root-parasitic nematodes in a Cambodian lowland rice field. *Journal of Nematology*, *51*.
9. Ly, S., Bajoul Kakahi, F., Mith, H., Phat, C., Fifani, B., Kenne, T., ... & Delvigne, F. (2019). Engineering synthetic microbial communities through a selective biofilm cultivation device for the production of fermented beverages. *Microorganisms*, *7*(7), 206.
10. Anal, A. K., Waché, Y., Louzier, V., Laurent, R., Mens, F., Avalllone, S., ... & Guidi, A. (2020). AsiFood and its output and prospects: An Erasmus+ project on capacity building in food safety and quality for South-East Asia. *Food Control*, *109*, 106913.
11. Peng, C., Hanawa, T., Azam, A. H., LeBlanc, C., Ung, P., Matsuda, T., ... & Tanji, Y. (2019). Silviavirus phage ϕMR003 displays a broad host range against methicillin-resistant Staphylococcus aureus of human origin. *Applied microbiology and biotechnology*, *103*(18), 7751-7765.
12. Khoeurn, K., Sakaguchi, A., Tomiyama, S., & Igarashi, T. (2019). Long-term acid generation and heavy metal leaching from the tailings of Shimokawa mine, Hokkaido, Japan: Column study under natural condition. *Journal of Geochemical Exploration*, *201*, 1-12.
13. Bajoul Kakahi, F., Ly, S., Tarayre, C., Deschaume, O., Bartic, C., Wagner, P., ... & Delvigne, F. (2019). Modulation of fungal biofilm physiology and secondary product formation based on physico-chemical surface properties. *Bioprocess and biosystems engineering*, *42*(12), 1935-1946.
14. Try, S., Voilley, A., Chunhieng, T., De-Coninck, J., & Waché, Y. (2018). Aroma compounds production by solid state fermentation, importance of in situ gas-phase recovery systems. *Applied microbiology and biotechnology*, *102*(17), 7239-7255.
15. Try, S., De-Coninck, J., Voilley, A., Chunhieng, T., & Waché, Y. (2018). Solid state fermentation for the production of γ-decalactones by Yarrowia lipolytica. *Process Biochemistry*, *64*, 9-15.
16. Waché, Y., Do, T. L., Do, T. B. H., Do, T. Y., Haure, M., Ho, P. H., ... & Chu-Ky, S. (2018). Prospects for food fermentation in South-East Asia, topics from the tropical fermentation and biotechnology network at the end of the AsiFood Erasmus+ Project. *Frontiers in Microbiology*, 2278.
17. Ly, S., Mith, H., Tarayre, C., Taminiau, B., Daube, G., Fauconnier, M. L., & Delvigne, F. (2018). Impact of microbial composition of Cambodian traditional dried starters (Dombea) on

flavor compounds of rice wine: combining amplicon sequencing with HP-SPME-GCMS. *Frontiers in Microbiology, 9*, 894.

18. Yoeun, S., Cho, K., & Han, O. (2018). Structural evidence for the substrate channeling of rice allene oxide cyclase in biologically analogous Nazarov reaction. *Frontiers in chemistry, 6*, 500.
19. Ung, P., Peng, C., Yuk, S., Ann, V., Mith, H., Tan, R., ... & Tanji, Y. (2018). Fate of Escherichia coli in dialysis device exposed into sewage influent and activated sludge. *Journal of Water and Health, 16*(3), 380-390.
20. Phat, C., Kim, S., Park, J., & Lee, C. (2017). Detection of emetic toxin genes in Bacillus cereus isolated from food and their production of cereulide in liquid culture. *Journal of Food Safety, 37*(1), e12293.
21. Nguyen, H. T., Truong, D. H., Kouhoundé, S., Ly, S., Razafindralambo, H., & Delvigne, F. (2016). Biochemical engineering approaches for increasing viability and functionality of probiotic bacteria. *International Journal of Molecular Sciences, 17*(6), 867.
22. Mith, H., Yayi-Ladékan, E., Sika Kpoviessi, S. D., Yaou Bokossa, I., Moudachirou, M., Daube, G., & Clinquart, A. (2016). Chemical composition and antimicrobial activity of essential oils of Ocimum basilicum, Ocimum canum and Ocimum gratissimum in function of harvesting time. *Journal of Essential Oil Bearing Plants, 19*(6), 1413-1425.
23. Phat, C., Moon, B., & Lee, C. (2016). Evaluation of umami taste in mushroom extracts by chemical analysis, sensory evaluation, and an electronic tongue system. *Food chemistry, 192*, 1068-1077.
24. Kim, E., Noh, H. M., Phat, C., Lee, G. P., Kim, J. H., Park, T. S., & Lee, C. (2016). Identification and Safety Assessment of Cucumber Mosaic Virus Coat Protein in Genetically Modified Pepper (Capsicum annuum). *Horticultural Science & Technology, 34*(6), 924-939.
25. Yoeun, S., Sukhanov, A., & Han, O. (2016). Separation of enzymatic functions and variation of spin state of rice allene oxide synthase-1 by mutation of Phe-92 and Pro-430. *Bioorganic Chemistry, 68*, 9-14.
26. Waché, Y., Ho, P. H., Phan-Thi, H., Simonin, H., Le Do, T. T., Try, S., ... & Chu-Ky, S. (2015). Explorer la biodiversité pour trouver de nouvelles souches microbiennes pour les innovations de produits alimentaires. *IAA La revue des industries agroalimentaires*, 25-29.
27. Mith, H., Clinquart, A., Zhiri, A., Daube, G., & Delcenserie, V. (2015). The impact of oregano (Origanum heracleoticum) essential oil and carvacrol on virulence gene transcription by Escherichia coli O157: H7. *FEMS microbiology letters, 362*(1), 1-7.
28. Phat, C., Li, H., Lee, D. U., Moon, B., Yoo, Y. B., & Lee, C. (2015). Characterization of Hericium erinaceum powders prepared by conventional roll milling and jet milling. *Journal of Food Engineering, 145*, 19-24.
29. Choi, J., Phat, C., Kim, E., Kim, M., Lee, G. P., Ryu, K. H., & Lee, C. (2015). Improved detection of Cucumber mosaic virus coat protein (CMV-CP) in genetically modified pepper (Capsicum annuum) using a polyclonal antibody to a synthetic CP peptide. *Horticulture, Environment, and Biotechnology, 56*(3), 316-323.
30. Yoeun, S., Sukhanov, A., & Han, O. (2015). Binding of Imidazole Stabilizes Low-spin State of Heme Iron in Dual-Substrate-Specific Rice Allene Oxide Synthase-1. *Bulletin of the Korean Chemical Society, 36*(8), 2015-2019.
31. Yoeun, S., Kim, J. I., & Han, O. (2015). Cellular localization and detergent dependent oligomerization of rice allene oxide synthase-1. *Journal of plant research, 128*(1), 201-209.

32. Bellafiore, S., Jougla, C., Chapuis, É., Besnard, G., Suong, M., Vu, P. N., ... & Thi, X. N. (2015). Intraspecific variability of the facultative meiotic parthenogenetic root-knot nematode (Meloidogyne graminicola) from rice fields in Vietnam. *Comptes Rendus Biologies, 338*(7), 471-483.

33. Mith, H., Dure, R., Delcenserie, V., Zhiri, A., Daube, G., & Clinquart, A. (2014). Antimicrobial activities of commercial essential oils and their components against food-borne pathogens and food spoilage bacteria. *Food science & nutrition, 2*(4), 403-416.

34. Lee, H. S., Phat, C., Nam, W. S., & Lee, C. (2014). Optimization of culture conditions of Fusarium solani for the production of neo N-methylsansalvamide. *Bioscience, Biotechnology, and Biochemistry, 78*(8), 1421-1427.

35. Seo, D. G., Phat, C., Kim, D. H., & Lee, C. (2013). Occurrence of Fusarium mycotoxin fumonisin B1 and B2 in animal feeds in Korea. *Mycotoxin research, 29*(3), 159-167.

36. Lee, H. S., Phat, C., Choi, S. U., & Lee, C. (2013). Synergistic effect of a novel cyclic pentadepsipeptide, neoN-methylsansalvamide, and paclitaxel on human multidrug resistance cancer cell lines. *Anti-Cancer Drugs, 24*(5), 455-460.

37. Yoeun, S., Rakwal, R., & Han, O. (2013). Dual positional substrate specificity of rice allene oxide synthase-1: insight into mechanism of inhibition by type II ligand imidazole. *BMB reports, 46*(3), 151.

38. Pham, H. N., Tan, R., Miyanaga, K., & Tanji, Y. (2013). Investigation of Hydrogen Sulfide Production in a Polluted Estuary by Using a Vertical Column Simulator. *Journal of chemical engineering of Japan, 46*(5), 359-366.

39. Fidero, K., Hiroshi, M., & Kiyohiko, N. (2013). Reduction of ammonia inhibition of organic matter degradation by turning during a laboratory-scale swine manure composting. *International Journal of Waste Resources (IJWR), 3*(1), 5-8.

40. Tan, R., Miyanaga, K., Uy, D., & Tanji, Y. (2012). Effect of heat-alkaline treatment as a pretreatment method on volatile fatty acid production and protein degradation in excess sludge, pure proteins and pure cultures. *Bioresource Technology, 118*, 390-398.

41. Fidero Kuok, Hiroshi Mimoto, Kiyohiko Nakasaki (2012). Effects of turning on the microbial consortia and the in situ temperature preferences of microorganisms in swine manure composting. Bioresource Technology, Vol. 116, 421-427.

42. Cho, K., Kim, Y. C., Woo, J. C., Rakwal, R., Agrawal, G. K., Yoeun, S., & Han, O. (2012). Transgenic expression of dual positional maize lipoxygenase-1 leads to the regulation of defense-related signaling molecules and activation of the antioxidative enzyme system in rice. *Plant science, 185*, 238-245.

43. Hav, M., Eav, S., Ky, V., Cuvelier, C., In, S., Kong, R., ... & Lem, D. (2011). Colorectal cancer in young Cambodians. *Asian Pac J Cancer Prev, 12*(4), 1001-5.

44. Tan, R., Miyanaga, K., Toyama, K., Uy, D., & Tanji, Y. (2010). Changes in composition and microbial communities in excess sludge after heat-alkaline treatment and acclimation. *Biochemical engineering journal, 52*(2-3), 151-159.

Local publications

1. Y. Nat, P. Houng, S. Lay, 2021. Effect of Ultrasound-Assisted Extraction Condition on Extraction of Bioactive Compounds from Khmer White Turmeric (*Curcuma Zedoaria*). The Bulletin of Cambodian Chemical Society 12.
2. S. Yoeun, S. Ly, F. Kuok, 2021. Alcohol-Based Hand Rub Analysis by High Performance Liquid Chromatography. The Bulletin of Cambodian Chemical Society 12.
3. S. Hoeun, S. Lay, P. Houng, S. In, 2021. Impact of Blanching and Drying on Bioactive Compounds of Black Turmeric. The Bulletin of Cambodian Chemical Society 12.
4. S. Lay, P. Houng, S. In, 2021. Effects of Solvent and Time on Extraction of Bioactive Compounds from Cambodia Black Turmeric Using Ultrasound-Assisted Extraction. Techno-Science Research Journal 9.
5. M. Yin, S. Heng, S. Rem, L. Chin, 2021. Development of Spicy Sweet Chili Sauce. Techno-Science Research Journal 9.
6. M. Yin, W. Ratphitagsanti, N. Therdthai, 2021. Changes on Qualities of Gluten-free Chalky Rice Breadstick during Storage. Techno-Science Research Journal 9.
7. S. Chuon, M. T. Chanto, R. Tan, C. Peng, 2021. Isolation and Characterization of Lactic Acid Bacteria from Soy-based Products. Techno-Science Research Journal 9.
8. L. Ly, M. T. Chanto, C. Peng, R. Tan, 2020. Market study of soy sauces in Cambodia. Techno-Science Research Journal, 2020, Volume 8, 64–68.
9. S. Kai, S. Yeoun, C. Phat, 2020. Analysis of pesticide residues in sediment from Chhnok Tru, Kampong Chhnang using different extraction methods. Techno-Science Research Journal 8.
10. D. Vantha, C. Peng, H. Mith, 2020. Detection and susceptibility of antibiotic-resistant Enterococcus spp. in fermented and pickled vegetables. Techno-Science Research Journal 8.
11. C. Phat, S. Rann, P. Teav, S. Soeung, F. Kuok, E. G. Mariquit, W. Kuriniawan, H. Hinode, 2020. Assessment of pesticide residues in surface water, sediment, and fish from Chhnok Tru, Kampong Chhnang. Techno-Science Research Journal 8.
12. S. Hoeun, E. Mom, S. In, 2020. Optimization of white pepper (*Piper nigrum* L.) processing by enzymatic activity. Techno-Science Research Journal 8.
13. V. Phoem, S. Ly, H. Mith, 2020. Cambodian Rice Liquor Development using *Rhizopus oryzae*, Saccharomyces cerevisiae and alpha-amylase. Techno-Science Research Journal 8.
14. S. Yoeun, 2020. High Performance Liquid Chromatography: Principle and Basic Application. The Bulletin of Cambodian Chemical Society 11.
15. P. Ek, F. Kuok, W. Kuriniawan, E. G. Mariquit, H. Hinode, C. Phat, 2020. Preliminary study on chemical pollutants in Tonie Sap Lake, Cambodia. The Bulletin of Cambodian Chemical Society 11.
16. R. Kong, S. Lun, P. Kang, C. Soeng, L. Blanchot, S. Kim, M. Leti, B. Fabre, H. Mith, 2020. Optimization of extraction and analysis of physico-chemical properties and chemical compositions of fatty oils extracted from kernel seed of different mango (*Mangifera indica* L.) varieties. The Bulletin of Cambodian Chemical Society 11.
17. K. Saing, S. HUL, 2019. Behavioural Study of People toward Plastic Bag Generation and Characteristics of Plastic Waste Composition in Phnom Penh Municipality, Cambodia. Techno-Science Research Journal 7.

18. Y. Nat, S. Hor, C. Taing, R. Kan, F. Kuok, C. Or, S. Hul, M. Hata, M. Furuuchi, 2018. Size distribution of particulate matters surrounding the burning zones of medical wastes in the remote area of Cambodia. Techno-Science Research Journal 6.
19. C. Taing, P. Ek, F. Kuok, 2017. Effects of Aluminium Sulfate and Klaraid during Wastewater Treatment Process at a Beverage Company in Phnom Penh, Cambodia. Techno-Science Research Journal 5.
20. K. Hong, R. Tan, K. Miyanaga, Y. Tanji, 2016. Optimization of white radish fermentation with rice bran. Techno-Science Research Journal 4.
21. R. Tan, D. Chan, T. Chunhieng, 2016. Biodiesel production from used frying oil in Phnom Penh. Techno-Science Research Journal 4.
22. C. Taing, P. Ek, F. Kuok, 2015. Effects of Aluminium Sulfate and Klaraid during Wastewater Treatment Process at a Beverage Company in Phnom Penh, Cambodia. Techno-Science Research Journal 3.
23. S. Srey, P. Ek, F. Kuok, 2015. Effects of Ferrous Sulfates and Poly-aluminum Chloride in Beverage Wastewater Treatment. Techno-Science Research Journal 3.
24. P. Ung, K. Yem, T. Chunhieng, 2014. Production de Biogaz à Partir des Résidus de Levures. Techno-Science Research Journal 2.
25. S. Yuk, W. A. Baraoidan, J. L. Auresenia, 2015. Optimization of the Biodegradation of 17-α-ethynylestradiol (EE2) using Response Surface Methodology. Techno-Science Research Journal 2.
26. R. Tan, S. Sdok, L. Sena, S. Eang, S. Chan, S. Heng, K. Miyanaga, Y. Tanji, 2014. Isolation and characterization of lactic acid bacteria in four different kinds of fermented vegetables sold in the markets. Techno-Science Research Journal 2.

Conference/Proceedings

1. S. Lay, P. Houng, 2021. Optimization of Ultrasound-Assisted Extraction of Phenolic Compounds from Cambodia Black Turmeric. *The 14th AUN/SEED-Net Regional Conference on Chemical Engineering 2021 (RCChE2021), In Conjunction with 1st International Conference on Innovation in Chemical Engineering & Technology (ICICET 2021)*, Selangor, Malaysia.
2. T. Or, M. Lim, D. Sang, M. T. Chanto, R. Tan, 2021. Improving Removal Efficiency of Natural Organic Matter from Drinking Water Treatment Plant by Powder Activated Carbon Injection in Coagulation Process. *The 6th International Symposium on Conservation and Management of Tropical Lakes, In Conjunction with The 3rd International Conference on Tropical Limnology (TROPLIMNO III)*, Phnom Penh, Cambodia.
3. L. Meak, S. Khoun, T. Mao, C. Phat, 2021. Assessment of Pesticides Residue in Groundwater in Kampong Thom, Cambodia. *The 6th International Symposium on Conservation and Management of Tropical Lakes, In Conjunction with The 3rd International Conference on Tropical Limnology (TROPLIMNO III)*, Phnom Penh, Cambodia.
4. S. Yoeurm, S. Khuon, C. Phat, S. Yeoun, 2021. Assessment of Pesticides Residues in the Farm Soils and Sediment from Chhnok Tru, Kampong Chhnang. *The 6th International Symposium on Conservation and Management of Tropical Lakes, In Conjunction with The 3rd International Conference on Tropical Limnology (TROPLIMNO III)*, Phnom Penh, Cambodia.

5. V-D. Pham, S. In, S. Sroy, M. Soeung, M. Nishiyama, S. Heng, H. Mith, S. Nget, T. Watanabe, 2021. Assessment of Heavy Metal(loid) Accumulation and Sources in Six Edible Fish Species of Tonle Sap Lake, Cambodia. *The 6th International Symposium on Conservation and Management of Tropical Lakes, In Conjunction with The 3rd International Conference on Tropical Limnology (TROPLIMNO III)*, Phnom Penh, Cambodia.
6. C. Phat, S. Yoeun, M. Ouk, K. Kun, F. Kuok, B. Ty, W. Kurniawan, E. G. Mariquit, H. Hinode, 2021. Assessment of pesticide contamination in vegetable and water from Chhnok Tru floating communities of Tonle Sap Lake. *The 35th Congress of the International Society of Limnology* (*SIL2021)*, Gwangju, Republic of Korea.
7. R. Tan, C. Be, C. Peng, P. Ung, K. Miyanaga, Y. Tanji, 2021. Investigation of Multidrug-Resistant Bacteria in Tonle Sap Lake, Tonle Sap River, Mekong River, and Wastewater. *The 35th Congress of the International Society of Limnology* (*SIL2021)*, Gwangju, Republic of Korea.
8. P. Ung, K. Seang, S. Keo, R. Tan, K. Miyanaga, Y. Tanji, 2021. Assessment of Microbiological Water Quality in Tonle Sap River and Kob Srov Lake in Phnom Penh, Cambodia. *The 35th Congress of the International Society of Limnology* (*SIL2021)*, Gwangju, Republic of Korea.
9. S. Sok, P. Thach, K. Miyanaga, R. Tan, 2020. Development of a Package Containing PAC and $Ca(OCl)_2$ for Drinking Water Treatment of Lake Water. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
10. S. In, S. Nget, S. Heng, D. V. Pham, M. Nishiyama, H. Mith, T. Watanabe, 2020. Bioaccumulation of heavy metals and trace elements in six fish species from Tonle Sap Lake, Cambodia. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
11. T. Yann, K. Miyanaga, R. Tan, 2020. The effectiveness of different types of polyaluminum chloride (PAC) and aluminum *sulfate* (alum) with $Ca(OCl)_2$ dosing for treatment surface water of Tonle Sap River. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
12. C. Phat, K. Kun, V. Pheap, S. Yoeun, E. G. Mariquit, W. Kuriniawan, H. Hinode, 2020. Assessment of Pesticide Residues in Surface Water and Fish from Chhnok Tru, Kampong Chhnang. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
13. K. Ngoun, G. Chhun, R. Tan, 2020. Optimization of Young Mango Fermentation and Effect of Different Preservation Methods on its Shelf-life. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
14. C. Nong and S. In, 2020. The effect of blanching on curcumin content and chemical composition of essential oils of dried Turmeric (*Curcuma longa*). *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

15. S. Hoeun, S. Meas, E. Morm, S. In, 2020. Production of White Pepper from Ripe Pepper Berries (*Piper nigrum* L.). *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

16. M. Net, D. Dim, R. Tan, 2020. Development of Fermented Small Cucumbers with Different Tastes Using Isolated Lactic Acid Bacteria. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

17. T. Kong, S. Hean, R. Tan, 2020. Development of Fermented Young Melon using Isolated Lactic Acid Bacteria. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

18. C. Sam, S. Nget, S. Heng, S. In, M. Nishiyama, T. Watanabe, H. Mith, 2020. Determination of Antibiotic Resistance of Enterococcus spp. Isolated from Drinking Water Collected from Stoung District. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

19. B. Bun, S. Nget, S. Heng, S. In, N. Maseteru, T. Watanabe, H. MitH, 2020. Investigation on Antibiotic Resistance of Escherichia coli Isolated from Drinking Water Collected in Stoung District. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

20. S. Sat, S. Nget, S. Heng, S. In, M. Nishiyama, T. Watanabe, H. Mith, 2020. Study on Antibiotic Resistance of Pseudomonas aeruginosa Isolated from Drinking Water Collected from Three communes in Kampong Thom Province. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

21. S. Phuong, M. T. Chanto, C. Peng, K. Miyanaga, R. Tan, 2020. Detection of Antibiotic-Resistant Bacteria in Water Environment of Tonle Sap Area and Wastewater. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

22. L. Ly, M. T. Chanto, C. Peng, R. Tan, 2020. Price Evaluation and Quality Control of Different Soy Sauces Sold in the Markets. *The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020), Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

23. C. Heang, S. Keo, C. Hok, K. Kong, C. Phat, F. Kuok, E.G. Mariquit, W. Kuriniawan, H. Hinode, 2019. Analysis of pesticide residues in surface water in Chhnok Tru community of Tonle Sap Lake. *The 4th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

24. K. Kong, C. Hok, C. Heang, S. Keo, C. Phat, F. Kuok, E.G. Mariquit, W. Kuriniawan, H. Hinode, 2019. Assessment of pesticide residues in surface water of Tonle Sap Lake, Cambodia during rainy season. *The 4th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

25. I. Yoneda, S. Ang, M. Nishiyama, H. Mith, R. Khanal, S. In, T. Watanabe, 2019. Spatial distribution of E. coli concentration in the Tonle Sap Lake during low water level season. *The*

4th International Symposium on Conservation and Management of Tropical Lakes, Phnom Penh, Cambodia.

26. M. Nishiyama, H. Mith, S. Nget, S. Say, S. In, J. Pu, T. Watanabe, 2019. Investigation of antimicrobial resistance of Enterococci collected from drinking water in Tonle Sap Lake, Cambodia. *The 4th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
27. S. Keo, M. Svay, P. Ung, 2019. Characterization of Tonle Sap River water quality as influent by untreated domestic wastewater. *The 4th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
28. E.S. Leaksmy and T. Reasmey, 2019. Study the Effectiveness of Different Natural Coagulants for Turbidity Removal from Tonle Sap River Water. *The 4th International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
29. C. Phat, F. Kouk, E.G. Mariquit, W. Kuriniawan, H. Hinode, 2019. Analysis of Pesticide Residues in Surface Water in Chnok Tru Floating Community of Tonle Sap Lake during Low Water Season. *The 12th Regional Conference on Chemical Engineering (RCChE 2019)*, Ho Chi Minh City, Vietnam.
30. K. Hin, L. Thourn, V. Leng, S. Chheong, F. Tivet, F. Kuok, 2018. Effect of Conventional plough-based Tillage (CT) and Direct Seeding Mulchbased Cropping Systems (DMC) on Soil Chemical and Mineralogical Properties in Kampong Thom. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
31. O. Heng, F. Kuok, V. Hul, L. Khun, S. Ol, L. Kong, T. Hoem, J. Cappelle, P. Dussart, V. Duong, 2018. Identification of bat species and astrovirus contained in samples from bat in Cambodia. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
32. C. Peng, P. Ung, K. Miyanaga, R. Tan and Y. Tanji, 2018. Response of Bacterial Community in Sewage Influent to Antibiotic Treatment. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
33. S. Chheun, C. Peng, R. Tan, C. Vann, S. Un, S. Aun, S. Penh, P. Ung, K. Miyanaga, Y. Tanji, 2018. Monitoring of Antibiotic-Resistant Bacteria in Tonle Sap River, Mekong River, and Wastewater in Dry Season. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
34. S. Penh, K. Miyanaga, P. Ung, R. Tan, S. Un, S. Aun, S. Chheun, Y. Tanji, 2018. Study the Effects of PAC Coagulant and $Ca(OCl)_2$ on Escherichia fergusonii and T4 Phage. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
35. C. Phat, F. Kuok, E. G. Mariquit, W. Kuriniawan, H. Hinode, 2018. Pesticide Residues in Sediment and Fish from Chnok Tru Floating Community of Tonle Sap Lake. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
36. P. Ung, S. Un, S. Chheun, S. Aun, S. Penh, S. Sann, R. Tan, K. Miyanaga, Y. Tanji, 2018. Analysis of Total Bacterial Concentration and Microbial Community in Waters Used by

Floating Villagers, Tonle Sap Lake. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

37. S. Aun, R. Tan, S. Un, S. Chheun, S. Penh, C. Peng, P. Ung, K. Miyanaga, Y. Tanji, 2018. Monitoring the Pathogenic Bacteria in Mekong River and Tonle Sap River. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.
38. S. Rann, C. Phat, F. Kuok, E. G. Mariquit, W. Kuriniawan, H. Hinode, 2018. Assessment of Pesticide Residues in Surface Water at Chhnok Trou Floating Community, Tonle Sap Lake. *The 11th Regional Conference on Environmental Engineering 2018 (RCEnvE-2018), Jointly held with The 3rd International Symposium on Conservation and Management of Tropical Lakes*, Phnom Penh, Cambodia.

5.4.3. Mechatronics and Information Technology (MIT Unit)

Cambodian Context

The booming of the IT and communication sector in Cambodia enables to transfer large amount of data from every single part of the territory at low cost. At the same time, agriculture, climate and weather authorities, public health institutions, energy firms, town councils…produce a growing number of data with the support of smartphones or data acquisition devices. The processing and the correct use of this information is a challenge in Cambodia under the threat of epidemics, climate change or air pollution events where fast processing and fast reactions are required.

On another hand, the food, mining and manufacturing industries do also require data science – for quality control -, but also actions and corrections, therefore an academic expertise in automatics and control, robotics, embedded objects are likely to trigger the development of cheap, smart devices (smartphones apps, small robots, controllers) for SMEs focused on high technology but with small capital investment.

Vision

To be center of excellence in Intelligent Mechatronics and Intelligent Decision Support System.

Mission

To advance applied multidisciplinary research of Mechatronics, Artificial Intelligence, Telecommunication, and Aerospace through national and international collaborations for fostering national academic community and serving society.

The Research Themes

The combination of the different areas: information science and mechatronics allows developing specific topics related to the Cambodian context as:

- Aerospace and Space Engineering
- Artificial Intelligence
  (Machine Learning, Deep Learning, and Optimization)
- Intelligent Mechatronics
- Telecommunication and Internet of Things

- Operation Research
- Supply Chain Management

Projects and Research Topics

The list of projects and research topics that are implementing in MIT unit as shown in the table below. For more detail information refers to a table in Annex 15.

Table 16. Research topics in MIT unit for the academic year 2021-2022

No.	Name of PI (FAMILY First name)	Sexe	Project/Research Topic	Funding source	Period	Collaboration scale * N = National R = Regional I = International	Project Type* 1= Basic 2 = Applied & Development 3 = Start-up 4 = Tech-transfer
1	Dr. SRANG Sarot	M	Development of Nanosatellite for Demo	MoEYS	2021-2024	N	2
2	M. TIM Hoksong	M	Development of Small Rocket for Experiment	MoE	2021-2022	N	2
3	Dr. THOURN Kosorl	M	Initiative Towards Electrical and Electronic Product Testing and Certification by EMC Laboratory	HEIP	2019-2023	N	2
4	Dr. THOURN Kosorl	M	Non-intrusive appliance load monitoring and diagnostics in residential homes	JICA	2020-2022	I	2
5	Dr. THOURN Kosorl	M	ASEAN Factory 4.0	Erasmus	2020-2023	I	2
6	Dr. VALY Dona	M	Ancient Manuscript Digitization and Indexation	HEIP	2020-2023	N	2
7	M. SOK Kimheng	M	Building trustable and privacy aware IoT systems using blockchain and smartvontracts	Government of Cambodia + ARES-CCD	2017-2022	I	2
8	M. TEP Sovichea	M	Power quality monitoring based on the deployment of sensors in the grid and parameter measurement	Government of Cambodia + BGF	2020-2022	I	2
9	M. YONRITH Phayuth	M	Indoor mobile robot localization using multisensor data fusion	MoE	2021-2022	N	2
10	M. KEO Chivorn	M	Flight controller and structural design for fixed-wing unmanned aerial vehicle (UAV)	AOARD	2022-2024	I	2
11	M. BAN Sam	M	Developing Countries' Transportation Enhancement through the Application of Physical Internet Paradigms	Government of Cambodia +	2019-2022	I	2

				ARES-CCD			
12	Dr. KIM Bunthern	M	Applied Control and Automation for Agriculture in Cambodia (ACAAC)	HEIP	2019-2023	N	2
13	M. HEL Chanthan	M	Toward Production Innovation via FabLab-ITC	HEIP	2019-2023	N	2
14	Dr. TITH Dara	M	Proof-of-Concept of Applying Blockchain Technology for Decentralized Identification Management of Medical System	LBE-JICA	2021-2022	I	2

Researchers

Dr. SRANG Sarot (Head of MIT research unit), Ph.D. in Engineering, Tokyo Institute of Technology, Japan
Instrumentation, estimation, control and robotics, dynamic modelling, simulation, Artificial Intelligence.

Dr. PEC Rothna, Ph.D. in Communication Engineering, Tokyo Institute of Technology, Japan.
Digital Signal Processing; radio communication; microwave and RF systems

Dr. PO Kimtho, Ph.D. in Communication Engineering, Tokyo Institute of Technology, Japan.
Digital Signal Processing; radio communication; microwave and RF systems

Dr. SRENG Sokchenda, Ph.D. in Telecommunication Engineering, INP Toulouse, France
Wireless communications, satellite communications, digital image processing

Dr. SIM Tepmony, Ph.D. in Information Science, Electronics and Communications, Telecom Paris, France
Markov theory; statistics; probability; maximum likelihood

Dr. THOURN Kosorl, Ph.D. in Electromagnetic Wave, Tokyo Institute of Technology, Japan
Computational methods for electromagnetics, electromagnetic compatibility, wave propagation, pattern recognition, image processing, computer vision

Dr. VALY Dona, Ph.D. in Image Processing and Deep Learning for Text Recognition from *Image, Louvain University, Belgium.*

Dr. TITH Dara, Ph.D. in Cybersecurity, Application Design and Medical Information System from Tokyo Institute of Technology, Japan

Dr. KIM Bunthern, Ph.D. in Electrical Engineering, INP Toulouse, France
Control system, robotics, renewable energy, automation, energy generation system

Mr. HEL Chanthan, Master in Telecommunication, Chulalonkorn University, Thailand
Wireless communication, Technology for agriculture

Dr. KONG Phutphalla, a Ph.D. candidate in Computer Engineering from University of Mons (UMONS), Belgium.

Mr. Chhorn Sopheaktra, Master in Electrical and Energy Engineering from Chulalongkorn University, Thailand.
Research interested: "Measurement instrument, Internet of Thing and Medical device"

Mr. KUY Movsun, Master in Mobile Technology, Institute of Technology of Cambodia
Mr. Chin Chan Daraly, Master in Telecommunication Networking from Chulalongkorn University, Thailand.

Mr. TEP Sovichea, M.Sc in Electronic System for Embedded and Communication Applications, INPT-ENSEEIHT, Toulouse, France
Research interest: "digital circuit design, PCB design and manufacturing, Internet of things, wireless sensor node, smart grid communication, industrial networks"

Mr. SOK Kimheng, Ph.D. candidate in Cybersecurity, Blockchain and Smart Contract, University of Namure, Belgium.

Mr. KEAN Jeudi, Ph.D. candidate in Telecommunication Engineering, INP-ENSEEIHT Toulouse, France

Mr. BAN Sam, Ph.D. candidate in Suply Chain Management, IMT-Albi, France

Mr. KEO Chivorn, Master in Industrial and Mechanical Engineering from Institute of Technology of Cambodia, Cambodia.

Mr. YONRITH Phayuth, Master in Mechatronics, Information and Communication Engineering, Institute of Technology of Cambodia.

Mr. TIM Hoksong, Master in Mechatronics, Information and Communication Engineering, Institute of Technology of Cambodia.

Academic Partners

Tokyo Institute of Technology, Japan
Toyohashi University of Technology, Japan
INP Toulouse, France
Institut Mines-Telecom, France
University of Namur, Belgium.

Non-academic partners

Asian Office of Aerospace Research and Development
Ministry of Education, Youth and Sports, Cambodia
Ministry of Water Resources and Meteorology, Cambodia
Ministry of Rural Development, Cambodia
Ministry of Industry and Handicraft, Cambodia
Ministry of Public Works and Transport, Cambodia
Ministry of Environment
JICA, Japan
Institut Pasteur du Cambodge

Industrial Partners and NGOs

The Sirea Group, France
Solar Green Energy Co., Ltd. Cambodia

Selected publications of MIT researchers since 2010

From 2020 to 2021, there are in total 98 research outputs from MIT unit classified into three categories: International publications, Local publications, and Conference and Proceedings as shown in the table below.

Table 17. Summary of number of research publications by year from 2010 to 2021

Publication classification/year	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	Total
International publications	0	1	1	4	0	4	2	1	2	0	1	0	**16**
Local publications	6	6	1	2	2	0	0	0	1	0	0	0	**17**
Conference/ Proceedings	6	5	3	8	4	8	8	7	3	1	1	1	**64**
Total	**12**	**12**	**5**	**14**	**6**	**12**	**10**	**8**	**6**	**1**	**1**	**1**	**97**

International publications

1. Sarot Srang, Sopagna Ath, and Masaki Yamkita, “Newton-Euler Based Dynamic Modeling and Control Simulation for Dual-Axis Parallel Mechanism Solar Tracker” Advances in Science, Technology and Engineering Systems Journal. Vol. 5, No. 5, 709-716, 2020.
2. M. Asim, R. Pec, T. H. Im, Y. S. Cho, “Cell Search Techniques for Underwater Acoustic Cellular Systems.” IEEE Access, vol. 7, pp. 106019-106033, 2019.
3. M. S. Khan, R. Pec, C. H. Park, and Y. S. Cho “Random Access Preamble Design for High-Velocity User in Millimeter-Wave Cellular Networks,” IEEE Access, vol. 6, pp. 66047-66054, 2018.
4. R. Pec, M. S. Khan, M. Asim, and Y. S. Cho, “Random Access for Underwater Acoustic Cellular Systems,” Sensors Journal, 18 (2): 432, 2018.
5. M.A. Jasper, R. Pec, Y.S. Cho, “An efficient handover measurement technique for millimeter-wave cellular communications,” IEICE Transaction on Communication, vol. 101-B (2), pp. 592-602, 2018.
6. Kesiman, Made Windu Antara, Dona Valy, Jean-Christophe Burie, Erick Paulus, Mira Suryani, Setiawan Hadi, Michel Verleysen, Sophea Chhun, and Jean-Marc Ogier. "Benchmarking of document image analysis tasks for palm leaf manuscripts from southeast asia." Journal of Imaging 4, no. 2 (2018): 43.
7. R. Pec, C.H. Park, Y.S. Cho, “Efficient handover measurement technique for small-cell networks using a virtual cell synchronization signal,” Wireless Communication and Mobile Computing, vol. 16, pp. 3408-3422, 2016

8. R. Pec, J.H. Choi, C.H. Park, Y.S. Cho, “Synchronization method for LTE-based machine-type communication in low-power cellular IoT,” International Journal of Distributed Sensor Networks, vol. 12, No. 8, pp. 1-14, 2016.
9. M.N. Lee, R. Pec, K.S. Kim, C.H. Park, Y.S. Cho, “An interference rejection combining technique for an SFBC-OFDM system with multiple carrier frequency offsets,” IEICE Transaction on Communication, vol. E99-B, no. 2, pp. 481-487, 2016.
10. Kesiman, Made WA, Dona Valy, Jean-Christophe Burie, Erick Paulus, I. Made Gede Sunarya, Setiawan Hadi, Kim Heng Sok, and Jean-Marc Ogier. "Southeast Asian palm leaf manuscript images: a review of handwritten text line segmentation methods and new challenges." Journal of Electronic Imaging 26, no. 1 (2016): 011011.
11. R. Pec, B.W. Ku, K.S. Kim, Y.S. Cho, “A receive beamforming technique for an LTE-based mobile relay station with antenna array,” IEEE Transactions on Vehicular Technology, vol. 64, no. 7, pp. 3299-3304, 2015.
12. R. Pec, J.H. Choi, Y.S. Cho, “A receive beamforming technique for a mobile station with multiple antenna arrays in mm-wave cellular communications,” IEICE Transaction on Communication, vol. E98-B, no. 3, pp. 456-466, 2015.
13. R. Pec, C.H. Park, Y.S. Cho, “Multiple CFO estimation using the properties of Zadoff-Chu sequence,” IEICE Transaction on Fundamentals/Communications/Electronics/Information and System, vol. E97-A, no. 1, pp. 429-431, 2014.
14. R. Pec, T.H. Hong, Y.S. Cho, “Cell searching and DoA estimation for a mobile relay station under a multipath environment,” Journal of Communication and Networks, vol. 15, no. 2, pp. 191-197, 2013.
15. Sarot Srang and Masaki Yamakita, “Adaptive friction compensation for a position control system with Stribeck friction using hybrid unscented Kalman filter,” International Journal of Information and Communication Technology. vol. 5, no. 3/4, pp. 283-295, 2013.
16. Kosorl Thourn, Yuttana Kitjaidure, and Shozo Kondo, “Shape Retrieval Using Eigen and Fisher Barycenter Contour”, ECTI Transactions on Electrical Eng., Electronics, and Communications, Vol. 9, No. 1, February 2011, pp. 23-32

Local publications

1. Sok An Siek and Sarot Srang, “Design and Prototyping of Solar Hybrid Switch Controller and Monitoring System,” Techno-Science Research Journal, 2021.
2. Phayuth Yonrith, Sarot Srang, Morokot Sakal, Boreth Sethy, "Mobile Robot Localization using Extended Kalman Filter with Kinematic Model" Techno-Science Research Journal, 2021.
3. Hoksong Tim, Sarot Srang, Morokot Sakal, "Simulation and Numerical Characterization of Gaseous Oxygen Injector for ABS/GOX Hybrid Rocket Motor" Techno-Science Research Journal, 2021.
4. Vanyi Chao, Sarot Srang, Morokot Sakal, Chivorn Keo, "Helipad Detection for UAV based on YOLOv4 Transfer Learning Model" Techno-Science Research Journal, 2021.
5. Sarot Srang, Nguonly Taing, Fidero Kuok, “Policy Brief: Minimum Pre-Requisite for Creating High-tech and Deep-tech Startup Ecosystem in Cambodia”, Asian Vision Institute, 2021.

6. Dalin Soun, Morokot Sakal, Hokly Sor and Sarot Srang, “Design and Implementation of the Commercial-Off-The-Shelf Electrical Power System for the Satellite Training Kit – DemoSat,” Techno-Science Research Journal, 2021, Cambodia.
7. Chivorn Keo, Sarot Srang, and Daro Van, “Modeling and Simulation at the Equilibrium of Fixed-Wing Unmanned Aerial Vehicle,” Techno-Science Research Journal, 2020, Cambodia.
8. Boreth Sethy, Sarot Srang, and Daro Van, “Pose Estimation for Differential Drive Mobile Robot using Multi-Sensor Data Fusion,” Techno-Science Research Journal, 2020.
9. Tongly Mork, Sarot Srang, and Daro Van, “Simultaneous Localization and Mapping using Intel RealSense Camera,” Techno-Science Research Journal, 2020.
10. Leangchheng Ly, Sarot Srang, and Daro Van, “Modeling, Control, and Simulation on 3DOF Robot Manipulator,” Techno-Science Research Journal, 2020.
11. Bunvireak Lim, Sarot Srang, and Daro Van, “Development of IoT Smart Controller: Case Study for the Gravity Irrigation System,” Techno-Science Research Journal, 2020.
12. Lyhor Tem, and Sarot Srang, “CNC-Mill Construction and Automatic Control to Shape the Specimen by CAD/CAM,” Techno-Science Research Journal, 2020.
13. Sarot Srang, “Dynamic Modeling for Multi Rigid Body UAV,” Techno-Science Research Journal, 2019, Cambodia.
14. Rethy Chhem et al., “Industry 4.0: Prospects and Challenges for Cambodia’s Manufacturing Sector”, Cambodia Development Resource Institute, 2018.
15. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, “Development of Broadband Parametric Permittivity Model of Dielectric Absorbing Material for Time-domain Electromagnetic Wave Simulation”, IEEJ Transactions on Fundamentals and Materials, Vol. 138, No. 6, June 2018, pp. 302-308
16. Sarot Srang and Masaki Yamakita, “Estimation of discontinuous dynamical systems using receding-horizon unscented Kalman filter,” Techno-Science Research Journal, 2017, Cambodia.
17. Kosorl Thourn, “Cambodian Vehicle License Plate Localization”, Techno-Science Research Journal, Vol. 1, December 2013, pp. 5-9

Conference/Proceedings

1. Rothvichea Chea, Kosorl Thourn, Sopheaktra Chhorn, "Improving V-I Trajectory Load Signature in NILM Approach", IEECON 2022, Korn Khen, Thailand, March 2022.
2. J. Kean, N. Raveu, H. Kaouach, K. Thourn and S. Sreng, "Analysis of Metamaterial Walls Reverberation Chamber by Using Modal Expansion Theory," 2021 Asia-Pacific International Symposium on Electromagnetic Compatibility (APEMC), 2021, pp. 1-4,
3. Chan Daraly Chin, Chanthan Hel, Rothna Pec, "Fab Lab Initiative in Higher Education: Digital Solutions Diverted to Traditional Farming in Cambodia Context," 2021 6th International STEM Education Conference (iSTEM-Ed), IEEE, 2021
4. Chan Daraly Chin, Chanthan Hel, Rothna Pec, "Initiation of the Creation of Fab Lab for Advanced Studies: Digital Solutions Focusing on Traditional Agriculture in the Context of Cambodia" 2021 3rd National Research Forum, 2021

5. Thura Peuo, Sopeak Yean, Boreth Sethy and Sarot Srang, “PD Controller and Dynamic Compensation Design for a DC Motor based on Estimated Parameters,” 2021 International Conference on Advanced Mechatronics, Intelligent Manufacture and Industrial Automation (ICAMIA). Indonesia.
6. Sophyn Srey, Vongchivorn Chhour and Sarot Srang, “Lumped Parameter Estimation of a Low-Cost DC Motor for Position Controller Design,” 2021 International Conference on Advanced Mechatronics, Intelligent Manufacture and Industrial Automation (ICAMIA). Indonesia.
7. Sam Ban, Andreea Dan, Félix Guinet, Julien Portanguen, Sarot Srang and Matthieu Lauras “Assessing the potentialities of Physical Internet for Developing Countries Last-Mile Deliveries,” IPIC 2021, 8th International Physical Internet Conference. 2021, Germany.
8. Sai Thavath, Bunrong Proeung, Sovichea Tep, Sopheaktra Chhorn, Rothna Pec, Vichhey Nall, Pinnara Ket, Chantha Oeurng, and Chanthan Hel. "Prototyping of Smart Irrigation System Using IoT Technology." In 2021 7th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), pp. 1-5. IEEE, 2021.
9. M. Mancas, P. Kong and B. Gosselin, "Visual Attention: Deep Rare Features," 2020 Joint 9th International Conference on Informatics, Electronics & Vision (ICIEV) and 2020 4th International Conference on Imaging, Vision & Pattern Recognition
10. Sam Ban, Matthieu Lauras, and Sarot Srang, "Toward Physical Internet-enabled Supply Chain and Logistics Networks in Developing Countries, " PRO-VE - 21st IFIP / SOCOLNET Working Conference on Virtual Enterprises , 2020, Spain.
11. Maximilien Berthet et al. , “ Student-Led Policy and Technical Capacity Building Program: The Road to Cambodia's First CubeSat ,” 71st International Astronautical Congress (IAC) , 2020.
12. Vannak VAI., Sopheaktra CHHORN, Roza CHHIM, TEP Sovichea, and BUN Long. "Modeling and Simulation of PV Module for Estimating Energy Production under Uncertainties." In 2020 8th International Electrical Engineering Congress (iEECON), pp. 1-4. IEEE, 2020
13. Valy, Dona, Michel Verleysen, and Sophea Chhun. "Data Augmentation and Text Recognition on Khmer Historical Manuscripts." In 2020 17th International Conference on Frontiers in Handwriting Recognition (ICFHR), pp. 73-78. IEEE, 2020.
14. S. Tep and R. Pec, “Design of Sensor Node System for Low-Cost and Customizable Applications,” 12th Regional Conference on Computer Information and Engineering, 2019, Loas.
15. Sarot Srang and Sopagna Ath, “Dynamic Modelling and Simulation for 2DOF Parallel Mechanism Solar Tracker,” IEEE/ASME International Conference on Advanced Intelligent Mechatronics, 2019. Hong Kong
16. Valy, Dona, Michel Verleysen, and Sophea Chhun. "Text Recognition on Khmer Historical Documents using Glyph Class Map Generation with Encoder-Decoder Model." In ICPRAM, pp. 749-756. 2019.
17. Phutphalla Kong, Matei Mancas, Nimol Thuon, Seng Kheang, and Bernard Gosselin. “Do deep-learning saliency models really model saliency?”. In 2018 25th IEEE International Conference on Image Processing (ICIP), pages 2331-2335. IEEE, 2018.
18. Phutphalla Kong, Matei Mancas, Seng Kheang,and Bernard Gosselin. “Saliency and object detection”. In 2018 International Conference on Pattern Recognition and Artificial Intelligence (ICPRAI), pages 523-528. CENPARMI, 2018.

19. Chhorn Sopheaktra, and Arporn Teeramongkonrasmee. "A Low - Cost USB - Controlled Potentiostat for Educational and Electrochemical Applications." In 2018 33rd The International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC), 2018. Thailand
20. Chhorn Sopheaktra, and Arporn Teeramongkonrasmee. "A portable USB-controlled potentiostat for paper-based electrochemical applications." In 2018 15th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), pp. 321-324. IEEE, 2018.
21. Kesiman, Made Windu Antara, Dona Valy, Jean Christophe Burie, Erick Paulus, Mira Suryani, Setiawan Hadi, Michel Verleysen, Sophea Chhun, and Jean-Marc Ogier. "ICFHR 2018 competition on document image analysis tasks for southeast asian palm leaf manuscripts." In 2018 16th International Conference on Frontiers in Handwriting Recognition (ICFHR), pp. 483-488. IEEE, 2018.
22. Valy, Dona, Michel Verleysen, Sophea Chhun, and Jean-Christophe Burie. "Character and text recognition of khmer historical palm leaf manuscripts." In 2018 16th International Conference on Frontiers in Handwriting Recognition (ICFHR), pp. 13-18. IEEE, 2018.
23. Hen, Sodet, Dona Valy, Sophea Chhun, and Ratha Siv. "An Initial Study on Synthetic Data for Khmer Ancient Document Analysis." In 11th AUN/SEED-Net Regional Conference on Computer and Information Engineering 2018 (AUN-RC CIE 2018), 2018.
24. Kimheng SOK, Jean Noël COLIN, Kimtho PO. 2018. Blockchain and Internet of Things Opportunities and Challenges. In The Ninth International Symposium on Information and Communication Technology (SoICT2018), December 6-7, 2018, Danang City, Vietnam. ACM. https://doi.org/10.1145/3287921.3287933
25. Valy, Dona, Michel Verleysen, and Kimheng Sok. "Line segmentation for grayscale text images of khmer palm leaf manuscripts." In 2017 Seventh International Conference on Image Processing Theory, Tools and Applications (IPTA), pp. 1-6. IEEE, 2017.
26. Valy, Dona, Michel Verleysen, Sophea Chhun, and Jean-Christophe Burie. "A new khmer palm leaf manuscript dataset for document analysis and recognition: Sleukrith set." In Proceedings of the 4th International Workshop on Historical Document Imaging and Processing, pp. 1-6. 2017.
27. R. Pec, M. S. Khan, C. H. Park, and Y. S. Cho, “A design of synchronization signal for efficient handover in small-cell networks with 3D beamforming,” IEEE VTC, Sydney, June 2017.
28. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, “Evaluation of the Influence of Reflection from Wave Absorber to Body Area Measurement in Anechoic Chamber Using RMS Time Delay,” IEICE Technical Report, vol.117, no.319, EMCJ2017-66, pp.13-16, November 2017.
29. R. Pec, M.S. Khan, C.H. Park, and Y.S. Cho, “A detection for synchronization signal in LTE-based machine-type communication,” ICTC 2016 (Int'l Conf. on ICT Convergence), Jeju, Oct. 2016.
30. J.M.P. Arana, R. Pec, and Y.S. Cho, “Handover measurement for millimeter wave cellular system with beamforming,” ICUFN 2016, Vienna, July 2016
31. Burie, Jean-Christophe, Mickaël Coustaty, Setiawan Hadi, Made Windu Antara Kesiman, Jean-Marc Ogier, Erick Paulus, Kimheng Sok, I. Made Gede Sunarya, and Dona Valy. "Icfhr2016 competition on the analysis of handwritten text in images of balinese palm leaf

manuscripts." In 2016 15th International Conference on Frontiers in Handwriting Recognition (ICFHR), pp. 596-601. IEEE, 2016.

32. Valy, Dona, Michel Verleysen, and Kimheng Sok. "Line segmentation approach for ancient palm leaf manuscripts using competitive learning algorithm." In 2016 15th International Conference on Frontiers in Handwriting Recognition (ICFHR), pp. 108-113. IEEE, 2016.
33. Chan Daraly Chin, Watit Benjapolakul, "NFC-enabled Android Smartphone Application Development to Hide 4 Digits Passcode for Access Control System", 2016 iEECON published in International Journal of Procedia Computer Science, Volume 86, pp. 429-432, Elsevier, 2016
34. Sarot Srang, "Inverse kinematics and trajectory tracking of a 4DOF robot manipulator", Inauguration of Robotic Conference in Cambodia, 2016, Cambodia.
35. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Analysis of On-Body Communication Channels with Consideration of Wave Absorbers Emulating Free Space," in 2016 URSI Asia-Pacific Radio Science Conference (URSI AP-RASC), 2016, Seoul, Korea, pp.1383-1386.
36. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Investigation of Wave Absorber Effects to WBAN Communication Using Simulation Approach," IEICE Technical Report, vol.116, no.141, MICT2016-16, pp.23-26, July 2016.
37. R. Pec and Y.S. Cho, "A beamforming technique for LTE-based mobile relay stations," ICTC 2015 (Int'l Conf. on ICT Convergence), Jeju, Oct. 2015
38. Chuor, Porchourng, Michel Verleysen, and Dona Valy. "Khmer Optical Character Recognition Using Zernike Moment." In 2015 Khmer Natural Language Processing annual conference (KNLP 2015). 2015.
39. Chanthan Hel, Chaiyachet Saivichit, "Performance Evaluation of Centralized In-Network Caching Policies and Content Visibility Levels in Information Centric Network over Emulated and PC-based OpenFlow Testbed", 8TH AUN/SEED-NET INT'L CONFERENCE ON EEE 2014 EEE Institute, UP Diliman, Manila, Philippines, November 16-17, 2015
40. Kimheng SOK, Serge MIRANDA (2015). "Future Mobiquitous Tourism in Cambodia", (pp. 257-259). In The 15th SCA Conference and International Symposium under the theme Science and Technology for Culture, 15th-16th May 2015, Siem Reap, Cambodia.
41. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Numerical Simulation of 2D Scattering by a Lossy Dielectric Cylinder Using Debye Modeling of Absorbing Material and Pulse Excitation Source," in 2015 7th Asia-Pacific Conference on Environmental Electromagnetics (CEEM), 2015, Hangzhou, China, pp.165-168.
42. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Wideband Characterization of Multilayer Wave Absorber Using FDTD Method," 2015 URSI-Japan Radio Science Meeting, August 2015.
43. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Numerical Simulation of EM Wave Propagation on Human Body with Consideration of the Effect of Wave Absorbers Using FDTD Method," IEICE Technical Report, vol.115, no.309, EMCJ2015-82, pp.7-12, November 2015.
44. Kosorl Thourn, Takahiro Aoyagi, and Jun-ichi Takada, "Characterization of Absorbing Material Using Multiple Poles Debye Model and Its Application for Wideband Simulation in FDTD Method," IEICE Technical Report, vol.115, no.131, EMCJ2015-41, pp.61-66, July 2015.

45. R. Pec, K.S. Kim, I.S. Kim, B.W. Ku, Y.S. Cho, “Cell searching and DoA estimation for a mobile station with antenna array in mm-wave cellular communications,” IEEE VTC, Seoul, May 2014
46. Sarot Srang and Masaki Yamakita, “Application of continuous-discrete unscented Kalman filter for control of nonlinear systems with actuator nonlinearity,” IEEE The 33rd Chinese Control Conference, pp. 8837-8842, 2014, China.
47. Sarot Srang and Masaki Yamakita, “Tracking control of nonlinear stochastic systems with actuator nonlinearity,” IEEE/ASME International Conference on Advanced Intelligent Mechatronics, pp. 697-702, 2014, France.
48. Sarot Srang and Masaki Yamakita, “On the estimation of systems with discontinuities using continuous-discrete unscented Kalman filter,” IEEE American Control Conference, pp. 457-463, 2014, OR, USA.
49. Chanthan Hel, Chaiyachet Saivichit, "Performance evaluation of centralized in-network caching and content visibility in information centric network over SDN/OpenFlow", Proceeding of the Electrical Engineering Computer Science and Informatics
50. Chanthan Hel, Chaiyachet Saivichit, "Evaluation of Software Defined-Information Centric Network’s Performance by Considering In-Network Caching and Content Searching Mechanism", IEICE technical report
51. "Chamrong OU, Piseth Sea, Kosorl Thourn, Long Bun, ""Economic Load Dispatch Using Particle Swarm Optimization: A Case Study of Electric Power Transmission System In Cambodia"", AUN/SEED-NET INTERNATIONAL CONFERENCE ON EEE, Malaysia, November 12-13, 2014.
52. R. Pec, Y.S. Cho, “A parameter estimation technique for an LTE-based-mobile relay station with antenna array,” ICTC 2013 (Int'l Conf. on ICT Convergence), Jeju, Oct. 2013
53. Sarot Srang and Masaki Yamakita, “Estimation of systems with multiple sliding surfaces,” IEEE/SICE International Symposium on System Integration, pp. 1-6, 2013, Japan.
54. Sarot Srang and Masaki Yamakita, “Estimation of discontinuous friction using continuous-discrete unscented Kalman filter for adaptive compensation,” IEEE/ASME International Conference on Advanced Intelligent Mechatronics, pp. 429-435, 2013, Australia.
55. R. Pec, H.J. Yoo, H.S. Kim, A.R. So, Y.S. Cho, “DoA estimation with cell searching for an IEEE 802.16-based mobile relay stations,” APCC 2012 (Asia-Pacific Conf. on Commun.), Jeju, Oct. 2012
56. Sarot Srang, Zainal Abidin, and Heideki Yanada, “Control strategy to avoid limit cycle oscillation due to Stribeck effect in position control,” Regional Conference on Mechanical and Aerospace Technology, 2010, Indonesia.
57. Sarot Srang, Zainal Abidin, and Heideki Yanada, “Prediction of the limit cycle due to Stribeck friction using describing function method,” The 2nd Regional Conference on Manufacturing Engineering, 2009, Indonesia.
58. Kosorl Thourn, Yuttana Kitjaidure, and Shozo Kondo, “Eigen and Fisher Barycenter Contour for 2D Shape Classification”, The 2009 IEEE-RIVF International Conference on Computing and Communication Technologies, July 13-17, 2009, Da Nang, Vietnam, pp. 290-295.

59. Kosorl Thourn, Yuttana Kitjaidure, and Shozo Kondo, “Robust 2D Shape Matching and Retrieval Using Fisher Barycenter Contour”, ECTI-CON2009, May 6-9, 2009, Vol. 2, Pattaya, Thailand, pp. 659-662.
60. Kosorl Thourn and Yuttana Kitjaidure, “Robust Multi-TAR of Barycenter Contour for Multiple View Shape Matching and Retrieval”, IEEE International Conference on Robotics and Biomimetics, February 22-25, 2009, Bangkok, Thailand, pp. 1894-1898.
61. Kosorl Thourn, Yuttana Kitjaidure, Shozo Kondo, "Affine Invariant Shape Recognition Based on PCA and FLDA", 1st AUN/SEED-Net Regional Workshop in Information and Communication Technology, March 03, 2009, Bangkok, Thailand, pp. 157-161.
62. Kosorl Thourn and Yuttana Kitjaidure, “Multi-View Shape Recognition Based on Principal Component Analysis”, International Conference on Advanced Computer Control, January 22-24, 2009, Singapore, pp. 265-269.
63. Kosorl Thourn, Yuttana Kitjaidure, and Shozo Kondo, “Affine Invariant Shape Recognition Based on Multi-Level of Barycenter Contour”, International Symposium on Communication and Information Technologies, October 21-23, 2008, Vientiane, Lao PDR, pp. 145-149.
64. T. Kosorl, K. Yawichai and Y. Kitjaidure, "Optimum shape representation based on Fisher’s discriminant analysis," 2008 5th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology, 2008, pp. 509-512

5.4.4. Materials Science and Structure (MSS Unit)

Cambodian Context

Cambodia has a long history of engineering skills in materials and structures. Looking back at Angkorian times, the Khmer empire built a considerable amount of constructions in bricks and stone such as religious buildings, bridges, dams (barray). Some of these heritage buildings now are in unstable conditions because of the deterioration of the materials and the damages of structures. The preservation of Khmer heritage is an important issue for or rich cultures and also the tourism industry. Currently, Cambodian universities are producing human resources with both science and practical capacity to do research and preservation their heritages, which is an important step to reach solutions.

In the present days, new challenges have to be met: the construction sector has boomed in 2016 with a total investment of 8.5 b$. There are over 900 high-rise buildings (more than 5 floors), the majority of them in Phnom Penh and Kompong Som. The fast evolution of Cambodian cities causes issues of quality (qualified human resources, redefining building standards) and of sustainability (depletion of local resources in construction materials).

Research in materials science and structure for improvement of manufacturing local value-added products and construction needs are steps towards development in eco-friendly concrete or building components adapted to local resources. Furthermore, study and reinforce the stability of embankments, dams, slopes, especially in a context of variable conditions of soils between the rainy and the dry season are also parts of materials science and structure.

Materials science and structure is not limited to the building industry, as there are also big challenges in recycling or recovering materials from waste, replacing polymers from fossil origin with natural polymers, and producing sustainable products from local materials.

Materials Science and Structure Research Unit was established to build up researcher group with the same skill and work with other researcher groups as interdisciplinary to create new materials and structures which serve for various applications.

The Research Unit

The Material Sciences and Structure Research Unit focuses on the innovation and trends in construction material, especially with low carbon impact materials and light structures, including geotechnical engineering, underground structures, minerals, polymers, ceramics and alloys to address specific Cambodian needs.

The whole set of available natural materials in Cambodia (silk, wood, agricultural by-products, starch, bamboo, clay, limestone, natural rubber) is also reconsidered to produce sustainable goods and products. The Research Unit works among an international network on heritage preservation with a specific dedication on materials science (stones, bricks, iron, and other alloy components). An important effort is made on modelling and simulations with high standards numerical tools associating mechanics, heat transfer and fluid mechanics.

Vision

MSS Research Unit will be nationally and internationally recognized for one of the first destination for education and research in materials and structure by industries and academic institutions. MSS Research Unit will be a source for technical innovation transfer, scientists and engineers.

Mission

- To strengthen research capacity in field of materials and structure
- To enlarge and improve Materials and Structure laboratory
- To boost the research activities through local and international collaborations (Universities, Government, SMEs, NGOs)
- To promote technology transfer and provide training and consultancy services
- To increase national and international publications
- To host scientific events

Research Theme

- Using numerical modelling and experimental analysis of infrastructure and materials
- Polymer composites and plastic waste recycling, eco-materials for construction (concrete, binder), alloy and traditional ceramic
- Failure analysis of steel structure
- Soil improvement for various applications using binder and waste products
- Slope stability analysis and deep excavation
- Heritage preservation (structure, source of rock…)

Projects and Research Topics

The list of projects and research topics that are implementing in MSS unit as shown in the table below. For more detail information refers to a table in Annex 16.

Table 18. Research topics in MSS unit for the academic year 2021-2022

No.	Name of PI (FAMILY First name)	Sexe	Project/Research Topic	Funding source	Period	Collaboration scale * N = National R = Regional I = International	Project Type* 1= Basic 2 = Applied & Development 3 = Start-up 4 = Tech-transfer
1	AUN Srean	F	Air Pollution Monitoring in Phnom Penh	In kind	2019-2023	I	1
2	BUN Polyka	F	Upgrading the quality of Cambodian ceramic using Kandal clay with incorporation of rock dust for application of brick	HEIP	2020-2023	R	2
3	KETH Kannary	F	Managing the interdisciplinary collaboration in construction 4.0: ITC's workshop case	ARES-Cambodia	2021-2024	I	1
4	MUT Mesa	M	Composite 3D Printing based on Filament Developed from Natural Fiber: Mechanical properties of matrixes	LBE	2020-2022	N	2
5	YOS Phanny	M	Cambodian natural rubber/different minerals composites for floor mat shock absorbing application	HEIP	2020-2023	R	2
6	DOUNG Piseth	M	Initiative on the development of wind load for design of building structures in Cambodia	HEIP	2020-2023	N	1
7	DOUNG Piseth	M	Testing of internal steel diaphragm in box column connections	KMUTT	2020-2021	R	1
8	DOUNG Piseth	M	Steel ring damper for seismic application - collaboration with King Mongkut's University of Technology Thonburi	KMUTT	2020-2022	R	2
9	DOUNG Piseth	M	Energy-based design for buildings - collaboration with King Mongkut's University of Technology Thonburi	KMUTT	2020-2021	R	2
10	TO Dara	M	Design and built a lightweight chassis of mini electric vehicle	LBE-JICA	2021-2022	N	2
11	PROK Narith	M	Durability of Concrete Beam Strengthening with GFRP	Fyfe Asia Pte Ltd	2020-2021	R	2

12	RATH Sovannsathya	F	Effectiveness and formulating of Tyfo FibrAchors with the Tyfo Fibrwrap Systems	Fyfe Asia Pte Ltd	2020-2021	R	2
13	SEANG Sirisokha	F	Hydrothermal alteration, Mineralization, Fluid inclusion, Geochemistry, and Geochronology of Porphyry Cu-Mo-Au Prospect in Kampot and Ratanakiri, Cambodia	LBE-JICA	2020-2022	R	2
14	HIN Raveth	M	Chemical Strengthening of Large-scale glass Pieces for Construction and Other Engineering Applications	HEIP	2020-2024	I	2
15	TAING Kimnenh	F	Green BIM - Analysis of BIM approach for designing a bioclimatic building	ARES	2020-2024	I	1

Researchers

Dr. YOS Phanny (Head of MSS Research Unit), Ph.D. in Materials Engineering, Kyushu University, Japan Polymers, composite material.

Dr. CHHIT Sao Sameth, Ph.D in Material Engineering, University of Ghent, Belgium
Material Sciences

Dr. HIN Raveth, Ph.D in Material Engineering, University of Rennes 1, France
Mechanical behaviour of Materials, Mechanics and Civil Engineering

Dr. HAN Virak, Ph.D in Civil Engineering, KOCHI University, Japan
Civil engineering materials, concrete, modelling

Dr. BUN Kim Ngun, Ph.D. in Materials Engineering, Universiti Sains Malaysia
Materials science, ceramics

Dr. SEANG Chan Sopheak, Ph.D. in Engineering, INSA de Rennes, France
Non destructive testing, numerical Analysis, welding

Dr. PROK Narith, Ph.D in Civil Engineering, KOCHI University, Japan
Soil-structure interaction; earthquake; tsunami

Dr. RATH Sovann Sathya, Ph.D in Civil Engineering, KOCHI University, Japan
Self-compacting concrete

Dr. SRY Vannei, Ph.D in Materials Engineering, Tokyo Institute of Technologyl Japan
Mechanical properties of Fiber

Ms. BUN Polyka, Master in Applied Sciences, Université Libre de Bruxelles, Belgium
Simulation of thin wall structures

Dr. DOUNG Piseth, Ph.D in Civil Engineering, Tokyo Institute of Technology, Japan
A study on performance evaluation of box column connections with internal diaphragms in steel frames

Dr. MAO Piseth, Ph.D in Earth Resources Engineering, Kyushu University, Japan
Evaluation of Stability and Its Countermeasures of Underground Longwall Coal Mine under Shallow and Weak Geological Conditions in Indonesia

Dr. SEANG Sirisokha, Ph.D in Economy Geology, Kyushu University, Japan
Earth mineral

Dr. BOEURT Sophea, Ph.D in Rock Mechanics Engineering, Hokkaido University, Japan
Variation of permeability of rocks due to transient disturbance in Axial Stress or Pore Pressure

Mr. MUT Mesa, Master of Materials and structures, Institute of Technology of Cambodia, Cambodia
Numerical Study of Rail Stresses Induced by Wheel-rail Contact using Abaqus

Dr. LIM Sovanvichet (Master coordinator of Materials and Structure), Ph.D in Civil Engineering, INSA-RENNE, France
Modélisation du comportement des connexions dans les structures mixtes acier-b eton, soumises à des sollicitations statiques dans des conditions normales de service ou dans des conditions d'incendie

Dr. SIV Easeng, Ph.D in Materials Science, Paris 13 University, France
Experimental mesoscale investigation of interface migration in polycrystalline copper

Ms. KETH Kannary, Master, University of Liège, Belgium
Feasibility of primary school in Phnom Penh by using recycled materials

Ms. TAING Kimnenh, Master, University of Liège, Belgium
Analyse et modélisation des données d'un bâtiment pour l'évaluation de son comportement thermique

Academic and Research Partners

Universitat de Girona, Spain
INSA de Rennes, France
Université de Paris 13, France
Ecole des mines d'Alès, France
Université Paul Sabatier, Toulouse, France
Kochi University, Japan
Chulalongkorn University, Thailand
Kyoto University, Japan
Ecole Française d'Extrême Orient, France
National Museum, Cambodia
Universiti Sains Malaysia

Non-academic partners

Ministry of Education, Youth and Sports, Cambodia
Ministry of Public Works and Transport, Cambodia
Ministry of Culture and Fine Arts, Cambodia
Ministry of Mines and Energy, Cambodia
Ministry of Environment, Cambodia
General Directorate of Rubber, Cambodia

Industrial Partners and NGOs

Dassault Systèmes, France
Minebea (Cambodia) co.ltd
Edotco Cambodia Co.,Ltd
Nikko-Kinzoku (Cambodia) Co.,Ltd
Fyfe Asia Pte Ltd, Singapore
Pierre Fabre

Selected Publications of MSS researchers since 2010

From 2020 to 2021, there are in total 43 research outputs from MSS unit classified into three categories: International publications, Local publications, and Conference and Proceedings as shown in the table below.

Table 19. Summary of number of research publications by year from 2010 to 2021

Publication classification/year	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**Total**
International publications	2	3	2	2	1	4	0	2	4	1	4	2	**27**
Local publications	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Conference/ Proceedings	9	1	1	3	0	1	0	0	0	0	0	0	**15**
Total	**12**	**4**	**3**	**5**	**1**	**5**	**0**	**2**	**4**	**1**	**5**	**2**	**43**

International publications

1. Leelataviwat, S., Doung, P., Naiyana, N. (2021) A review on performance-based plastic design method: concept and recent developments. 155. https://doi.org/10.1007/978-3-030-73932- 4_8 (Book chapter)
2. Piseth, D., Sutat, L., Eiichi, S. (2021) Tensile strength and failure mechanism of internal diaphragms in wide flange beam-to-box column connections with concrete filling. Elsevier, https://doi.org/10.1016/j.jobe.2020.102037 **(IF: 5.138)**
3. Sophea, B., Yoshaiki, F., Jun-ichi, K., Daisuke, F., Anjula, D., A.K.M. Badrul A. (2020) Laboratory Investigation on the Permeability Variation of Fractured Inada Granite by Multiple Transient Axial Stress Disturbances. Pure and Applied Geophysics. 177(11). 5385-5396 (2020). DOI: 10.1007/s00024-020-02565-2

4. Amirthan, T., Lahiru, D., Tharaka, D., Anjula, D., Chulantha, J., Maheshwari, W., Yoshiaki, F., Sophea, B. (2020) Stability Analysis of Slopes in Aruwakkalu Limestone Mine During Rain: A Finite Element Approach. IEEE. DOI: 10.1109/MERCon50084.2020.9185268
5. Takashi, S., Pisith, M., Hideki, S., Akihiro, H., and Jiro, O. (2020) Numerical Analysis of Longwall Gate-Entry Stability under Weak Geological Condition: A Case Study of an Indonesian Coal Mine. Energies 13, no. 18: 4710
6. Kafi, M.A., Aktar, M.K., Phanny, Y., Todo, M. (2019) Adhesion, proliferation and differentiation of human mesenchymal stem cell on chitosan/collagen composite scaffold. Journal of Materials science,131. https://doi.org/10.1007/s10856-019-6341-8
7. Seang, S., Kotaro, Y., Thomas, T., Tetsuya, N., Koichiro, W., Jocelyn, P. (2019) Lithogeochemistry of Intrusive Rocks in the Halo Porphyry Copper-Molybdenum Prospect, Northeast Cambodia. Open Journal of Geology. 7 (342). https://doi.org/10.4236/ojg.2019.97023
8. Todo M, Yos P, Arahira T, Myoui A (2018) Development and characterization of porous hydroxyapatite scaffolds reinforced with polymeric secondary phase for bone tissue engineering. In vivo, 11 (12)
9. Yonghuort, L., Mohd R. I. (2018). Efficacy of Double Skin Façade on Energy Consumption in Office Buildings in Phnom Penh City. International Transaction Journal of Engineering, Management, & Applied Science & Technologies. 9,119-132.
10. Ukritchon, B., Ouch, R., Pipatpongsa, T., Khosravi, M.H. (2017) Experimental studies of floor slip tests on soil blocks reinforced by brittle shear pins, International Journal of Geotechnical Engineering, DOI: 10.1080/19386362.2017.1314126
11. Ouch, R. Ukritchon, B., Pipatpongsa, T. (2016) Stability of soil block on low Interface friction plane with and without side supports, Engineering Journal. 20:2
12. Lay, M., Méndez, J.A., Pèlach, M.À., Bun, K.N., Vilaseca, F. (2016), Combined effect of carbon nanotubes and polypyrrole on the electrical properties of cellulose-nanopaper, Cellulose, 23(6), 3925-3927
13. Lay, M., Méndez, J.A., Delgado-Aguilar, M., Bun, K.N., Vilaseca, F. (2016) Strong and electrically conductive nanopaper from cellulose nanofibers and polypyrrole, Carbohydrate Polymers, 152, 161-169
14. Pothisiri, T.; Chou, S.; Sektheera, C. (2016) Effect of Polypropylene Fibers and Wire Mesh on Fire Performance of Precast Concrete Walls, ACI Structural Journal; 113.2, pp393-403
15. Bun, K.N., Mohamad, H., Katsumata, K., Okada, K., Zainal, A. A. (2014). Using design of mixture experiments to optimize triaxial ceramic tile compositions incorporating Cambodian clays, Applied Clay Science, Vol. 87, pp: 97-107
16. Pothisiri, T., Chou, S., (2014) Effects of Mixing Sequence of Polypropylene Fibers on Spalling Resistance of Normal Strength Concrete, Engineering Journal, Vol 18:3
17. Kollika, N., Inaba, K., Hori, T., Kishimoto, K. (2013) Effect of a Single Particle on Water–Tube Interaction Subjected to Axial Impact Loading, Theoretical and Applied Mechanics Japan, Vol. 61 p. 151-160
18. Han, V., Ros, S., Shima, H. (2013) Effects of Sand Content, Superplasticizer Dosage and Mixing time on Compressive Strength of Mortar, ACI Materials Journal, Vol.110:1
19. Han, V., Ros, S., Shima, H., (2013-A) Strength model for mortar based on hydration heat and microstructure developments, Journal of JSCE, vol. 1, 366-378

20. Nallis, K., Katsumata, K., Isobe, T., Okada, K., Bone, P., Otman, R. (2013). Preparation and UV-shielding property of Zr0.7Ce0.3O2-kaolinite nanocomposites, Applied Clay Science, Vol. 80-81,pp: 147-153
21. Seng, S., Tanaka, H. (2012) Properties of very soft clays: A study of thixotropic hardening and behavior under low consolidation pressure, Soils and Foundations, Vol. 52, Issue 2, 335-345
22. Kollika, N., Inaba, K., Takahashi, H., Kishimoto, K. (2011) Numerical Study on Wave Propagation in Coupled Pipe and Homogeneous Solid-Liquid Flow, Theoretical and Applied Mechanics Japan, Vol. 60, pp. 239-248
23. Bun, K.N., Mohamad, H., Shamsul, K. S., Zainal, A. A. (2011) Some ceramic properties of clays from central Cambodia, Applied Clay Science 53(1):33-41
24. Lim, S., Bernard, F. (2011) Parametric Study of Bonded Connection in Composite Structures through the FE Modeling of Push-Out Test, Procedia Engineering, Volume 14, 1455-1462
25. Horng, V., Tanaka, H. (2011) Hirabayashi H, Tomita R., Sample disturbance effects on undrained shear strengths - study from Tahuhoku site, Sapporo, Soils and foundations, Vol. 51 No. 2 P 203-213
26. Pipatpongsa, T., Heng, S., Iizuka, A., Ohta, H. (2010) Statics of loose triangular embankment under Nadai's sand hill analogy, Journal of the Mechanics and Physics of Solids, 58(10):1506-1523
27. Heng, S., Pipatpongsa, T. (2010) Admissible stress fields for a semi-infinite planar heap of granular medium possessing self-weight in loose condition, Journal of Solid Mechanics and Materials Engineering 4(8):1261-1272

Local publications

1. Laymey, S., Azura, A. R., Phanny, Y. (2021) Effects of Cambodian Clay on the Physical and Mechanical Properties of Natural Rubber Latex Foams. Techno Science Research Journal, In Press

Conference/Proceedings

1. Sreng, L., Seang, S., Azura, A.R., Yos, P. (2021) Characterization of Cambodian Natural Rubber/Common Clay Composites. Proceeding of the 14th AUN/SEED-Net Regional Conference on Materials 2021 & 4th International Postgraduate Conference on Materials
2. Seang, S., Kakda, K., Jaydee, A., Kov, R., Hang, B., Ly, S. C. S., Chan, C., Oy, K., Sitha, K. (2021) Initial Study on Lithological, Hydrothermal Alteration, and Geochemistry for Mineral Exploration in Chhouk District, Kampot Province, Southwest Cambodia. Regional Conference on Natural Disaster, Yangon University Research Center, Yangon, Myanmar
3. Kret, K., Chan, C., Seang, S., Kuoch, T., Kong, S., Kry, R., Boeut, S., Hoeun, S. (2021) Hydrothermal alteration mineral mapping by integrating ASTER and Landsat-8 OLI: A case study in Ratanakiri province, northeast Cambodia. Regional Conference on Natural Disaster, Yangon University Research Center, Yangon, Myanmar
4. Kret, K., Chan, C., Seang, S., Kuoch, T., Kong, S., Kry, R., Boeut, S., Hoeun, S. (2021) Hydrothermal alteration mineral mapping by integrating ASTER and Landsat-8 OLI: A case study in Ratanakiri province, northeast Cambodia. Regional Conference on Natural Disaster, Yangon University Research Center, Yangon, Myanmar

5. Ly, S., Sirisokha, S., Oy, K., Kakda, K., Kov, R., Hang, B., Chorn, S., Jaydee, A., Kong, S., Sitha, K., Kotaro, Y., Koichiro, W., Sophea, B., Tola, S., Seangleng, H. (2021) Preliminary study on lithology, hydrothermal alteration, and soil and rock geochemistry for gold and copper at Area 6, Phnom Sro Ngam Tenement, Chhouk District, Kampot Province, Cambodia. International Symposium on Earth Science and Technology, Japan
6. Chhayo, C., Kakda, K.t, Sirisokha, S., Chanmoly, O., Sitha, K., Reaksmey, K., Sophea, B., Kimhouy, O., Seangleng, H., Jaydee, A., Kong, S. (2021) Hydrothermal alteration mapping from ASTER and Landsat-8 in Kampot Fold Belt, southwest Cambodia. International Symposium on Earth Science and Technology, Japan
7. Leakhena, H., Phalla, T., Srean, A., Dalin, U.,Taing, C. (2021) Air Emission Inventory of Factory Boiler and impact to human health. Case Study in Phnom Penh, Cambodia The 6th International Symposium on Conservation and Management of Tropical Lakes" In Conjunction with
8. Leakhena, H. , Phalla, T., Srean, A., Dalin, U.,Taing, C. (2021-A) Assessment of human health impact of particulate matter formation from industry textile boiler in Cambodia. 15th Regional Conference in Environmental Engineering
9. Leakhena, H. , Phalla, T., Srean, A., Dalin, U.,Taing, C. (2021-B) Feasibility of air quality standard compliance link with perception of people : case study Phnom Penh Cambodia. Asean young scientist conference
10. Menghor, L., Mouyyi, H., Nallis, K., Sirisokha, S., and Ichhuy, N. (2020) Primary Investigation on lithology and alteration minerals for geothermal resource in Te Teuk Pus, Oral district Kampot Speu province, Cambodia. International of Symposium on Earth Science and Technology. 420-425.
11. Seang, S., Kotaro, Y., Koichiro, W., Thomas, T. (2019) Lithogeochemistry, Alteration, and Mineralization in the Halo Porphyry Copper-Molybdenum Prospect, Northeast Cambodia. Regional Conference on Geological and Geo-Resources Engineering, University of the Philippines Diliman, Philippines.
12. BUN, P., IDIR, R., BUN, K., CYR, M. (2018) Concrete made of 100% recycled materials_Feasibility strudy. WasteEng 7th International Concrete on Engineering for waste and Biomass Valorisation, Prague, Czech Republic
13. Narith, P. and Sinnara, L. (2018). Critical Area of Ground Motion Amplification in Phnom Penh City, Regional Conference in Civil Engineering (RCCE2018), Yogyakarta, Indonesia.
14. Sovann Sathya, R., Narith, P., Sithpisey, S., and Phearin, C. (2018) Strengthening Reinforced Concrete Beam Sample Using Fiber Reinforcing Polymer Materials, Regional Conference in Civil Engineering RCCE2018 and The 4th International Conference on Sustainable Civil Engineering Structures and Construction Materials (SCESCM), Yogyakarta, Indonesia
15. Kruy, S., Aoyama, H. (2016) Burr prediction due to flank wear in end-milling, International Symposium on Flexible Automation, Page 412-417

5.4.5. Water and Environment Unit (WAE Unit)

Cambodian Context

Water is a huge issue in the world and particularly in Cambodia. Although the country is crossed by the Mekong river and possesses a large fresh water lake (the Tonle Sap Great lake), Cambodia is vulnerable to the succession of annual floods and droughts with severe episodes. Many problems arise due changes in land use, natural resources exploitation and climate change. Moreover, there is concern with current and future situation of intensive use of ground water for irrigation in the dry season, sea water intrusion in the coastal areas, heavy metals release due to mining activities, non-point source pollution from agriculture, soil erosion, air pollution, and urbanization with no waste water treatment. Besides regional water environmental issues, the quality of water is low in rural areas or low-income urban environments with contamination of crops, faecal contamination and strong arsenic concentration in ground water in the Lower Mekong area.

Research plays a pivotal role in environmental protection by providing the knowledge to better understand and manage issues such as climate change and water quality & availability. In parallel, the development of innovative and environmentally friendly technologies can offer sustainable economic opportunities through the responsible management of both natural and man-made resources. Often, environmental challenges go beyond national frontiers and require a coordinated approach in ASEAN and at global level.

Vision

Our vision is to become a well-known knowledge hub to provide the scientific research information on utilization and management of water and environment for sustainable development in the region.

Purposes

- To bring together institutional-wide centers and researchers to tackle national, regional and global water and environmental issues through multi and interdisciplinary research under Research and Innovation Center.
- To develop and offer graduate program on Science in Water and Environmental Engineering that support to country development and benefit to civil society.
- To provide knowledge, skill, tool, and awareness pertaining to water and environmental quality and human-environment interactions in order to improve and sustain the function of environmental systems, protect human health and economic growth.

Mission

- Conducting multi-disciplinary and interdisciplinary both basic and applied research on the utilization and protection of the environment, minimization and treatment of pollution particularly to the water resources, hydrological and ecological systems.
- Developing, demonstrating and disseminating new finding and methodology supporting to science and engineering for the environmental management and monitoring, disaster management, ecological restoration, treatment and disposal of pollution.
- Collaborating on the local and global scale in research and education to protect the precision resources that comply with national policy and SDG to sustain human life.

- Educating and training personnel for management, supervision and operation of water resources and environmental systems.

Research Theme

The research unit Water and Environmental Engineering is established to address the needs of Cambodia in this very large field. Research activity is needed:

1. **Hydrology and Water Resources Management**: Hydrological Modeling and Analysis, Hydrogeological Analysis, Groundwater and surface water interaction, Water Balance, Soil Erosion, River Bank Erosion and failure, Land Use Change, Environmental Modelling, Watershed Carrying Capacity, GIS and Remote Sensing, Hydraulic Structure …
2. **Climate Change and Disaster Risk Management:** Weather Forecasting, Weather Forecasting, Climate Change Modeling, Climate Change Downscaling, Climate Change Impacts, Climate Change Vulnerability and Adaptation, Tropical Meteorology, Flood/Drought Management, other hazards…
3. **Urban Water Supply, and Wastewater Treatment**: Drinking Water Assessment and Treatment, Pollution Management, Waste Water Treatment, WASH, Water Treatment Technology, Microbiology, Water Quality Modeling, Water Biochemistry…
4. **Coastal and Marine Environment (CME)**: Seawater Intrusion, Coastal Processes and Sediment Transport, Coastal Wetland Ecosystem, Sea Surface Current, Sea Grass and Coral Protection, Wave Impact on Coastal and Offshore Structures, Coastal Karst Landforms, Coastal Geology, Coastal Flood Management…
5. **Soil and irrigation:** Soil-Plant-Water Relation, Agricultural Water Management, Soil Quality…
6. **Urban Environmental Management**: Air Pollution Management, Solid Waste Management, Hazardous Waste Management, Environmental Health and Risk Assessment…

The research Unit Water and Environmental Engineering has strong interactions with a worldwide community of researchers and stakeholders focused on climate change, environmental disasters prevention, as well as companies involved in waste management, water supply, wastewater and sanitation.

Projects and Research Topics

The list of projects and research topics that are implementing in WAE unit as shown in the table below. For more detail information refers Annex 17.

Table 20. Research topics in WAE unit for the academic year 2021-2022

No.	Name of PI (FAMILY First name)	Sex	Project/Research Topic	Funding source	Period	Collaboration scale * N = National R = Regional I = International	Project Type* 1= Basic 2 = Applied & Development 3 = Start-up 4 = Tech-transfer
1	Dr. OR Chanmoly	M	SATREPS: Establishment of Risk Management Platform for Air Pollution in Cambodia	JICA-JST	2022-2027	I	2

2	Dr. OM Romny	M	SATREP: Establishment of Environmental platform of Tonle Sap Lake	JICA-JST	2016-2022	I	2
3	Dr. BUN Saret	M	Addressing Water Scarcity in a Rural Community of Cambodia through Groundwater Use	LBE-JICA	2020-2022	R	2
4	Dr. CHHIN Rattana	M	Collaborative Research Platform to Manage Risk and Enhance Resilience of Coral Reef in Southeast Asia	APN	2019-2021	I	1
5	Dr. DOUNG Ratha	M	Water Evolution and Vulnerability Under Global Changes in Coastal Catchments of Cambodia	IRD	2019-2022	I	1
6	Dr. CHHOUN Kong	M	Understanding and Managing the Cambodian Floodplains, The Preks of Kandal Province		2019-2022	I	1
7	Dr. CHAN Rathborey	M	Spatio-temporal assessment of surface and groundwater quality affected by urban wastewater: case study in Tamouk Lake Area	EU/AFD	2020-2021	N	1
8	Dr. HEU Rina	F	Assessment of Silicon (Si) in water and bottom sediment in Tonle Sap Lake: an implication for highly productive ecosystem.		2020-2021	N	1
9	M. KIM Lengthong	M	Assessment of Flood Risk on Urban Areas due to Flow Alteration of Lower Mekong and Rapid Urban Development		2020-2021	N	1
10	Dr. TY Boreborey	F	Arsenic removal from groundwater using ECAR treatment technology		2020-2021	N	1
11	Dr. DOUNG Ratha	M	Impact of climate and land use change on hydrology pattern in the Coastal Zone of Cambodia		2018-2021	N	1
12	Dr. PENG Chanthol	F	Antibiotic-resistant bacteria in wastewater and their impact on receiving freshwater system		2020-2021	N	1
13	Dr. KHOEUN Kimleang	F	Application of Alternative Bio-adsorbents in Wastewater Treatment		2020-2021	N	1
14	M. LUN Sambo	M	Formulizing the design criteria for the piped-water system in Cambodia		2020-2021	N	1
15	Ms. AUN Srean	F	Air pollution in Phnom Penh/East Asia-Nanoparticle monitoring network (EA-Nanonet)	Kanazawa University	2011-Present	I	1
16	Dr. HANG Leakhena	F	Development of a bio-filter system model to control air pollution toward industrial application	HEIP	2021-2023	I	2

17	Dr. HEU Rina	F	Improving Sustainable Water Supply and Sanitation in Cambodia: Case of Tonle Sap Lake's Floating Villages		2021-2023	N	2
18	Dr. KET Pinnara	F	Integrated approach of precise irrigation and sustainable soil management to improve crop water productivity in Cambodia through ITC soil laboratory development: the focus on rice farming		2021-2023	N	1
19	Dr. BUN Saret	M	Development of Eco-Friendly and Low-Cost Wastewater Treatment System as an On-Site Product		2021-2023	N	2
20	Dr. CHHUN Kong	M	Development of Climate Data Information System for Cambodia		2021-2023	I	2
21	Dr. OEURNG Chantha	M	Strengthening Flood and Drought Risk Management and Early Warning System in Lower Mekong Basin of Cambodia		2021-2023	N	2
22	Ms. MOUN Ratha	F	Termite bioturbation in Cambodia-From Characterization to Application (PhD project)	ITC and BGF	2019-2022	I	1
23	Dr. SONG Layheang	M	Impact of Land Use Change and Climate Change on Surface Runoff and Suspended Sediment in the Mekong Basin (PhD project)		2019-2022	I	1
24	Dr. SOK Ty	M	Dynamic Transport of the Sediment and Nutrient in the Mekong River Basin and the Role of the Tonle Sap: Assessment Coupling Data and Modelling Approaches (PhD project).		2019-2022	I	1
25	Dr. PENG Chanthol	F	Aquaculture in Cambodia: Sustainability and Risk Prevention (AquaCam)	French Embassy	2020-2022	I	1
26	Dr. CHAN Rathborey	M	Development of Electrocoagulation Reactor Integrated Sedimentation for Turbidity and Color Removal from Industrial Wastewater	LBE-JICA	2021-2023	N	2
27	Dr. KET Pinnara	F	Prototype of Low-cost and Smart In-vessel Composter for converting Spent Mushroom Substrates to Bio-Organic Fertilizer	LBE-JICA	2021-2022	N	2

Researchers

Dr. PENG Chanthol (Head of WAE Research Units), Dr. Eng. in Life Science and Technology, Tokyo Institute of Technology, Japan.
Food and Environmental Microbiology, Water Quality Monitoring

Dr. CHHOUN Kong, Ph.D. in Environmental Engineering, University of the Philippines-Diliman and Tokyo Institute of Technology, Japan.
Environmental Hydrology, integrated water resources management, watershed hydrology

Dr. ANN Vannak, Ph.D in Water Science and Technology, Universitat de Girona, Spain
Water-Soil-Plant-Microorganism Interactions and Biodiversity, Hydrologic processes in a river basin, Climate change-related topics

Dr. DOUNG Ratha, PhD in Environmental Engineering, University of Philippines Diliman (UPD) and Tokyo Institute of Technology (TIT), Japan
Hydrogeology; groundwater modeling; coastal aquifer management

Dr. KET Pinnara, Ph.D. in Agricultural Science and Biological Engineering, University of Liege-Gembloux Agro-Bio Tech, Belgium
Irrigation water saving for crop production

Dr. OEURNG Chantha, Ph.D in Water Resources Engineering, INP, Université de Toulouse, France
Hydrological modelling, Irrigation and Watershed Management

Dr. PEN Sytharith, Ph.D in Environmental engineering, Hokkaido University, Japan
Bed instability in suspended load dominated environments

Dr. TY Bore Borey, Ph.D. in Environmental Engineering, University of the Philippines-Diliman and Hokkaido University, Japan
Leaching, Wastewater Treatment, Water and Wastewater Treatment, Ion Exchange Resins

Dr. EANG Khy Eam, Ph.D. in Sustainable Resources Engineering, Hokkaido University, Japan.
Environmental Geochemistry, Water Environment, Hydrogeology, Geochemical Modeling and Solute Transport, Sustainable Resources Management, Geomechanics and Rock Slope Stability

Dr. KHOEURN Kimleang, Ph.D. in Sustainable Resources Engineering, Hokkaido University, Japan.
Water and Wastewater Treatment, Mine Water and Remediation, Heavy Metal Leaching and speciation, Extraction, Sorption-Desorption Processes, Environmental Chemistry, Geochemical Modeling, Environmental Pollution and Waste Management

Mr. LUN Sambo, Master in Geological Engineering, Gadjah Mada University (UGM), Indonesia
Groundwater management and evaluation, Water Supply and Senination

Dr. SOK Ty, PhD in Functional Ecology and Environment (Double Degree) from National Polytechnic Institute of Toulouse (INP-Toulouse), France.
Hydrology, Water Resources, Climate change and Environmental Monitoring and Assessment

Dr. SONG Layheang, PhD in Continental Surfaces and Interfaces, Hydrology, Université Toulouse III - Paul Sabatier, France.

Hydrology, Soil Erosion, Disaster and Agricultural Irrigation and Modeling.

Ms. SANG Davin, Master in Environmental Engineering, Kasetsart University, Thailand
Water and Wastewater Treatment, Membrane Technology

Mr. KIM Lengthong, Master in Water Resources and Environmental Engineering University of Peradeniya, Sri Lanka
Hydrology, Hydraulic model, Hydrodynamics model, Hydrologic model

Ms. MUON Ratha, Master in Environmental and Water Resource Engineering, University of Peradeniya, Sri Lanka
Soil science, Water management, Wastewater management

Dr. HEU Rina, Dr. Eng. in Civil and Environmental Engineering, Tokyo Institute of Technology, Japan.
Water Quality and Environmental Assessment, Water Treatment Technology, Environmental Ecosystems, Water Supply and Sanitation

Dr. Chan Rathborey, Dr. Eng. in Environmental Engineering, Kasesart University, Thailand and Tokyo Institute of Technology, Japan.
Wastewater Monitoring, Wastewater and Solid Waste Treatment

Mrs. CHANTO Monychot Tepy, Master in Environmental Design, Kanazawa University, Japan
Water Quality and Pollution, Biological Wastewater Treatment, Environmental Biotechnology, Microbial Community Analysis, Environmental and Food Microbiology

Mr. CHAN Ratboren, M. Eng. in Environmental Engineering, Kasetsart University, Thailand.
Water Quality Assessment, Water and Wastewater Treatment, Membrane Bioreactor, Antibiotics Treatment.

Mrs. HANG Leakhena, M. Eng. in Environmental Engineering, Univserity of The Philipine Diliman, Philippine.
Indoor/Outdoor air pollution

Academic Partners

Royal University of Agriculture, Cambodia
Royal University of Phnom Penh, Cambodia
Tokyo Institute of Technology, Japan
Tokyo University of Agriculture and Technology, Japan
University of Girona, Spain
Université de Toulouse, France
Université de Liège-Gembloux, Belgium
CARE, Ho Chi Minh City, Vietnam
Guilin University of Technology, China
Wuhan University, China
Kanazawa University, Japan
Kyoto University, Japan
Chulalongkorn University, Thailand
University of Nantes, France
CNRS, France
IRD, France

Non-academic partners

Ministry of Education, Youth and Sports, Cambodia
Ministry of Water Resources and Meteorology, Cambodia
Ministry of Rural Development, Cambodia
Ministry of Industry and Handicraft, Cambodia
Ministry of Public Works and Transport, Cambodia
Ministry of Environment, Cambodia
JICA, Japan
JST, Japan
AFD, France
APN, Japan

Industrial Partners and NGOs

Phnom Penh water supply Authority
SAFEGE
BORDA
GRET
B2G
Weventure

Selected publications of WAE researchers since 2010

From 2020 to 2021, there are in total 148 research outputs from MIT unit classified into three categories: International publications, Local publications, and Conference and Proceedings as shown in the table below.

Table 21. Summary of number of research publications by year from 2010 to 2021

Publication classification/year	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**Total**
International publications	11	15	27	15	3	4	1	2	6	2	3	3	**92**
Local publications	6	3	5	5	5	5	4	7	2	-	-	-	**42**
Conference/ Proceedings	14	-	-	-	-	-	-	-	-	-	-	-	**14**
Total	**31**	**18**	**32**	**20**	**8**	**9**	**5**	**9**	**8**	**2**	**3**	**3**	**148**

(-) stand for missing information.

International publications

1. Pascal, J., et al. (2022). The impact of termites on soil sheeting properties is better explained by environmental factors than by their feeding and building strategies. 412. 115706https://doi.org/10.1016/j.geoderma.2022.115706 **(IF: 6.1)**
2. Chan, R., Chart, C., Wilai, C., Alongkot, B., & Phitsanu, T. (2022). Occurrence of antibiotics in typical pig farming and its wastewater treatment in Thailand. 8 21-29. https://doi.org/10.1016/j.emcon.2021.12.003 **(CiteScore: 9.7)**

3. Chhin, R., Siev, S., & Yoden, S. (2021). Time-lagged correlations of pre-monsoon precipitation in the Indochina Peninsula confirmed in a large ensemble simulation dataset. International Journal of Climatology, 1–18. Doi: 10.1002/joc.7292. **(IF:4)**
4. Chan, R., Chan, R., Chiemchaisri, W., & Chiemchaisri, C. (2021). Treatment of aquaculture farm effluent containing antibiotics in high-rate membrane bioreactor. Desalination and water treatment, 221, 56-63. **(IF:1.2)**
5. Charlotte, J.H., Mauricio, E.A., Zhewen Y., Ty, S., & Michael, C. W. (2021). Plastic transport in a complex confluence of the Mekong River in Cambodia. Environmental Research Letter. **(IF:6.7)**
6. Chan, R., Chiemchaisri, C., & Chiemchaisri, W. (2021). Application of Membrane Bioreactor with Sponge Media in Aquaculture Wastewater Treatment. Journal of Fisheries and Environment, 45(2), 106-118. **(IF:0.42)**
7. Dai, J., Rad, S., Xu, J., Pen, S., Gan, L., Chen, X., Yu, C., & Zhang, S. (2021). Impacts of climate change verus land use change on recent Lijiang River flood regime, South China. https://doi.org/10.24850/j-tyca-2021-03-07. **(IF:0.29)**
8. Rajendra, K., Uk, S. Dilini, K., Siev, S., & Chihiro, Y. (2021). Impact of Water Level Fluctuation on Sediment and Phosphorous Dynamics in Tonle Sap Lake, Cambodia. Water Air Soil Pollut 232, 139 (2021). https://doi.org/10.1007/s11270-021-05084-5. **(IF:2.5)**
9. Bun, S., Sek, S., Oeurng, C., Manabu, F., Ham, P.,& Pisut, P. (2021). A Survey of Household Water Use and Groundwater Quality Index Assessment in a Rural Community of Cambodia. Sustainability 13(18), 10071; https://doi.org/10.3390/su131810071. **(IF:3.2)**
10. Jain, S., Chhin, R., Ruth, M. D., Saroj K. M., & Shigeo, Y. (2021). A New Graphical Method to Diagnose the Impacts of Model Changes on Climate Sensitivity. Journal of the Meteorological Society of Japan. Ser. II. **(IF:2.2)**
11. Sok, T., Oeurng, C., Kaing, V., Sabine, S., Mathias, G. K., & José, M. S. P. (2021). Assessment of Suspended Sediment Load Variability in The Tonle Sap and Lower Mekong Rivers, Cambodia. Catena. **(IF:5.1)**
12. Wandee, S., Chan, R., Chiemchaisri, W., & Chiemchaisri, C. (2021). Alteration of antibiotic-resistant phenotypes and minimal inhibitory concentration of Escherichia coli in pig farming: Comparison between closed and open farming systems. Science of The Total Environment, 781, 146743. **(IF:7.9)**
13. Try, S., Tanaka, S., Kenji, T., Sayama, T., Oeurng, C., Uk, S., Takara, K., Hu, M., & Han, D. (2020). Comparison of Gridded Precipitation Datasets for Rainfall-runoff and Inundation Modeling in the Mekong River Basins. Plos one 15, no. 1, e0226814; doi.org/10.1371/journal.pone.0226814.
14. Sophal Try, Shigenobu Tanaka, Kenji Tanaka, Takahiro Sayama, Giha Lee, and Chantha Oeurng. (2020). Assessing the Effects of Climate Change on Flood Inundation in the Lower Mekong Basin Using High-Resolution AGCM Outputs. Progress in Earth and Planetary Science, 7, 1-16; doi.org/10.1186/s40645-020-00353-z.
15. Sophal Try, Shigenobu Tanaka, Kenji Tanaka, Takahiro Sayama, Maochuan Hu, Ty Sok, and Chantha Oeurng. (2020). Projection of extreme flood inundation in the Mekong River basin under 4K increasing scenario using large ensemble climate data." Hydrological Processes 34, no. 22: 4350-4364.
16. Ty Sok, Chantha Oeurng, Ilan Ich, Sabine Sauvage, and José Miguel Sánchez-Pérez. (2020). Assessment of Hydrology and Sediment Yield in the Mekong River Basin Using SWAT Model. Water 12, no. 12: 3503.

17. Tharo Touch, Chantha Oeurng, Yanan Jiang, Ali Mokhtar. (2020). Integrated Modeling of Water Supply and Demand Under Climate Change Impacts and Management Options in Tributary Basin of Tonle Sap Lake, Cambodia. Water, 12, 2462; doi:10.3390/w12092462.

18. Hoang Quoc Anh, Thi Phuong Quynh Le, Nhu Da Le, Xi Xi Lu, Thi Thuy Duong, Josette Garnier, Emma Rochelle-Newall, Shurong Zhang, Neung-Hwan Oh, Chantha Oeurng, Chaiwat Ekkawatpanit, Tien Dat Nguyen, Quang Trung Nguyen, Tran Dung Nguyen, Trong Nghia Nguyen, Thi Lieu Tran, Tatsuya Kunisue, Rumi Tanoue, Shin Takahashi, Tu Binh Minh, Huu Tuyen Le, Thi Ngoc Mai Pham, Thi Anh Huong Nguyen. (2020). Antibiotics in Surface Water of East and Southeast Asian Countries: A Focused Review on Contamination Status, Pollution Sources, Potential Risks, and Future Perspectives. Science of the Total Environment, 142865; doi.org/10.1016/j.scitotenv.2020.142865.

19. Rathborey Chan, Sirinthrar Wandee, Manna Wang, Wilai Chiemchaisri, Chart Chiemchaisri, Chihiro Yoshimura. (2020). Fate, transport and ecological risk of antibiotics from pig farms along the Bang Pakong River, Thailand. Journal of Agriculture, Ecosystem & Environment. 304:107173.

20. Rathborey Chan, Chart Chiemchaisri, Wilai Chiemchaisri. The effect of sludge recirculation on antibiotic removals in Two-stage membrane bioreactor (MBR) treating livestock wastewater. (2020). Journal of Environmental Health Science and Engineering. 18: 1541-1553.

21. Heu, R.; Ateia, M.; Yoshimura, C. (2020). Photocatalytic Nanofiltration Membrane Using Zr-MOF/GO Nanocomposite with High-Flux and Anti-Fouling Properties. Catalysts, 10, 711.

22. Heu, R.; Ateia, M.; Awfa, D.; Punyapalakul, P.; Yoshimura, C. (2020). Photocatalytic Degradation of Organic Micropollutants in Water by Zr-MOF/GO Composites. J. Compos. Sci., 4, 54. Journal of Composite Science.

23. Chhin, R., C. Oeurng, and S. Yoden, (2020). Drought Projection in the Indochina Region Based on the Optimal Ensemble Subset of CMIP5 Models. Climatic Change, 162, 687–705.

24. S. Tweed, S. Massuel, J.L. Seidel, K. Chhuon, S. Lun, K.E. Eang, J.P. Venot, G. Belaud, M. Babic, M. Leblanc (2020). Seasonal influences on groundwater arsenic concentrations in the irrigated region of the Cambodian Mekong Delta, Journal of Science of the Total Environment, Vol. 728.

25. Layheang, Song; Boithias, Laurie; Sengtaheuanghoung, Oloth; Oeurng, Chantha; Valentin, Christian; Souksavath, Bounthan; Sounyafong, Phabvilay; de Rouw, Anneke; Soulileuth, Bounsamay; Silvera, Norbert; Lattanavongkhot, Bounchanh; Pierret, Alain; Ribolzi, Olivier (2020). Understory Limits Surface Runoff and Soil Loss in Teak Tree Plantations of Northern Lao PDR. Water, 12, 2327.

26. Li, S., Heng, S., Siev, S., Yoshimura, C., Saavedra, O., Ly, S. (2019). Multivariate interpolation and information entropy for optimizing rain gauge network in the Mekong River Basin. Hydrological Sciences Journal. 1–14.

27. Siev, S., Paringit, E., Yoshimura, C., & Hul, S. (2019). Modeling Inundation Patterns and Sediment Dynamics in the Extensive Floodplain along the Tonle Sap River. River Research and Applications. 1–15.

28. Hoshikawa, K., Fujihara, Y., Siev, S., Arai, S., Nakamura, T., Fujii, H., Sok, T., & Yoshimura, C. (2019). Characterization of total suspended solid dynamics in a large shallow lake using long-term daily satellite images. Hydrological Processes. 1–14.

29. Tanaka, T., Yoshioka, H., Siev, S., Fujii, H., Ly, S., & Yoshimura, C. (2019). A consistent finite difference local inertial model for shallow water simulation. Hydrological Research Letters, 13 (2), 28–33.

30. Ung, P., C. Peng, S. Yuk, R. Tan, V. Ann, K. Miyanaga, Y. Tanji, (2019). Dynamics of Bacterial Community in Tonle Sap Lake, a Large Tropical Flood-pulse System in Southeast Asia. Science of the Total Environment. Vol. 664, 414-423.

31. Try S., Lee, G., Yu, W., Oeurng C. (2019). Delineation of flood-prone areas using geomorphological approach in the Mekong Rever Basin, Quaternary international 503, 79-86.

32. Chantha Oeurng and Ty Sok. (2020). Assessing changes in flow and water quality emerging from hydropower development and operation in the Sesan River Basin of the Lower Mekong Region. Sustainable Water Resources Management 6, no. 2: 1-12.

33. Chantha Oeurng, Thomas A. Cochrane, Sarit Chung, Mathias G. Kondolf, Thanapon Piman, Mauricio E. Arias. (2019). Assessing Climate Change Impacts on River Flows in the Tonle Sap Lake Basin, Cambodia. Water, 11, 618; doi:10.3390/w11030618.

34. Sok K., Supattra V., Heng S. (2019). A Comparative Assessment of Meteorological Drought Indices for the Baribo Basin (Cambodia) In H. I. Chaminé, B. Maurizio, K. Ozgur, C. Mingjie, B. J. Merkel (Ed.) Advances in Sustainable and Environmental Hydrology, Hydrogeology, Hydrochemistry and Water Resources, Springer International Publishing

35. Ann, V., A. Freixa, A. Butturini, A. M. Romaní. (2019). Interplay between sediment properties and stream flow conditions influences surface sediment organic matter and microbial biomass in a Mediterranean river. Hydrobiologia 828(1):199-212.

36. Siev Sokly, YangHeejun, Sok Ty, Uk Sovannara, Song Layheang, Kodikara Dilini, Oeurng Chantha, Hul Seingheng, Yoshimura Chihiro. (2018). Sediment dynamics in a large shallow lake characterized by seasonal flood pulse in Southeast Asia, Science of The Total Environment, Vol. 631-631, 597-607.

37. Eang K.E., Igarashi T., Kondo M., Nakatani T., Tabelin C.B., Fujinaga R. (2018). Groundwater Monitoring of an Open-Pit Limestone Quarry: Water-Rock Interaction and Mixing Estimation within the Rock Layers by Geochemical and Statistical Analyses. International Journal of Mining Science and Technology, 28(6), 849-857.

38. Eang K.E., Igarashi T., Fujinaga R., Kondo M., Tabelin C.B. (2018). Groundwater Monitoring of an Open-Pit Limestone Quarry: Groundwater Characteristics, Evolution and Their Connections to Rock Slopes. Environmental Monitoring and Assessment, 190(193), 1-15.

39. Sophal Try, Giha Lee, Wansik Yu, Chantha Oeurng. (2018). Large-Scale Flood-Inundation Modeling in the Mekong River Basin, Case Studies, Journal of Hydrologic Engineering 23(7).

40. Sovannara Uk, Chihiro Yoshimura, Sokly Siev, Sophal Try, Heejun Yang, Chantha Oeurng, Shangshang Li, Seingheng Hul. (2018). Tonle Sap Lake: Current status and important research directions for environmental management, Lakes & Reservoirs Research & Management 23(3): 177-189.

41. G. Mathias Kondolf, Rafael J.P. Schmitt, Paul Carling, Steve Darby, Mauricio Arias, Simone Bizzi, Andrea Castelletti, Thomas A. Cochrane, Stanford Gibson, Matti Kummu, Chantha Oeurng, Zan Rubin, Thomas Wild. (2018). Changing sediment budget of the Mekong: Cumulative threats and management strategies for a large river basin, Science of The Total Environment 625(7), 114-134.

42. Pinnara Ket, Sarah Garré, Chantha Oeurng, Lyda Hok and Aurore Degré. (2018). Simulation of Crop Growth and Water-Saving Irrigation Scenarios for Lettuce: A Monsoon-Climate Case Study in Kampong Chhnang, Cambodia, Water 10(5): 666.

43. Pinnara Ket, Chantha Oeurng and Aurore Degré. (2018). Estimating Soil Water Retention Curve by Inverse Modelling from Combination of In Situ Dynamic Soil Water Content and Soil Potential Data, Soil system 2(4).

44. Sith. R, et al. (2018). Assessment of water quality and evaluation of best management practices in a small agricultural watershed adjacent to Coral Reef area in Japan, Joural Agricultural Water Management

45. Tom Murphy, Kongkea Phan, Emmanuel Yumvihoze, Kim Irvine, Ken Wilson, David Lean, Borey Ty, Alexander Poulain, Brian Laird, Laurie Hing Man Chan. (2018). Groundwater irrigation and arsenic speciation in rice". Journal of health and Pollution 8(19).

46. Luke Makarichi, Rithy Kan, Warangkana Jutidamrongphan, Kua-anan Techato. (2018) Suitability of municipal solid waste in African cities for thermochemical waste-to-energy conversion: The case of Harare Metropolitan City, Zimbabwe, Waste Management and Research, 1-12.

47. Raksmey Ang, Chantha Oeurng. (2018). Simulating streamflow in an ungauged catchment of Tonlesap Lake Basin in Cambodia using Soil and Water Assessment Tool (SWAT) model, Water Science 32(1): 89-101.

48. T. Seng, S. Ly, S. Heng. (2018). Feasible study of a micro-hydropower project based on economic analysis: a case study of a remote area in Cambodia, Water Security in Asia: Opportunities and Challenges in the Context of Climate Change. California, Springer.

49. Kan, R., Kaosol, T., Tekasakul, P., and Tekasakul, S. (2018). Risk assessment of particle-bound polycyclic aromatic hydrocarbons derived from combustion of lignite and rubber sawdust pellets: size distribution and human health effects. Walailak Journal of Science and Technology. 16 (10).

50. Ly, S., Kim, L., Demerre, S., Heng, S. (2018). Flood mapping along the Lower Mekong River in Cambodia. Engineering Journal 22 (1).

51. Valois, R., Vouillamoz, J.M., Lun, S. and Arnout, L. (2018). Mapping groundwater reserves in northwestern Cambodia with the combined use of data from lithologs and time-domain-electromagnetic and magnetic-resonance soundings. Hydrogeology Journal, 1-14.

52. Zuliziana Suif, Chihiro Yoshimura, Nordila Ahmad and Seingheng Hul. (2018). Distributed model of hydrological and sediment transport process in Mekong River Basin, International Journal of GEOMATE, 14(42), 134-139.

53. Kimhuy Sok, Supattra Visessri, Sokchhay Heng. (2017). Meteorological Drought Assessment for the Baribo Basin in Cambodia, Internet Journal of Society for Social Management Systems. Vol. 11.

54. Raksmey Ang, Chantha Oeurng. (2017). Simulating stream flow in an ungauged catchment of Tonlesap Lake Basin in Cambodia using Soil and Water Assessment Tool (SWAT) model, Water Science.

55. Suif, Z., Yoshimura, C., Saavedra, O., Ahmad, N., Hul, S. (2017). Suspended sediment dynamics changes in mekong river basin: Possible impacts of dams and climate change, International Journal of GEOMATE, Volume 12, Issue 34, Pages 140-145.

56. Oeurng, C., Cochrane, T.A., Arias, M.E., Shrestha, B., Piman, T. (2016). Assessment of changes in riverine nitrate in the Sesan, Srepok and Sekong tributaries of the Lower Mekong River Basin, Journal of Hydrology: Regional Studies, 8, 95-111.

57. Chhin, R., Trilaksono, N.J., Hadi, T.W. (2016). Tropical cyclone rainfall structure affecting indochina peninsula and lower mekong river basin (LMB), Journal of Physics: Conference Series, 739(1).

58. Seng, B., Kristanti, R.A., Hadibarata, T., Hirayama, K., Katayama-Hirayama, K., Kaneko, H. (2016). Mathematical model of organic substrate degradation in solid waste windrow composting, Bioprocess and Biosystems Engineering, 39(1), 81-94.

59. Sokly Siev, Enrico C. Paringit, Chihiro Yoshimura and Seingheng Hul. (2016). Seasonal Changes in the Inundation Area and Water Volume of the Tonle Sap River and Its Floodplain, Hydrology 2016, 3(4), 33.

60. Heng, S., Suetsugi, T. (2015). Regionalization of sediment rating curve for sediment yield prediction in ungauged catchments. Hydrology Research, 46(1), 26–38. http://doi.org/10.2166/nh.2013.090.

61. Vouillamoz, J. M., Valois, R., Lun, S., Caron, D., & Arnout, L. (2015). Can groundwater secure drinking-water supply and supplementary irrigation in new settlements of North-West Cambodia?, Hydrogeology Journal, 24(1), 195–209.

62. B Ty, W Wilopo, DPE Putra. (2015). Removal Of Copper From Water Using Columns Experiment Of Lignite, Shale, And Ironsand, Journal of Applied Geology, Vol 4, No 1.

63. Heng, S., Suetsugi, T. (2014). Comparison of regionalization approaches in parameterizing sediment rating curve in ungauged catchments for subsequent instantaneous sediment yield prediction. Journal of Hydrology, 512, 240–253.

64. Pouv K. S., Besq A., Guillou S., Toorman E.A. (2014). On cohesive sediment erosion: A first experimental study of the local processes using transparent model materials, Advances in Water Resources 72:71-83.

65. Heng, S., Suetsugi, T. (2013). Coupling Singular Spectrum Analysis with Artificial Neural Network to Improve Accuracy of Sediment Load Prediction. Journal of Water Resource and Protection, 05(04), 395–404.

66. Suif, Z., Yoshimura, C., Valeriano, S. O. C. et Hul, S. (2013). Spatial and seasonal variation of suspended sediment load in the Mekong river basin, Journal of Japan Society of Civil Engineers, Vol. 70 (2014) No. 4 p. I7-I12.

67. Heng, S., Suetsugi, T. (2013). Estimating quantiles of annual maximum suspended sediment load in the tributaries of the Lower Mekong River. Journal of Water and Climate Change, 4(1), 63–76.

68. Heng, S., Suetsugi, T. (2013). Investigation on applicability of data-driven models in ungauged catchments: sediment yield prediction. Earth Resources, 1(2), 37-47.

69. Heng, S., Suetsugi, T. (2013). An Approach to the Model Use for Measuring Suspended Sediment Yield in Ungauged Catchments. American Journal of Environmental Science, 9(4), 367-376.

70. Kuok, F., Mimoto, H., Nakasaki, K. (2013). Reduction of ammonia inhibition of organic matter degradation by turning during a laboratory-scale swine manure composting. International Journal of Waste Resources, Vol. 3(1) 2013, pp5-8.

71. Kuok, F., Mimoto, H., & Nakasaki, K. (2012). Effects of turning on the microbial consortia and the in situ temperature preferences of microorganisms in a laboratory-scale swine manure composting. Bioresource Technology, 116, 421–427.

72. Pouv K. S., Besq A., Guillou S. (2012). Rheometric study for elaborating transparent model cohesive sediments for local investigations of erosion behaviour, DOI: 10.5150/revue-paralia.2012.001.

73. Ly, S., Charles, C., Degré, A. (2011). Geostatistical interpolation of daily rainfall at catchment scale: the use of several variogram models in the Ourthe and Ambleve catchments, Belgium. Hydrology and Earth System Sciences, 15(7), 2259–2274.
74. Oeurng, C., Sauvage, S., Coynel, A., Maneux, E., Etcheber, H., & Sánchez-Pérez, J.-M. (2011). Fluvial transport of suspended sediment and organic carbon during flood events in a large agricultural catchment in southwest France. Hydrological Processes, 25(15), 2365–2378.
75. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2011). Assessment of hydrology, sediment and particulate organic carbon yield in a large agricultural catchment using the SWAT model. Journal of Hydrology, 401(3–4), 145–153.
76. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2010). Dynamics of suspended sediment transport and yield in a large agricultural catchment, southwest France. Earth Surface Processes and Landforms, 35(11), 1289–1301.
77. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2010). Temporal variability of nitrate transport through hydrological response during flood events within a large agricultural catchment in south-west France. The Science of the Total Environment, 409(1), 140–149.

Local publications

1. Kol, P., & Doung, R. (2021). Application of SWMM to Explore Possible Climate Change Impact on Urban Stormwater Drainage. Techno Science Journal.

2. Khen, C., Ich, I., Sok, T., Try, S., & Oeurng, C. (2021). Hydrological Components and Catchment Scale Sediment Delivery in Prek Thnot River Basin, Cambodia. Techno Science Journal.

3. Heng, D., Ty, B., Hul, S. (2021). Study on Nutrients and Heavy Metals in Bottom Sediment of Tonle Sap Lake. Techno Science Journal.

4. Heng, S., Kheav, K., Hok, P., Chhuon, K., Ly, S., Kinouchi, T. (2021). Urban Flood Modeling in Phnom Penh Using Flo-2D: Consideration of Climate Change Effect. Techno Science Journal.

5. Lai, C., Vorn, T., Eang, K.E., Ty, B. (2021). Evaluation of Wastewater Treatment Efficiency Utilizing Coconut Fiber as Filter Media. Techno Science Journal.

6. Neang, P., Hul, S.H., Endo, G., Miyauchi, K. (2021). Groundwater Arsenic Contamination and Social Needs of Economical Arsenic Removal Technology in Rural Areas of Cambodian Mekong Delta. Techno Science Journal

Conference/Proceedings

1. Khun, E., Chan, R., Chan, R., Bun, S., & Chart, C. (2021). Optimization of hydraulic rentention time (HRT) in high-rate aeration tank for maximum nitrate production from aquaculture wastewater. The 10th Scientific Day of ITC, May 2021.
2. Chan, R., Chan, R., Wandee, S., Manna, W., Wilai, C., Chart, C., & Chihiro, Y. (2021). Fate and transport of antibiotic from pig farm along the Bang Pakong River, Thailand. The 13th AUN/SEED-Net Regional Conference on Chemical Engineering (RCChE-2020), 04- 05 February 2021.

3. Kaing, V., Ilan, I., Lieng, T., Yos, C., Chan, R., Chan, R., Song, L., Mong, M., Oeurng, C., & Sok,. T. (2021). Application of Multivariate Techniques in the Evaluation of Spatial Surface Water Quality in an Urbanized Floodplain Area in Cambodia. The 13th AUN/SEED-Net Reginal Conference on Chemical Engineering (RCChE-2020), Phnom Penh, Cambodia.
4. Heang, B., Chan, R., Chuy, V., & Bun, S. (2021). Technical Review and Challenge of Various Decentralized Anaerobic Treatments for Domestic Wastewater. The 10th Scientific Day of ITC.
5. Seng, P., Chan, R., & Bun, S. (2021). Recent Research and Development of Anaerobic Baffled Reactor and Filter for Wastewater Treatment: A Review. The 10th Scientific Day of ITC.
6. Ka, K., Khe, S., Chan, R., Chan, R., Tes, D., Kaing, V., Oeurng, C., & Ty, S. (2021). Seasonal Dynamic on Occurrence and Distribution of Pollutants from Urban Canal and Aquaculture Farm to Tamouk Lake, a Floodplain Urbanized Area in Phnom Penh. The 10th Scientific Day of ITC, May 2021.
7. You, R., Hok, S., Sieng, S., Ty, B. (2021). The Preliminary of Arsenic Removal from Groundwater by ultilizing Electro-Chemical Arsenic Remediation (ECAR). The 10th Scientific Day of ITC, May 2021.
8. Nhem, V., Siev, S.,Chhin, R., Ung, P., Fuji, H., & Chhihiro, Y. (2021). Water Quality Mapping Using High Resolution Satellite Image Sentinel-2. The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2021
9. Thoeurn, T., Tri, W. H.,& Chhin, R. (2021). Application of Statistical Downscaling for Seasonal Rainfall Forecasts in Cambodia: A Application of Statistical Downscaling for Seasonal Rainfall Forecasts in Cambodia: A Comparison between Constructed Analogue and Bias Correction Methods. The 13th AUN/SEED-Net Regional Conference on Chemical Engineering
10. Sang, D., Tan, R., & Pierre, L. C. (20211. Kinetic and Equilibrium Studies of Caffeine Adsorption on Different Type of Activated Carbons. The 10th Scientific Day of ITC, May 2021.
11. Or, T., Sang, D., Chanto, M.T., Tan, R. (2021). Natural Organic Matter Removal in Drinking Water Treatment by Combination of Adsorption and Coagulation Processs: A Comprehensive Review. The 10th Scientific Day of ITC, May 2021.
12. Meng, C., Lun, S., Sith, R., & Sang, D. (2021). Formulizing the Design Criteria for the Piped Water Supply in Urban Area of Cambodia. The 10th Scientific Day of ITC, May 2021.
13. Visal, R., Sith, R., & Lun, S. (2021). Assessment of Hydraulic Performance of Water Supply System in Takhmao City, Using Modeling Approach, Proceedings of the 10th Scientific Day of ITC, May 6, 2021, Phnom Penh.
14. Sona, Y., Pen, S., & Lun, S. (2021). 2D-Fluvial Hydraulic Characteristic Assessment at Chaktomuk Junction, Phnom Penh City, Proceedings of the 10th Scientific Day of ITC, May 6, 2021, Phnom Penh.
15. Ekkawatpanit, Tien Dat Nguyen, Quang Trung Nguyen, Tran Dung Nguyen, Trong Nghia Nguyen, Thi Lieu Tran, Tatsuya Kunisue, Rumi Tanoue, Shin Takahashi, Tu Binh Minh, Huu Tuyen Le, Thi Ngoc Mai Pham, Thi Anh Huong Nguyen. (2020). Antibiotics in Surface Water of East and Southeast Asian Countries: A Focused Review on Contamination Status, Pollution Sources, Potential Risks, and Future Perspectives. Science of the Total Environment, 142865; doi.org/10.1016/j.scitotenv.2020.142865.

16. Rathborey Chan, Sirinthrar Wandee, Manna Wang, Wilai Chiemchaisri, Chart Chiemchaisri, Chihiro Yoshimura. (2020). Fate, transport and ecological risk of antibiotics from pig farms along the Bang Pakong River, Thailand. Journal of Agriculture, Ecosystem & Environment. 304:107173.

17. Rathborey Chan, Chart Chiemchaisri, Wilai Chiemchaisri. The effect of sludge recirculation on antibiotic removals in Two-stage membrane bioreactor (MBR) treating livestock wastewater. (2020). Journal of Environmental Health Science and Engineering. 18: 1541-1553.

18. Heu, R.; Ateia, M.; Yoshimura, C. (2020). Photocatalytic Nanofiltration Membrane Using Zr-MOF/GO Nanocomposite with High-Flux and Anti-Fouling Properties. Catalysts, 10, 711.

19. Heu, R.; Ateia, M.; Awfa, D.; Punyapalakul, P.; Yoshimura, C. (2020). Photocatalytic Degradation of Organic Micropollutants in Water by Zr-MOF/GO Composites. J. Compos. Sci., 4, 54. Journal of Composite Science.

20. Chhin, R., C. Oeurng, and S. Yoden, (2020). Drought Projection in the Indochina Region Based on the Optimal Ensemble Subset of CMIP5 Models. Climatic Change, 162, 687–705.

21. S. Tweed, S. Massuel, J.L. Seidel, K. Chhuon, S. Lun, K.E. Eang, J.P. Venot, G. Belaud, M. Babic, M. Leblanc (2020). Seasonal influences on groundwater arsenic concentrations in the irrigated region of the Cambodian Mekong Delta, Journal of Science of the Total Environment, Vol. 728.

22. Layheang, Song; Boithias, Laurie; Sengtaheuanghoung, Oloth; Oeurng, Chantha; Valentin, Christian; Souksavath, Bounthan; Sounyafong, Phabvilay; de Rouw, Anneke; Soulileuth, Bounsamay; Silvera, Norbert; Lattanavongkhot, Bounchanh; Pierret, Alain; Ribolzi, Olivier (2020). Understory Limits Surface Runoff and Soil Loss in Teak Tree Plantations of Northern Lao PDR. Water, 12, 2327.

23. Li, S., Heng, S., Siev, S., Yoshimura, C., Saavedra, O., Ly, S. (2019). Multivariate interpolation and information entropy for optimizing rain gauge network in the Mekong River Basin. Hydrological Sciences Journal. 1–14.

24. Siev, S., Paringit, E., Yoshimura, C., & Hul, S. (2019). Modeling Inundation Patterns and Sediment Dynamics in the Extensive Floodplain along the Tonle Sap River. River Research and Applications. 1–15.

25. Hoshikawa, K., Fujihara, Y., Siev, S., Arai, S., Nakamura, T., Fujii, H., Sok, T., & Yoshimura, C. (2019). Characterization of total suspended solid dynamics in a large shallow lake using long-term daily satellite images. Hydrological Processes. 1–14.

26. Tanaka, T., Yoshioka, H., Siev, S., Fujii, H., Ly, S., & Yoshimura, C. (2019). A consistent finite difference local inertial model for shallow water simulation. Hydrological Research Letters, 13 (2), 28–33.

27. Ung, P., C. Peng, S. Yuk, R. Tan, V. Ann, K. Miyanaga, Y. Tanji, (2019). Dynamics of Bacterial Community in Tonle Sap Lake, a Large Tropical Flood-pulse System in Southeast Asia. Science of the Total Environment. Vol. 664, 414-423.

28. Try S., Lee, G., Yu, W., Oeurng C. (2019). Delineation of flood-prone areas using geomorphological approach in the Mekong Rever Basin, Quaternary international 503, 79-86.

29. Chantha Oeurng and Ty Sok. (2020). Assessing changes in flow and water quality emerging from hydropower development and operation in the Sesan River Basin of the Lower Mekong Region. Sustainable Water Resources Management 6, no. 2: 1-12.

30. Chantha Oeurng, Thomas A. Cochrane, Sarit Chung, Mathias G. Kondolf, Thanapon Piman, Mauricio E. Arias. (2019). Assessing Climate Change Impacts on River Flows in the Tonle Sap Lake Basin, Cambodia. Water, 11, 618; doi:10.3390/w11030618.

31. Sok K., Supattra V., Heng S. (2019). A Comparative Assessment of Meteorological Drought Indices for the Baribo Basin (Cambodia) In H. I. Chaminé, B. Maurizio, K. Ozgur, C. Mingjie, B. J. Merkel (Ed.) Advances in Sustainable and Environmental Hydrology, Hydrogeology, Hydrochemistry and Water Resources, Springer International Publishing

32. Ann, V., A. Freixa, A. Butturini, A. M. Romaní. (2019). Interplay between sediment properties and stream flow conditions influences surface sediment organic matter and microbial biomass in a Mediterranean river. Hydrobiologia 828(1):199-212.

33. Siev Sokly, YangHeejun, Sok Ty, Uk Sovannara, Song Layheang, Kodikara Dilini, Oeurng Chantha, Hul Seingheng, Yoshimura Chihiro. (2018). Sediment dynamics in a large shallow lake characterized by seasonal flood pulse in Southeast Asia, Science of The Total Environment, Vol. 631-631, 597-607.

34. Eang K.E., Igarashi T., Kondo M., Nakatani T., Tabelin C.B., Fujinaga R. (2018). Groundwater Monitoring of an Open-Pit Limestone Quarry: Water-Rock Interaction and Mixing Estimation within the Rock Layers by Geochemical and Statistical Analyses. International Journal of Mining Science and Technology, 28(6), 849-857.

35. Eang K.E., Igarashi T., Fujinaga R., Kondo M., Tabelin C.B. (2018). Groundwater Monitoring of an Open-Pit Limestone Quarry: Groundwater Characteristics, Evolution and Their Connections to Rock Slopes. Environmental Monitoring and Assessment, 190(193), 1-15.

36. Sophal Try, Giha Lee, Wansik Yu, Chantha Oeurng. (2018). Large-Scale Flood-Inundation Modeling in the Mekong River Basin, Case Studies, Journal of Hydrologic Engineering 23(7).

37. Sovannara Uk, Chihiro Yoshimura, Sokly Siev, Sophal Try, Heejun Yang, Chantha Oeurng, Shangshang Li, Seingheng Hul. (2018). Tonle Sap Lake: Current status and important research directions for environmental management, Lakes & Reservoirs Research & Management 23(3): 177-189.

38. G. Mathias Kondolf, Rafael J.P. Schmitt, Paul Carling, Steve Darby, Mauricio Arias, Simone Bizzi, Andrea Castelletti, Thomas A. Cochrane, Stanford Gibson, Matti Kummu, Chantha Oeurng, Zan Rubin, Thomas Wild. (2018). Changing sediment budget of the Mekong: Cumulative threats and management strategies for a large river basin, Science of The Total Environment 625(7), 114-134.

39. Pinnara Ket, Sarah Garré, Chantha Oeurng, Lyda Hok and Aurore Degré. (2018). Simulation of Crop Growth and Water-Saving Irrigation Scenarios for Lettuce: A Monsoon-Climate Case Study in Kampong Chhnang, Cambodia, Water 10(5): 666.

40. Pinnara Ket, Chantha Oeurng and Aurore Degré. (2018). Estimating Soil Water Retention Curve by Inverse Modelling from Combination of In Situ Dynamic Soil Water Content and Soil Potential Data, Soil system 2(4).

41. Sith. R, et al. (2018). Assessment of water quality and evaluation of best management practices in a small agricultural watershed adjacent to Coral Reef area in Japan, Joural Agricultural Water Management

42. Tom Murphy, Kongkea Phan, Emmanuel Yumvihoze, Kim Irvine, Ken Wilson, David Lean, Borey Ty, Alexander Poulain, Brian Laird, Laurie Hing Man Chan. (2018). Groundwater irrigation and arsenic speciation in rice". Journal of health and Pollution 8(19).

43. Luke Makarichi, Rithy Kan, Warangkana Jutidamrongphan, Kua-anan Techato. (2018) Suitability of municipal solid waste in African cities for thermochemical waste-to-energy

conversion: The case of Harare Metropolitan City, Zimbabwe, Waste Management and Research, 1-12.

44. Raksmey Ang, Chantha Oeurng. (2018). Simulating streamflow in an ungauged catchment of Tonlesap Lake Basin in Cambodia using Soil and Water Assessment Tool (SWAT) model, Water Science 32(1): 89-101.
45. T. Seng, S. Ly, S. Heng. (2018). Feasible study of a micro-hydropower project based on economic analysis: a case study of a remote area in Cambodia, Water Security in Asia: Opportunities and Challenges in the Context of Climate Change. California, Springer.
46. Kan, R., Kaosol, T., Tekasakul, P., and Tekasakul, S. (2018). Risk assessment of particle-bound polycyclic aromatic hydrocarbons derived from combustion of lignite and rubber sawdust pellets: size distribution and human health effects. Walailak Journal of Science and Technology. 16 (10).
47. Ly, S., Kim, L., Demerre, S., Heng, S. (2018). Flood mapping along the Lower Mekong River in Cambodia. Engineering Journal 22 (1).
48. Valois, R., Vouillamoz, J.M., Lun, S. and Arnout, L. (2018). Mapping groundwater reserves in northwestern Cambodia with the combined use of data from lithologs and time-domain-electromagnetic and magnetic-resonance soundings. Hydrogeology Journal, 1-14.
49. Zuliziana Suif, Chihiro Yoshimura, Nordila Ahmad and Seingheng Hul. (2018). Distributed model of hydrological and sediment transport process in Mekong River Basin, International Journal of GEOMATE, 14(42), 134-139.
50. Kimhuy Sok, Supattra Visessri, Sokchhay Heng. (2017). Meteorological Drought Assessment for the Baribo Basin in Cambodia, Internet Journal of Society for Social Management Systems. Vol. 11.
51. Raksmey Ang, Chantha Oeurng. (2017). Simulating stream flow in an ungauged catchment of Tonlesap Lake Basin in Cambodia using Soil and Water Assessment Tool (SWAT) model, Water Science.
52. Suif, Z., Yoshimura, C., Saavedra, O., Ahmad, N., Hul, S. (2017). Suspended sediment dynamics changes in mekong river basin: Possible impacts of dams and climate change, International Journal of GEOMATE, Volume 12, Issue 34, Pages 140-145.
53. Oeurng, C., Cochrane, T.A., Arias, M.E., Shrestha, B., Piman, T. (2016). Assessment of changes in riverine nitrate in the Sesan, Srepok and Sekong tributaries of the Lower Mekong River Basin, Journal of Hydrology: Regional Studies, 8, 95-111.
54. Chhin, R., Trilaksono, N.J., Hadi, T.W. (2016). Tropical cyclone rainfall structure affecting indochina peninsula and lower mekong river basin (LMB), Journal of Physics: Conference Series, 739(1).
55. Seng, B., Kristanti, R.A., Hadibarata, T., Hirayama, K., Katayama-Hirayama, K., Kaneko, H. (2016). Mathematical model of organic substrate degradation in solid waste windrow composting, Bioprocess and Biosystems Engineering, 39(1), 81-94.
56. Sokly Siev, Enrico C. Paringit, Chihiro Yoshimura and Seingheng Hul. (2016). Seasonal Changes in the Inundation Area and Water Volume of the Tonle Sap River and Its Floodplain, Hydrology 2016, 3(4), 33.
57. Heng, S., Suetsugi, T. (2015). Regionalization of sediment rating curve for sediment yield prediction in ungauged catchments. Hydrology Research, 46(1), 26–38. http://doi.org/10.2166/nh.2013.090.

58. Vouillamoz, J. M., Valois, R., Lun, S., Caron, D., & Arnout, L. (2015). Can groundwater secure drinking-water supply and supplementary irrigation in new settlements of North-West Cambodia?, Hydrogeology Journal, 24(1), 195–209.

59. B Ty, W Wilopo, DPE Putra. (2015). Removal Of Copper From Water Using Columns Experiment Of Lignite, Shale, And Ironsand, Journal of Applied Geology, Vol 4, No 1.

60. Heng, S., Suetsugi, T. (2014). Comparison of regionalization approaches in parameterizing sediment rating curve in ungauged catchments for subsequent instantaneous sediment yield prediction. Journal of Hydrology, 512, 240–253.

61. Pouv K. S., Besq A., Guillou S., Toorman E.A. (2014). On cohesive sediment erosion: A first experimental study of the local processes using transparent model materials, Advances in Water Resources 72:71-83.

62. Heng, S., Suetsugi, T. (2013). Coupling Singular Spectrum Analysis with Artificial Neural Network to Improve Accuracy of Sediment Load Prediction. Journal of Water Resource and Protection, 05(04), 395–404.

63. Suif, Z., Yoshimura, C., Valeriano, S. O. C. et Hul, S. (2013). Spatial and seasonal variation of suspended sediment load in the Mekong river basin, Journal of Japan Society of Civil Engineers, Vol. 70 (2014) No. 4 p. I7-I12.

64. Heng, S., Suetsugi, T. (2013). Estimating quantiles of annual maximum suspended sediment load in the tributaries of the Lower Mekong River. Journal of Water and Climate Change, 4(1), 63–76.

65. Heng, S., Suetsugi, T. (2013). Investigation on applicability of data-driven models in ungauged catchments: sediment yield prediction. Earth Resources, 1(2), 37-47.

66. Heng, S., Suetsugi, T. (2013). An Approach to the Model Use for Measuring Suspended Sediment Yield in Ungauged Catchments. American Journal of Environmental Science, 9(4), 367-376.

67. Kuok, F., Mimoto, H., Nakasaki, K. (2013). Reduction of ammonia inhibition of organic matter degradation by turning during a laboratory-scale swine manure composting. International Journal of Waste Resources, Vol. 3(1) 2013, pp5-8.

68. Kuok, F., Mimoto, H., & Nakasaki, K. (2012). Effects of turning on the microbial consortia and the in situ temperature preferences of microorganisms in a laboratory-scale swine manure composting. Bioresource Technology, 116, 421–427.

69. Pouv K. S., Besq A., Guillou S. (2012). Rheometric study for elaborating transparent model cohesive sediments for local investigations of erosion behaviour, DOI: 10.5150/revue-paralia.2012.001.

70. Ly, S., Charles, C., Degré, A. (2011). Geostatistical interpolation of daily rainfall at catchment scale: the use of several variogram models in the Ourthe and Ambleve catchments, Belgium. Hydrology and Earth System Sciences, 15(7), 2259–2274.

71. Oeurng, C., Sauvage, S., Coynel, A., Maneux, E., Etcheber, H., & Sánchez-Pérez, J.-M. (2011). Fluvial transport of suspended sediment and organic carbon during flood events in a large agricultural catchment in southwest France. Hydrological Processes, 25(15), 2365–2378.

72. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2011). Assessment of hydrology, sediment and particulate organic carbon yield in a large agricultural catchment using the SWAT model. Journal of Hydrology, 401(3–4), 145–153.

73. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2010). Dynamics of suspended sediment transport and yield in a large agricultural catchment, southwest France. Earth Surface Processes and Landforms, 35(11), 1289–1301.
74. Oeurng, C., Sauvage, S., & Sánchez-Pérez, J.-M. (2010). Temporal variability of nitrate transport through hydrological response during flood events within a large agricultural catchment in south-west France. The Science of the Total Environment, 409(1), 140–149.

5.5. Research Facilities

Due to the international collaboration (Embassy of France, ARES-CCD, AUF), ITC is able to launch the teaching activities and research. From 2010-2011, ITC has received a number of new equipment from Japanese government. Other equipment has been supported during 2014-15 due to the research project financed by ARES-CCD. These equipments will facilitate the research activities, teaching and strengthen the cooperation activities with industries. It is important to note that the SATREPS project, approximately 1.5 M$ are reserved for the purchase of new equipment for research. About 90% of research equipment has been delivered to ITC. In this 2019, ITC received 350 MRiels from the government of Cambodia through the ministry of education, youth and sport for research facility. Furthermore, ITC also received 7 M$ from the government of Cambodia under the World Bank loan. Table below presents the laboratory by research unit.

Table 22. Laboratories of ITC by research unit.

Research unit	Name of laboratory
ETM	• Power Lab • Energy Lab • Thermal Lab • Fluid Mechanics Lab • Internal Combustion Engine Lab • Biomass Energy Lab
FTN	• Food Microbiology Lab • Food Chemistry Lab • Physicochemical and Analytical Chemistry Lab • Organic Chemistry and Biochemistry Lab • Food Processing Lab • Hall Technology • Chromatography Lab (ASS, HPLC and GC-MS) • Plant Biotechnology Lab
MIT	• Computer Lab • Networking Lab • Mobile Develop Lab
MSS	• Materials Science and Engineering Lab • Geotechnical Lab • Civil Engineering Lab (Asphalt Lab, Materials Engineering Lab and Soil Mechanic Lab) • XRD and XRF Lab

WAE	• Hydrology and Hydraulics Lab • Water Quality Lab (Water Chemistry, Water Supply) • Soil Lab • Topography Lab • GIS and Remote Sensing Lab

5.6. Research and Innovation Dissemination

5.6.1. Techno-Science Research Journal

Techno-Science Research Journal is a peer reviewed Journal that is hosted and published by Research and Innovation Centre (RIC) of ITC. In 2013, Techno-Science Journal was released its first volume containing 11 research papers that have been published, and its recently published volume 9 of 20 papers in 2021 (Annex 18). By contributing from institutional stakeholders, faculty staffs and researchers mainly from Chemical Engineering and Food Technology, Civil Engineering, Electrical and Energy Engineering, Geo-resources and Geotechnical Engineering, Industrial and Mechanical Engineering, Information and Communication Technology, and Rural Engineering, the number of research papers submitted to this journal is increased year by year. Until December 2021, there were 9 volumes of Techno-Science Journal with a total paper of 100 research papers have been published. To disseminate the research output, the research findings in those search papers have been organized to share in national and international conferences. Furthermore, each volume of our journal has been printed out about more than 100 hard copies circulated to relevant institutions and stakeholder among our network.

For the improvement of our journal, the editorial boards have been working harder. Our commitment is to be indexed our journal in ACI (ASEAN citation index) by the ASEAN Committee. From our commitment and efforts, it is hopeful that in the near future the Techno-Science Research journal will be indexed by ACI.

5.6.2. RIC Website

Research and Innovation Center (RIC) of ITC has published an own website (https://ric.itc.edu.kh/) supported by ARES-CCD since 2018. This website is created with two main purposes, to provide descriptive information on research units as well as RIC research potential and to facilitate the communications (external and internal). Data management and record including online researcher application form has been established and used from 2018-2019 then the online permission request for researchers has been updated in 2019-2020. In 2020-2021, under KPI improvement part of HEIP project, RIC website has been updated especially on researcher profile and KPI. With this update, researcher does not require to complete KPI excel file at the end of academic year anymore, the system can generate KPI based on the input data in the researcher profile.

5.7. Report of International Consultant for improving the governance of RIC

Under HEIP, ITC has hired an internal consultant to define the proper plan for research and development at ITC. The four-month assignment of the consultant is to characterize the research environment at ITC, and develop the strategy development plan as well as the research operation manual.

The consultant has developed a practical operation manual (OM). The main objective of OM is to guide new researchers, especially fresh graduated from oversea and become researcher, to well understand about how to work as a researcher at ITC. The career path of OM shows researchers how they will be in the future through the academic tract. Moreover, it is such kind of orientation document for researcher, where, who and how to be contacted for troublesome.

The consultant has interviewed with internal and external stakeholders for understanding the research environments in Cambodia as well as at ITC. The findings are framed using SWOT analysis framework. The framework uses strengths, weaknesses, opportunities and threats to frame the analysis findings.

Strengths in this framework describe what the ITC excels at and what separate it from other institutes in the country and the region; they help the ITC to achieve its objectives. **Weaknesses** stop the ITC from performing at its optimum level; they hinder the achievement of its objectives. **Opportunities** refer to favorable external factors that could help the ITC to achieve its objectives, whereas **threats** refer to factors that have the potential to harm the ITC and that could prevent the ITC from achieving its goals as shown in Table below.

Table 23. Strengths and weaknesses of research environment of RIC

	Helpful to achieving objectives	**Harmful** to achieving objectives	
Internal origin (i.e., attributes of the RIC and the ITC)	**Strengths** • Existing international connections • Senior researchers with diverse skills and experiences • Good reputation in Cambodia; strong sense of belonging among alumni • High level of job security and autonomy • Highly qualified and passionate junior researchers as future leaders • Existing cooperation between senior researchers and the industrial sector • Generous support from non-government organisations	**Weaknesses** • Nearly no support and training on project management, financial management and procurement support • Insufficient incentives for experienced researchers to take on new research projects • Inefficient internal communication; unclear job roles; laboratory management issues • Weak and passive external communication • Lack of advanced equipment • Insufficient human resource management support	more impactful less impactful
External origin (i.e., attributes of the environment)	**Opportunities (preliminary)** • Government's interest and commitment in R&D and innovation • International organisations' continuous support • Continuous increase in number of students in STEM majors • Expected increase of private sector, especially SMEs, demands for professional services in the 4IR • Nascent but vibrant innovation and entrepreneurship ecosystem in Cambodia	**Threats (preliminary)** • Competition for talent from private universities and firms/organisations • Complex procedures and lengthy negotiation between ministries and public HEIs regarding budgeting • Disruptions to the labour market of Cambodia caused by the 4IR • Continuous decline of grant/donation from international organisations • Emigration of highly educated individuals	more impactful less impactful

Based on the analysis of the research environment, the consultant has worked together with RIC and ITC to produce the development plan for RIC. The consultant has defined five strategic issues for development of research at ITC such as professional research support, adequate incentives for researchers, effective communication, active engagement with private and third sectors, and coherent organizational structure. The activities and impacts can be indicated in the Table below.

Table 24. The five strategies issues for development of research at RIC

<table>
<tr><th rowspan="2">Strategic Issues</th><th colspan="4">→→</th></tr>
<tr><th>Selected Key Activities</th><th>Outputs</th><th>Outcomes</th><th>Impact</th></tr>
<tr><td>Professional research support</td><td>Hire and provide training to at least two research operation officers (ROOs).
Provide support on: team formation and proposal writing; funding and grant identification; and project management and administration.
Provide more continuous professional development (CPD) opportunities to researchers, in particular on project management and research impact.</td><td>Better and coordinated support on: team formation and proposal writing; funding and grant identification; and project management and administration.
Improved provision of CPD opportunities.</td><td>Researchers are able to focus on conducting scientific research.
Quality and impact of research increase.
RIC becomes a fully functional research centre.</td><td rowspan="5">Contribute to the development of a national innovation ecosystem.
Promote and encourage technology transfer in the key industries identified in the IDP.
Instil in society a science, technology and innovation culture; ensure public confidence and trust on products and services that use national technologies.
Continue to develop ITC's capacities in scientific research and innovation as one of the best universities in the region.</td></tr>
<tr><td>Adequate incentives for researchers</td><td>Review and revise the performance-based researcher evaluation system.
Apply to new research funds/grants to diversify ITC's research portfolio to increase income.
Regularly conduct research environment analyses and collect feedback from researchers and stakeholders to improve quality of services.</td><td>An improved performance-based researcher evaluation system.
Collection of feedback and regular research environment analyses.</td><td>Researchers are appropriately motivated and incentivised to conduct scientific research in the ITC.
Services provided by the RIC to its researchers and stakeholders is responsive and appropriate.</td></tr>
<tr><td>Effective communication</td><td>Create a unified digital system for research policies, practices and outcomes, and ensure that guidelines and regulations are transparent and available to researchers.
Improve existing communication channels with external stakeholders and establish new ones to broaden ITC's reach and improve ITC's relevance.</td><td>An improved mechanism, with the right personnel, to facilitate internal communication (i.e., within the ITC) and external communication (i.e., between ITC and stakeholders).</td><td rowspan="2">Administration that is related to research operation is simplified.
Researchers' efficiency increases.
ITC works more closely with the private, industrial and third sectors in knowledge generation, diffusion and deployment/transfer.
Research impact increases.</td></tr>
<tr><td>Active engagement with private, industrial and third sectors</td><td>Conduct impact assessments, particularly that on social impact, for existing and future research projects.
Centrally manage, and increase and strengthen, skills development collaboration.
Transform University-Industry Linkage (UIL) Office into a fully functional office. *</td><td>A mechanism that promotes collaboration between ITC researchers and the private/industrial/third sectors in knowledge generation, diffusion and deployment/transfer.</td></tr>
<tr><td>Coherent organizational structure</td><td>Review and revise existing organizational structure to reduce overlaps between entities and increase ITC's efficiency.</td><td>A more coherent organizational structure that can promote and support research and innovation in a coordinated manner.</td><td>ITC's resources on promoting research and innovation are used in the most efficient way.</td></tr>
</table>

5.8. Conclusion

The structuring of research units at ITC has been a substantial move to promote the research at ITC. The research activities at ITC plays an important role. New equipment and Research and Innovation Center will facilitate the research and teaching activities. The equipment also contributes to the project development between ITC and industries as well as other partners. Due to the scientific publication and participation in conferences by researchers, the research capacity of ITC lecturers has been well recognized with the increasing ITC visibility in the field of engineering. It is noted that ITC has committed our best to finance the research activities at ITC. Since 2012, ITC has secured 20% of its annual budget for research and innovation. In addition, the commitment from the government of Cambodia has shown a lot of positive improvement to ITC as provided 7.92 MUSD for research and innovation.

Comparing to 2020-2021, we observed that the total projects decreased accordingly due to the termination of 9 AFD/EU projects and some LBE projects. Among 84 ongoing projects in 2021-2022 (plus 10 new LBE projects expected to be announced in March 2022), about 70% of the projects are applied and development researches which contribute to social development, and strengthening the collaboration with industries. For example, one of the grant projects which is SATREPS contributes significantly to the society through the creation of Platform for Aquatic Ecosystem Research. And the international symposium has been held every year to share the research outputs to stakeholders. The research results are in response to the policy of Ministry of Environment, Ministry of Water Resources and Meteorology, and Tonle Sap Authority. On the other hand, 22 research projects with private sectors have been conducted within this fiscal year. For instance, Higher Education Improvement Project (HEIP) projects, ARES-CCD projects, Pierre Fabre, Erasmus+ projects are in close collaboration with private sectors, which is in accordance with ITC perspective. Furthermore, there are many other small research projects with SMEs which are the usual practical collaboration between each department and private sectors and SMEs.

In conclusion, it is clear that most of these projects contribute mainly to the development of Cambodia through the research applications. Nevertheless, the RIC should keep improving the research governance and research environment of RIC/ITC to moving forwards.

6. National and International Cooperation

6.1. Memorandum of understanding and Memorandum of agreement

In the framework of internationalization, ITC, like other leading universities in the world, wishes to have more new local, regional and international partners, in order to develop collaborations and to enlarge its multilateral relations. As a result, for the academic year 2021-2022, 8 documents including 5 memoranda of understanding and 3 framework agreements have been signed between ITC and its partners. In this regard, it is worth noting that the support and funding from the World Bank is important and is pushing ITC to have more concrete cooperation and activities with the institutions with which we have signed the MoU. The below table illustrates these details:

No	Name of institution	Country	Date	Type (MoU/MoA)
PROTOCOLE D'ACCORD (MoU)				
1	The official launch of the food technology research and Innovation platform (UNIDO)	UNIDO	2022-02-08	MoU
2	Griffith University	Australia	2022-1-11	MoU
3	Global Green Growth Institute (GGGI)	GGGI	2021-11-1	MoU
4	The United Nations Development Programme	UNDP	2021-7-20	MoU
5	Université Sorbonne Paris Nord	France	2021-7-16	MoU
ACCORD DE COOPÉRATION (MoA)				
1	Convention de cotutelle de thèse (Université Libre de Bruxelles)	Belgium	2021-7-27	MoA
2	Cooperation Agreement on jointly supervised doctoral thesis (Université de Sorbonne)	France	2021-7-23	MoA
3	Inter-institutional Agreement (INP Toulouse)	European Commission	2021-7-16	MoA

For this year 2021-2022, despite the Covid-19 pandemic, ITC's cooperation with its partners remains good and fruitful.

6.2. Internship and visit

6.2.1. Foreign student at ITC

As part of multilateral inter-university exchanges, for this 2021-2022 academic year, due to the spread of Covid-19, there are only 9 foreign students, five of whom are students of the ECAM LaSalle international program, launched on October 11, 2021, two from the GIC department and one from the civil engineering department. Detail information is shown in Annex 19.

6.2.2. Big university visits/meetings and other

For the first semester of this academic year 2021-2022, as part of the strengthening of international relations, several official visits and meetings have taken place, one after the other at the ITC. The following table shows only the most important ones.

No	Name of organization or university	Country	Date
1	Meeting with Mrs. Adèle MARTIAL, Country Representative	IRD	2022-2-2
2	Visit of the mayor of the city of Metz	France	2022-2-11
3	Visit of Cart Tire company Co., Ltd	China	2022-1-5
4	M. Kaoru TSUDA (Jica-Cors)	Japan	2022-1-21
5	Visit of the Ambassador of the Czech Republic and Inauguration of the Biomedical Laboratory	Czech Republic	2022-1-17
6	Patric Obertelli, inspector of the Engineering Qualifications Commission (CTI)	France	2022-1-10
7	Mr. André SPIEGEL, director of Institut Pasteur du Cambodge	France	2021-12-6
8	Visit of Director of General Department of Education of Prey Veng and Governor of PEARING District	Cambodia	2021-12-21
9	Plantations (Cambodia-Asia) ITC-MoE	Cambodia	2021-11-30
10	Meeting HEIP-ITC-NUBB (FoodStem & LBE Project)	Cambodia	2021-11-23
11	Inauguration of the ITC-GEAR Group laboratory	Korea + Cambodia	2021-11-17
12	Mondulkiri Gold Mine Tour, Renaissance Company	Australia	2021-10-26
13	Launch of the international ECAM LaSalle program	France	2021-10-11
14	Meeting with former ITC students who finished their civil nuclear studies in Russia	Cambodia	2021-8-11

6.2.3. Foreign organizations on the ITC campus

As the Institute of Technology of Cambodia places more emphasis on research and innovation, we have foreign organizations on our campus that are involved in different areas of research with ITC researchers. These international bodies are as follows:

1. Agence Universitaire de la Francophonie (AUF)
2. Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD)
3. Institut de Recherche pour le Développement (IRD)
4. Laboratory Based-Education (LBE)
5. Japan International Cooperation Agency (JICA)
6. Global Green Growth Institute (GGGI)

For the operation of these organizations, they have 30 people (staff, researchers and international experts) who are in full activity from different countries: United States, Australia, United Kingdom, Belgium, France, Italy, Japan and Laos.

6.3. Collaboration with industries

6.3.1. Seminars for lecturer and student

1) 15th Feb 2021 to 19th April 2021, 3 Lecturers from GCI and MLMUPC were joining an online workshop on ***"Ensuring Safety in the Construction Sector and Built Environment"*** organized by Queensland University of Technology, Australia.
2) 04th May 2021, GIM were joining online workshop on ***"Call for SDF proposals"*** organized by Skills Development Fund (SDF).
3) 26th June 2021, GIM were joining online workshop on ***"Get ready for Master's Degree"*** organized by Thermal Lab. The topic was about Introduction to Thermal Lab, Research topic and proposal, Application and document required, Stay motivated with your research.
4) 31st July 2021, GIM were joining online workshop on "***Preparing yourself to be a research student and preparing your final year thesis"*** organized by Thermal Lab. The topic was about Final year thesis progress: Tips and communication with advisor, Oversea exchange program and progressive planning for final year thesis, Why should you join research activities as a student? And how to be one?.
5) On 26th – 27th August 2021, deputy head of UIL organized a two days training with topic related ***"Agri-Food Opportunity and Development in Cambodia"*** for lecturers and researchers of the Faulty of Chemical and Food Engineering. 28th August 2021, GIM were joining online workshop on "***Practical knowledge, career path and prospect of thermal energy engineering"*** organized by Thermal Lab, GIM and AFU. The topic was about Intensive Training: MEP (GIM alumnus), Solar PV (GIM alumnus, Thermal Lab alumnus), Steam Powerplant (Thermal Lab alumnus), Automotive manufacturer industry (GIM alumnus), Panel discussion, Thermal Energy (panellists including Dr. Kong Rithy, Dr. Nguon Kollika, and Dr. Chan Sarin).
6) 15th September 2021, GCI and CHIP MONG were having an online webinar on ***"Cement Technologies webinar"*** to strengthen knowledge of Cement fabrication, store and uses for civil engineering students (120 participants).
7) 25th September 2021, GIM were joining online workshop on ***"Thermal Lab alumni call"*** organized by Thermal Lab.
8) 25th September 2021, GIM were organized an online training on ***"Soft-skill Training"*** via Zoom.
9) 01st October 2021, GIM were joining online workshop on ***"QC 7 tools"*** organized by Denso Cambodia.
10) 23rd October 2021, GIM were joining online training on ***"A glance of energy efficiency in Cambodia"*** organized by Thermal Lab and EnergyLab. The topic was about Introduction to energy efficiency (Dr. Kinnaleth Vongchanh), Training curriculum/program for energy efficiency in ITC (Dr. Kim Buntheoun), Research projects and implementing projects related to energy effiiciency in ITC (Dr. Chan Sarin), Experience sharing from students (Thermal Lab Master student), Introduction to CEECOMP (Energy Consultant, Thermal Lab alumnus). Moreover, the training was a part of Clean Energy Week Cambodia and Thermal Lab PhD and Master students were selected as Clean Energy Youth Ambassador.
11) 23th October 2021, GIM were organized an offline workshop on ***"AC training"***.
12) 03rd November 2021, GCI, Fyfe Asia Pte Ltd, Singapore, ITC, AiSD, BECL, NPIC, Fuxin, EEC (~150 participants) were having an online webinar on ***"TYFO FIBWRAP SYSTEMS WEBINAR"*** to Innovate technology of strengthening and repairing structure.

13) 03rd November 2021, GCI, CHIP MONG INSEE (~120 participants) were having an online webinar on ***"Concrete Technologies webinar"*** to enhance knowledges of concrete mixes and uses in the construction.

14) On 17th November 2021: UIL was organizing a research output seminar on ***"Dissemination on Chemical and Food Technology toward Local Products Development in Cambodia"*** for SMEs and stakeholders.

15) 27th November 2021, GIM were joining online training on ***"Publishing a research paper"*** organized by Thermal Lab. The contents of the training were about an introduction to a research paper (Mr. Dara Seyhak), Process of publishing a research paper (Dr. Hin Raveth), Preparing your manuscript and selecting a journal for your paper (Dr. Kong Rithy), Introduction to Techno-Science Research Journal (Dr. Eang Khyeam).

16) 20th-24th December 2021, GIM were joining online training on ***"Energy audits and management"*** organized ny National Productivity Council, India and APO Secretariat.

17) 12th January 2022, GIM were joining online workshop on ***"Heat Stress"*** organized by Thermal Lab. The topic was about heat stress on the society, a focus on the occupational sector and sustainable solutions (Assoc. Prof. Dr. Jason Kai Wei Lee, NUS) and the updates on heat stress Cambodia project (Dr. Kinnaleth Vongchanh, ITC).

18) 08th January 2022, GCI and Y Chhe Group were joining an online workshop on ***"Our Home 2030"***.

19) 19th January 2022, GCI and Greenway Asia were joining an online workshop on ***"Soil stabilizer***".

20) 22nd January 2022, GIM were joining online training on ***"Laboratories and design tools for mechanical engineering"*** organized by Thermal Lab and Materials Science and Engineering Lab. The contents of the training were about, Opening remark (Dr. Nguon Kollika), Thermal Laboratory (Mr. Chea Vabotra, PhD student, Thermal Lab), Materials Science and Engineering Laboratory (Mr. Mut Mesa, Lecturer, GIM), Dynamic and Control Laboratory (Mr. Sarit Chanvirak, Master student, DC Lab), Engineering Design & Manufacturing Laboratory (Mr. Siev Keanan, I5 student, GIM), Closing remark (Dr. Chhith Saosameth).

20 seminars were organized for ITC students and lecturers in order to learn the new update technology from industries and improve the capacity of ITC and lecturers at ITC on the new update technology.

6.3.2. Joining Seminar and workshop that Organized by other organization/ Ministries/Universities/ abroad

1) On 5th March 2021, deputy head of UIL were Joining 1st consultation workshop on ***"Demand analysis of a quality infrastructure system (QIS) for agricultural products in Cambodia"*** for the presentation on preliminary findings of demand analysis of a quality infrastructure system for agricultural products in Cambodia.

2) On 5-6th April 2021, deputy head of UIL was Joining virtual workshop on ***"Application process of Joint training program between SMEs and university"***. The training program project is supported by SDF (Skills Development Fund). The workshop introduced the process of application and eligibility of applicants.

3) On 22nd April 2021, deputy head of UIL was joining online workshop on ***"National Laboratory Testing Service"***. The workshop organized by Ministry of Industry, Science,

Technology and Innovation. The main objective is to present about the testing service and operational processes at the National Laboratory.

4) On 19th May 2021, deputy head of UIL and ITC student were joining online event on "***Successful Career Planning"*** organized by Chip Mong Insee company in collaboration with UIL-ITC. The event purpose is to promote job opportunity for engineering students in Cambodia.
5) On 7th June 2021, deputy head of UIL were joining evet on ***"CAPFish-Capture: Panel discussion on fostering food safety through partnership"***. The event provided panel discussion on linkage between university, private sectors and ministries to support the safe food system in Cambodia.
6) On 7st July 2021, deputy head of UIL, Mr. HEL Chanthorm and Dr. CHHITH Saosameth from GIM were joining online workshop on ***SDF (Skill Development Fund)*** program. The workshop was presented about the SDF program and support from SDF team on proposal preparation and application to get the fund.
7) On 26th July 2021, deputy head of UIL was joining online workshop on ***ISO/IEC 17025*** about the document preparation for ISO application for lab accreditation.
8) On 3rd August 2021, deputy head of UIL was joining ***CapFish*** workshop.
9) On 16th August 2021, deputy head of UIL were joining lecture on ***Industrial Network and Partnership with KMUTT (Thailand)*** about the industry collaboration structure and strategy for the case of KMUTT.
10) On 25th August 2021, deputy head of UIL was joining lecture on ***Industrial Network and Partnership with KMUTT (Thailand)*** about the Industry collaboration structure and strategy for the case of KMUTT.
11) On 20th October 2021, UIL joined Chip Mong ***Virtual Career Fair*** that to help university students to discover their potentials and explore career opportunities at Chip Mong and its business units in various industries.
12) From June to November, 2021, representative of UIL from GIM, joined the professional training on Production Manager organized by CJCC.
13) On 17th November 2021, Ggear Group and ITC did the handover ceremony of lab Lab AirCond for GIM department.
14) On 1st December 2021, deputy head of UIL were joining a seminar on ***IP of fabric sector*** about IP registration and framework for fabric sector in Cambodia.
15) On 21st to 23rd February 2022, head of UIL joined a training on intelligence marketing.

In total, there are 15 seminar and workshop that ITC lecturer-researcher joined in order to improve the capacity.

6.3.3. Enterprise visit at ITC

1) 02nd February 2021, DAIKIN Malaysia and GA Aircon paid a visit to ITC in addition to participating in Handing Ceremony of VRF system to GIM.
2) On 25th June 2021, deputy head of UIL was having a physical meeting with Dr. Guillaume Taing from Bodia Company to discuss about the scope of collaboration agreement and tour visting to GCA laboratory.

3) On 27th August 2021, Krassna Management company, and Yamato Green Co., Ltd visited laboratory of GCA and RIC.
4) On 21th October 2021, Mr. SEIYA Ashikari and Mr. KOJINO Ohtani from Ecologgie (Japanese Company) was having laboratory visit all laboratories at GCA to see the available facility (lab equipment) for the research collaboration on cricket processing.
5) On 6th December 2021, André SPIEGEL, director of the Institute of Pasteur visited ITC to discuss about the potential collaboration between ITC and IPC.
6) On 22th December 2021, deputy ambassador of Australia, Mr. Andreas Zurbrugg and 4 SMEs namly Yang Li Yi Tofu, Green Fresh Market, WoT-Natural Moringa and Kirirum Food Processing Co., Ltd. visited GCA laboratory and tired some developed food products.
7) On 22th December 2021, RIC member, Head and Deputy head of UIL office met with Mr. Kenji Tsuzaki from SUNWASPA Co., Ltd. to discuss on research collaboration pro of LBE Project had a meeting with SUNWASPA to discuss on "Research collaboration, exchanged internship students".
8) 23rd December 2021, Chip Mong Insee paid a visit to ITC in addition to participating in lab tours and to collaborate with GCI on laboratory standards.
9) On 22th December 2021, deputy head of mission (DEOM), from Australian Embassy visited ITC to research for future collaboration.
10) On 05th January 2022, deputy director of ITC and team met with Cart Tire Co., Ltd in order to discuss on curriculum of materials science and engineering at ITC, MoU, student job opportunity and internship, collaborations, exchanged training and visiting between ITC and company.
11) 28th January 2022, IKEE Chip made a visit to ITC in terms of engaging in lab visits and establishing research collaborations with GCI, GTR, and GGE on plastic waste and AC recycling.
12) On 30th January 2022, Patric Obertelli, member of Commission des Titres d'ingénieurs visited ITC to discuss about the collaboration with ITC on the international program ECAM LaSalle.

In total, there are 12 industries visited to ITC with the main objective to search for future collaboration.

6.3.4. ITC lecturers and students visit the industries

1) 21st January 2021, GIM were having a visit to ISI Steel Co., Ltd with the purpose of observe what can be contents of upskilling for QC staffs.
2) 21st March 2021, GIM were having a visit to ISI Steel Co., Ltd for Training Production and QC staffs on Basic Knowledge of Steel.
3) On 29th July to 01st August 2021 Dr. ENG Chandoeum and other 4 researchers from GGE were having a visit to Sambo Prei Kuk National Authority to discuss challenges such as maintenance and repair of temples to reach a Memorandum of Understanding between the Faculty of Mines and Geology and Sambo Prei Kuk National Authority in Kampong Thom Province.

4) On 9th September 2021, deputy head of UIL and FTN research unit visited two SMEs producing salts. An SME is located at Kompot province and the other one is located at Kompong Speu province. The purpose of the visit is to see and assess the problem of the salt processing, then developing a research project to solve the problem. The trip is supported by AFD.
5) On 16th-19th October 2021, Dr. CHHUON Kong Dean of Faculty HRE and other researchers were having a visit to Link Anco water supply company in Sihanouk Ville province to conduct the linkage and collaboration between the researchers from the department of hydrology and water resources and the Anco Water Supply, To request for the location and set up field monitoring equipment's in Kbal Chhay area which is under management of the company and To plan the discussion on the proposal of MoU between to the faculty and the company so that they can support the internship and other research activities in water supply sector.
6) 21st October 2021, GIM were having a visit to ISI Steel Co., Ltd for Training Production and QC staffs on Mechanical Properties of Materials
7) On 26th October 2021, the top management of ITC visited Renaissance Minerals company to study observed and search for collaboration between ITC and company.
8) On 23th December 2021, Head of UIL and two researchers from FIN was having a visit to Kirirom Food Production Plant in Kampong Speu Province to research and collaborate on a new mango by-products project in Kirirum Food Production Plant, such as mango oil from seed and animal feed from mango peel.
9) On 24th December 2021 Head of UIL and two researchers from FIN was having a visit to La Plantation Pepper Farm in Kampot Province to do observation and conduct research on spices such as pepper and turmeric in drying solar machine at Pepper Farm in Kampot and to schedule a meeting to discuss the faculty's proposal for a Memorandum of Understanding with the company so that they can support internships and other research activities in the food and agricultural supply sector.
10) 29th January 2022, GIM were having a visit to K-Cement in Kompot, with the aim of visiting the control room and waste heat recovery department.
11) On 24th to 28th January 2022, dean of Chemical and Food Engineering faculty and three researchers visited the Agri-SuD international and Baca Villa at Siem reap province to search for research collaboration on processing of Turmeric.
12) On 2nd February 2022, researcher-lecturer from Chemical and Food Engineering faculty visited WOT-Natural Khmer Moringa to study observed and conduct experiment on the Moringa and turmeric processing.

In order to strengthening the collaboration with industries, ITC top management, UIL office and researcher-lecturers from faculties have been visited to industries. For 2021, there are 12 visited have been organized.

6.3.5. Event Organization

- On 19th May 2021, ITC in collaboration with Chip Mong Insee organized a career fair for ITC students.
- On 20th October, 2021, ITC in collaboration with Chip Mong Group organized a career fair for ITC students.
- On 14th January 2022, ITC in collaboration with JICA, organized a career fair on "Career development program for ITC students and other university students.
- On 11th February 2022, ITC in collaboration with JICA organized an event namely: ITC-Industry Open House 2022 (Work Smart Together for Sustainable & Bright Future) with the objective to promote the services of ITC to the public and private sectors.

There are 4 events have been organized by UIL office and faculties of ITC. The event is mainly focus on create a connect for ITC with the private sector.

6.3.6. Project developed with SMEs and other services

- On 22nd September 2021, Department of Industrial and Mechanical Engineering had developed a project with Som Sokha Machine Shop on "Tensile test of Laminate Elastomer Bearing Pad".
- 23th August 2021 to 23th September 2021, GEE paid a visit to Global Camstar Co., Ltd with the purposes of giving a training service on electrical systems with 4 Modules include Overview of electrical system and lighting system (4h), Electrical Socket (4h), LV Cable (4h) and Circuit Breaker (4h).
- In 2021, with the financial support of Cavac and Khmer Enterprise, faculty of Chemical and Food Engineering offered the service of technical consulting and food product development and improvement to five Food SME. In total, 10 food products were developed and improved the quality.

In 2021, ITC offered 2 technical short course training to industries and got 5 project collaboration with industries.

6.3.7. Conclusion

The following actions of UIL by 2021 are:

1) **Develop internal policy/manual**

Policy/manual for collaboration agreement with private sectors will develop for ITC. Collect information from all faculties to develop ITC business services (extension, training, consulting): Process requirements, financial policy (e.g. overhead cost to ITC, cost to faculty), Report requirements.

2) **Strengthen internal collaboration**

Prepare internal manual for the scope/limitation of the collaboration, roles/responsibilities of UIL to facilitate the faculty. UIL representative of all faculties, RIC (expected twice a year).

3) **Promote ITC business services and collaboration**

- Prepare poster/manual indicating all availability of ITC services in the engineering/scientific fields
- Making a UIL-ITC Facebook page or UIL-ITC website is considering
- Organize seminar/workshop/ career fair
- Engage private sectors to research project
- Prepare regular meeting with industries

However, to implement these activities, UIL will face with following challenge:

- Less support/collaboration from ITC faculty,
- Limited financial budget to promote/marketing ITC business services to private sectors,
- No enough policies/manual yet for operating collaboration/business services. It takes much time and need supports from all faculties and direction to develop the policies/manuals,
- Most ITC staffs (lecturers and researchers) normally misunderstand about UIL roles.

Annex

Annex 1. Minutes of meeting of the International Consortium Meeting on 30 March 2021

COMPTE-RENDU DE LA REUNION DU CONSORTIUM INTERNATIONAL D'APPUI A L'ITC
Les 30 mars 2021, à l'ITC, Phnom Penh

I. Établissements étrangers

1	Prof. Yves WACHE	Agro Sup Dijon (GCA et Formation de 3ème cycle)
2	Prof. TIVET Florent	Centre international de recherche agricole pour le développement (GCA et Centre de recherche et innovation)
3	Prof. DOSSANTOS-UZARRALDE Pierre	École Nationale Supérieure de l'informatique pour l'Industrie et l'Entreprise (GIC)
4	Prof. DEBASTE Frédéric	École Polytechnique de Bruxelles (GIM)
5	Prof. Adèle MARTIAL	Institut de Recherche pour le Développement (GCA, GGG et GRU)
6	Prof. CHARLES Yann	Institut Galilée, Université Paris 13 (GIM)
7	Prof. BASTIDE Serge	Institut Mines –Télécom (GEE, option énergie)
8	Prof. COQUAN Catherine	Institut Mines-Télécom
9	Prof. Isabelle THIBON	Institut National des Sciences Appliquées de Rennes (GCI et GIM)
10	Prof. GABRIEL Denis	INSA Toulouse, Institut National Polytechnique, INP de Toulouse (GEE)
11	Prof. SOK Nicolas	Institut National Supérieur des Sciences Agronomiques de l'Alimentation et de l'Environnement – Agrosup (GCA)
12	Prof. DARRACQ Bruno	Institut Universitaire de Technologie d'Orsay (GEE)
13	Prof. SIREE Chaiseri	KASETSART University (GCA)
14	Prof. KOICHIRO Watanabe	KYUSHU University (GGG)
15	Prof. AVALLONE Sylvie	Montpellier SupAgro (GCA)
16	Prof. PHALIP Vincent	Polytech Lille (GCA)
17	Prof. JUN-CHI Takada	Tokyo Institute of Technology
18	Prof. VERLEYSEN Michel	Université catholique de Louvain (Programme Master et Doctorat)
19	Prof. Frédéric Rousseaux	Université de La Rochelle (GIC)
20	Prof. LECLERCQ Pierre	Université de Liège (GCA/GCI/GRU)
21	Prof. COLIN Jean-Noël	Université de Namur (GIC)
22	Prof. Jacques Mercadier	Université de Pau et des pays de l'Adour
23	Prof. PHALIP Vincent	Université de Polytech-Lille (GCA)
24	Prof. COLBEAU-JUSTIN Christophe	Université Paris-Sud
25	Prof. CHABRIAT Jean-Pierre	Université de la Réunion (GEE)
26	Prof. Michel Dequatremare	Université de Toulon (GEE et GIM)

II. Entreprises

27. KhmerDev : M. Franck TOUCH

III. Partenaires institutionnels

28. S.E. M. YUOK Ngoy, secrétaire d'État au Ministère de l'éducation, de la jeunesse et des sports (MEJS)
29. S.E. Madame PEN Chhorda, secrétaire d'État au Ministère des mines et de l'énergie
30. M. GIGAUDAUT Christophe, conseiller de coopération et d'action culturelle à l'ambassade de France au Cambodge
31. M. Jean-Marc LAVEST, directeur de l'AUF Asie-Pacifique
32. Ms. Kamei Haruko, chief representative of JICA to Cambodia

IV. Membres invités

33. Prof. YINDIZOGLU Murat, conseiller du MEJS
34. M. VALLEE Thomas, attaché de Coopération Universitaire et Scientifique
35. Mme GIGAUDOT Valentine, attachée de coopération pour le français à l'ambassade de France au Cambodge
36. Mme Chikako SASAKI, Project Coordinator of LBE Project
37. M. IM Kravong, responsable de l'Antenne AUF de Phnom Penh
38. Prof. EA KIM Buntha, Institut Universitaire de Technologie d'Orsay (TC)
39. Prof. DESPLANCHE Didier, directeur général de l'ECAM
40. Mme BARIL Laurence, directrice de l'Institut Pasteur du Cambodge
41. M. BRISSON Martin, Chambre de Commerce et d'Industrie Française du Cambodge
42. M. BOUTEILLE Bruno, Directeur de Sirea
43. Mme Mathilde SESTER, chercheuse du CIRAD
44. Mme Karolien CASAER-DIEZ, Representative Country, Cambodia, GGGI
45. M. THOEUN VONGDY, Program Officer, JICA Cambodia (Représente Mme Kamei Haruko, chief representative of JICA to Cambodia)
46. Mme Aiko YAMASHITA, coordinator of SATREPS Project, JICA
47. M. Christian OBRECHT, Maître de Conférences - INSA de Lyon, Responsable de la mobilité sortante, Centre d'Énergétique et de Thermique de Lyon, Département Génie Civil et Urbanisme
48. M. Thibaut SKRZYPEK, École Nationale des Ponts et Chaussées de Paris
49. Mme Beatrice LEGEAIS, IUT de St Nazaire, de Nantes
50. M. Denis GABRIEL, head of International Relations Office of INSA Toulouse

V. Équipe de direction de l'ITC

V. 1. Direction

51. S.E. PHOEURNG Sackona, présidente du Conseil d'Administration et ministre de la culture et des beaux-arts
52. S.E. OM Romny, directeur général de l'ITC
53. Prof. PROTIN Ludovic, directeur honoraire de l'ITC
54. M. DAGUES Bruno, conseiller de direction de l'ITC
55. M. CHUNHIENG Thavarith, directeur adjoint chargé des relations internationales
56. M. NUTH Sothân, conseiller chargé des affaires académiques
57. M. PHOL Norith, conseiller chargé de la planification et du développement
58. M. PENH San, conseiller chargé d'administration
59. M. PO Kimtho, directeur adjoint chargé d'administration et planning
60. M. SOY Ty, directeur adjoint chargé des affaires académiques
61. M. OEURNG Chantha, directeur adjoint chargé de recherche
62. M. SIM Tepmony, directeur de la formation de 3ème cycle
63. M. KHIEV Samnang, responsable du service informatique
64. M. KIM Vannada, responsable d'assurance de qualité
65. M. IN Sokneang, doyenne de la faculté de génie chimique et alimentaire et responsable des relations avec les entreprises
66. M. OR Chanmoly, directeur du Centre de Recherche et d'Innovation

67. M. LIN Mongkolserey, coordinateur de l'ITC Tbongkhmum
68. M. SIEANG Phen, responsable du bureau des relations internationales et chef de cabinet de direction
69. Mlle SUONG Malyna, vice-directrice du Centre de Recherche et d'Innovation
70. Mme TAN Reasmey, vice-directrice du Centre de Recherche et d'Innovation

V.2. Facultés, départements et sections

71. M. BUN Kimgnoun, doyen de la faculté de Génie Géotechnique et Géoressources
72. M. ENG Chandoeurn, vice-doyen de la faculté de Génie Géotechnique et Géoressources
73. M. HAN Virak, doyen de la faculté de génie civil
74. M. LY Hav, vice-doyen de la faculté de génie civil
75. M. HASH Chanly, responsable du programme d'architecture
76. M. CHHUON Kong, doyen de la faculté d'hydrologie
77. M. ANN Vannak, vice-doyen de la faculté d'hydrologie
78. M. SEANG Chansopheak, directeur adjoint de la formation de 3ème cycle
79. M. HIN Raveth, directeur adjoint de la formation de 3ème cycle
80. M. MITH Hasika, responsable du programme Master du Département de Génie Chimique et Alimentaire
81. Mme SREY Malis, chef du département TC
82. M. CHRIN Phok, chef du département électrique et énergétique
83. M. AM Sokchea, adjoint du département électrique et énergétique
84. M. SRENG Sochenda, chef de département Télécommunication
85. M. GNUON Kollika, chef du département de Génie Industriel et Mécanique
86. M. KHUN Veng Kheang, chef du département de Transports
87. Mme KHEMTRAN Krasel, responsable de la section de français
88. M. CHUM Tival, responsable de la section d'anglais
89. M. CHHOUK Chhay Horng, conseiller de la faculté de génie civil
90. M. CHREA Rada, conseiller de la faculté de génie civil
91. M. BUN Long, vice-doyen de la faculté de génie électrique
92. M. LAY Héng, vice-doyen de la faculté de génie électrique
93. M. YOU Vanndy, adjoint du département de génie informatique et communication
94. M. NOU Sotheany, responsable du Centre E-learning
95. M. YOEUN Sereyvath, vice-doyen de la Faculté de génie chimique et alimentaire
92. Mlle HOUNG Peany, lecturer and coordinator of ASSET Project
93. M. SRANG Sarot, responsable du programme Start-Up et école d'usine et coordinateur du programme international ECAM-ITC

La réunion du Consortium de 2021 s'est déroulée différemment par rapport aux précédentes qui se tenaient pendant deux jours consécutifs. En effet, chaque année, ces rencontres se faisaient en présentiel mais cette fois-ci, en ligne, à cause de la pandémie du Covid-19. L'ordre du jour était le suivant :

Mardi 30 mars 2021
14h00-17h30 au Cambodge
9h00-12h30 en Europe
16h00-19h30 au Japon

14h00-14h30 : Accueil des participants
« Tour d'écran » : présentation des participants :
Mots de bienvenue de S.E. Madame PHOEURNG Sackona, Présidente du Conseil d'Administration et Ministre de la Culture et des Beaux-Arts

14h30-17h00 : Retours des membres du Consortium sur les activités présentées dans le rapport d'activités et le rapport perspectives et stratégies

Zoom sur des projets émergeants :
- Programme international avec ECAM,
- Création de la faculté des sciences appliquées,
- Création de la faculté de l'ICT & Cyber Université,
- Mise en place du programme de mathématiques appliquées et statistiques pour les ingénieurs,
- Création du Master en génie des sciences des données,
- Création du nouveau département de génie alimentaire,
- …

Questions/Réponses, avis des nouveaux participants

17h00-17h30 : Discours de clôture de S.E. Madame PHOEURNG Sackona, Présidente du Conseil d'Administration et Ministre de la Culture et des Beaux-Arts.

En introduction, **S. E. Mme PHOEURNG Sackona**, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC, via la visioconférence, salue tous les membres du Consortium international d'appui à l'ITC, de France, du Japon, de Thaïlande et d'autres pays. Pour commencer, elle présente la situation du Covid-19 dans laquelle se déroule la réunion du Consortium international de l'ITC. Elle précise que malgré cette situation, l'ITC fait beaucoup d'efforts pour maintenir le rythme et l'efficacité de sa formation. Les cours sont en ligne et cette année, nous avons réussi l'organisation du concours d'entrée à l'ITC. C'était un travail bien apprécié de candidats. Pour moi, cette réunion joue un rôle très important pour la mise à jour des programmes académiques de l'ITC. Nos collègues qui sont de différents établissements membres de l'ITC, peuvent tenir compte des difficultés et du progrès de l'ITC. « J'en profite pour remercier tous nos membres du Consortium pour leurs soutiens et leur fidélité avec lesquels l'ITC s'est beaucoup développé » a-t-elle ajouté.

Quant à **son Excellence Dr. OM Romny**, directeur de l'ITC, il tient aussi à se féliciter de toutes sortes de coopération des partenaires de l'ITC. Il réaffirme qu'à travers cette rencontre annuelle, nous pouvons avoir les feedbacks afin que l'on puisse améliorer notre programme de formation.

Madame la Présidente donne ensuite la parole aux personnalités de la séance :

M. Christophe GIGAUDAUT, attaché de coopération et d'action culturelle de l'ambassade de France au Cambodge
Je suis très heureux de pouvoir participer à cette réunion. L'ambassade de France au Cambodge se félicite de cette réunion du Consortium dans les conditions que vous venez d'évoquer. Je souhaite d'abord un excellent succès à ce Consortium qui nous réunit très nombreux. Pour nous, c'est quelque chose d'important qui montre que dans le contexte que l'on sait nous sommes tous mobilisés. La France, comme vous le savez, est un partenaire important de l'ITC et l'ITC est un partenaire essentiel de la France, à travers beaucoup de projets de recherche de l'enseignement supérieur que nous menons ensemble. Nous avons aujourd'hui avec nous CIRAD et IRD qui est une base importante de rechercher ici. Nous avons également un autre projet ECAM LaSalle qui va arriver bientôt à l'ITC. Encore une fois merci à ce monde francophone bien intéressant.

Concernant le projet d'augmenter le nombre d'employés docteurs pour 2021-2022, nous soutenons la mobilisation des ressources humaines de l'ITC à travers les bourses cofinancées par l'Ambassade de France et le ministère de l'éducation, de la jeunesse et des sports. Nous nous félicitons aussi de l'ouverture du nouveau département des transports, en collaboration avec Insa de Lyon et l'école nationale des ponts et chaussées. Monsieur Bruno DAGUES en témoigne bien entendu. Nous croyons également que certains étudiants pourront bénéficier des bourses du gouvernement français.

Nous sommes contents de voir d'autres projets apparaitre et comptez sur l'Ambassade de France pour apporter son soutien autant qu'elle le peut.

Encore une fois bravo à toutes les équipes de l'ITC et merci à madame la présidente et à monsieur le directeur de m'avoir donnée l'occasion de participer à cette réunion.

M. VALLEE Thomas, attaché de Coopération Universitaire et Scientifique
Merci beaucoup madame la ministre de m'avoir invité à ce Consortium. C'est ma troisième participation. À chaque fois, pour moi, c'est un moment enrichissant. On voit le dynamisme de l'ITC. Je crois que ce Consortium sera aligné comme d'autres et je suis content d'être là.

M. Jean-Marc LAVEST, directeur de l'AUF en Asie-Pacifique
Even I represent AUF, I can speak in English so that everyone understands me. I am very happy to be present with you. As you know AUF has a long history with ITC. So, I'm pleased to listen to your comments to improve our relationships. Thank you very much.

M. Thoeun Vongdy, Program Officer, JICA Cambodia (Représente Mme Kamei Haruko, chief representative of JICA to Cambodia)
Yes, thank you for inviting JICA to join this meeting. I apologize for the absence of my chief representative of JICA Cambodia because has another meeting. So, she asked me to join this meeting with you. I am VONGDY, in charge of higher education and TEVET sector in Jica Cambodia Office. It is nice to meet you all. Thank you.

Prof. YINDIZOGLU Murat, conseiller du MEJS
Bonjour votre excellence la présidente, votre excellence monsieur le directeur et chers collègues, madame et monsieur. Je suis très heureux de participer pour la première fois à cette réunion. J'ai lu le rapport et je tiens me féliciter beaucoup de tout ce que l'ITC a réalisé et cela fait partie des modèles auxquels le ministère peut se référer pour en construire d'autres pour d'autres établissements.

M. Denis GABRILLE, INSA Toulouse
Hi yes, I am GABRIEL Denis, I am head of International Relations Office, in South-East of France.

Prof. DOSSANTOS-UZARRALDE Pierre, École Nationale Supérieure de l'informatique pour l'Industrie et l'Entreprise (GIC)
Je suis aussi ravi d'être parmi vous. ENSIIE supporte son partenariat avec l'ITC. Nous sommes très contents d'être avec vous pour vous tenir, et surtout Data Science. Nous travaillerons dans ce sens-là. Je vous remercie beaucoup.

Prof. CHARLES Yann, Institut Galilée, Université Paris 13 (GIM)
Bonjour à tous, je suis directeur adjoint chargé des relations internationales. Je suis content d'être là. Je suis prêt à partir à Phnom Penh quand on l'occasion de discuter.

Prof. BASTIDE Serge, Institut Mines –Télécom (GEE, option énergie)
Bonjour chers collègues, heureux de vous retrouver, je participe, pour la troisième fois, à ce Consortium. Nous aurions bien sûr être à Phnom Phen parmi vous. Mais c'est un plaisir de vous tous et de vous entendre. Nous accueillons en ce moment des étudiants de l'ITC pour le cursus diplôma. Nous sommes contents de les avoir chez nous, malgré la situation difficile que connait la France en ce moment. Nous faisons tout pour que ce soit mieux pour eux.
Merci beaucoup.

Prof. Aveline DARQUENNES, Institut National des Sciences Appliquées de Rennes (GCI et GIM)
Oui, bonjour, je suis professeur DARQUENNES, je remplace Madame Ducasse qui ne pouvait pas être là. Merci beaucoup pour l'invitation. Je participe à ce super Consortium pour la deuxième participation. De toute façon, on depuis longtemps avec l'ITC.

M. Denis GABRIEL, head of International Relations Office of INSA Toulouse
Bonjour madame la Présidente. Je suis à INSA Toulouse. C'est ma première participation. Je suis ravi d'être parmi vous et encore merci pour cette invitation.

Prof. DARRACQ Bruno, Institut Universitaire de Technologie d'Orsay (GEE)
Bonjour madame la Ministre, bonjour à tous. DARRACQ Bruno, je suis de l'IUT d'Orsay. Je représente Paris Saclay. C'est bien sûr, ma deuxième participation, au Consortium. C'est un grand plaisir de participer de nouveau à ce Consortium.

Prof. SIREE Chaiseri, KASETSART University (GCA)
Hi everybody. I look into the report and it seem everything going well with ITC and I'm very happy. Thank you !

Prof. KOICHIRO Watanabe, KYUSHU University (GGG)
Bonjour! I am Watanabe Professor at Kyushu University in Japan. Actually, I am retired this month. I move to Tokyo today and then I work for JICA from next month. We have a LBE Project for ITC. So I am very happy to go back to Cambodia and ITC, after Coronavirus. Thank you for inviting me to this Consortium and I continue to joint the discussion during this meeting. Now, Tokyo is not so good but I hope the Coronavirus will finish very soon. Thank you ! Merci beaucoup !

Prof. JUN-CHI Takada, Tokyo Institute of Technology (GGG)
Good morning and good afternoon everybody, I am Takada from Tokyo Institute of Technology. Now, I am the vice-President for International Affairs and I also chief adviser for Jica's LBE Project, as Prof. Watanabe have mentioned. We are very happy to be connected to everybody around the world even the pandemic of Covid-19. I missed the Consortium meeting for two years

ago. Today, I am very happy to see you and we can update the progress of ITC. Thank you and hope to see all of you face to face in next few years.

Prof. VERLEYSEN Michel, Université catholique de Louvain (Programme Master et Doctorat)
Bonjour Madame la Ministre et chers collègues. Merci pour votre invitation. Je pense que c'est ma 4ème participation si je me souviens bien. Je suis heureux de vous revoir tous et toutes même si dans les conditions bien différentes. Merci aussi pour le rapport que vous avez envoyé, qui montre le dynamisme de l'ITC même pendant cette année qui est compliquée pour tous. Merci beaucoup !

Prof. CHABRIAT Jean-Pierre, Université de la Réunion (GEE)
Oui, je suis là. Bonjour Madame la Ministre, de nous accueillir dans ce Consortium, en visioconférence. C'est la troisième fois que je participe au Consortium. J'ai été deux fois à Phnom Penh. Je reconnais certains collègues qui sont là. Ce qui est intéressant, c'est que j'ai lu le rapport d'activités et la projection de l'ITC. Par rapport à mes précédents, j'ai vu une très forte progression. Félicitations pour votre travail et j'espère vous revoir bientôt en direct. Merci beaucoup !

Prof. Adèle MARTIAL, Institut de Recherche pour le Développement (IRD)
Bonjour Madame la Ministre, Votre Excellence ! Je suis la nouvelle représentante de l'IRD au Cambodge. Je me permets donc d'intervenir à la place de Jean-Philippe VENOT qui était représentant de l'IRD au Cambodge. C'est ma première participation. Je profite de cette occasion pour remercier SE Dr. OM Romny de nous accueillir dans le campus de l'ITC, et aussi à toute son équipe qui nous a aidé pour mieux nous installer en septembre dernier. Nous avons de bonnes relations avec l'ITC depuis 15 ans, avec les trois départements qui ont des chercheurs pouvant mener des activités de recherche ensemble. Je suis avec beaucoup d'intérêts pour cette réunion et le suivi de ce Consortium.

Prof. COQUAN Catherine, Institut Mines Télécom
Bonjour Madame la présidente, pour moi, c'est ma deuxième participation. Je suis contente de pouvoir participer à cette réunion du Consortium.

Prof. LECLERCQ Pierre, Université de Liège (GCA/GCI/GRU)
Good morning. Thank you for the invitation to this meeting. I represent the Univesity of Liège.

Prof. AVALLONE Sylvie, Montpellier SupAgro (GCA)
Bonjour à tous. Très heureuse de participer à cet événement, donc je représente SupAgro de Montpellier. C'est la huitième participation de notre établissement au Consortium. Nous travaillons avec vous dans le cadre de bourses de thèse. Nous mesurons chaque année, le dynamisme de l'ITC même pendant la situation Covid-19. Félicitations pour votre travail et très heureuse d'être avec vous.

M. Christian OBRECHT, Maître de Conférences - INSA de Lyon, Responsable de la mobilité sortante, Centre d'Énergétique et de Thermique de Lyon, Département Génie Civil et Urbanisme
Bonjour, je me permets de prendre la parole et de me présenter. J'ai été invité à participer à ce Consortium. INSA de Lyon n'est pas encore partenaire de l'ITC. Au nom de l'établissement, je peux vous confirmer notre intérêt pour une future collaboration, en particulier, par rapport à la création du nouveau département Transport et infrastructure. Voilà, merci beaucoup.

Mme Karolien CASAER-DIEZ, Country Representative in Cambodia, *Global Green Growth Institute*

Bonjour madame. Je m'appelle Karolien, je représente Global Green Growth Institute. C'est notre première réunion du Consortium, nouveau partenaire de l'ITC. Nous sommes en train de développer un accord de coopération dans le domaine de la croissance verte et plus spécifiquement, la gestion des déchets, les industries, les transports électriques. Merci.

Prof. Jacques Mercadier, Université de Pau et des pays de l'Adour
Bonjour Madame Sackona. C'est un plaisir de vous revoir. I'm Jacques Mercadier from Université de Pau et des pays de l'Adour. I am member of Consortium for a long time. It is pleased to be here with you and we try to collaborate with ITC. I would like to congratulate all of works well done during the last months.

Mme LAURIAC Florence, Directrice du Rayonnement Institutionnel et de l'Internationalisation R2I, Toulouse INP
Bonjour Madame, je suis Florence LAURIAC de Toulouse INP. Je prends la suite de Bruno. Je suis contente d'être parmi vous. Une longue collaboration avec l'ITC depuis longtemps, nous sommes très heureux de pouvoir continuer à l'avenir cette fructueuse collaboration. Merci.

M. Kravong IM, responsable de l'AUF Cambodge
Bonjour Madame la ministre, je suis Kravong IM, responsable de l'AUF au Cambodge. Je participe au Consortium de l'ITC toutes les années, parce que le bureau de l'AUF du Cambodge se trouve même sur le campus de l'ITC. Nous travaillons en étroite collaboration avec tous les départements de l'ITC. Merci beaucoup.

S. E. Mme PEN Chhorda, secrétaire d'État du ministère des mines et de l'énergie
Good afternoon, his excellency minister, professors and lady and gentlemen, my name is PEN Chhorda from the Ministry of Mines et Energy. Thank you !

Prof. Gérard Philippe, Directeur régional du CIRAD, Hanoi
Bonjour, je suis Philippe Gérard, directeur régional du CIRAD basé à Hanoi. Je représente le CIRAD. Merci pour cette invitation. Nous sommes partenaires de l'ITC depuis des années. Vous hébergez une de nos chercheurs au sein de l'ITC. Je suis ravi d'être parmi vous aujourd'hui.

Prof. Laurence BARIL, Directrice de l'Institut Pasteur du Cambodge
Bonjour madame la ministre, bonjour monsieur le recteur et bonjour à tous. Nous devons renforcer encore les relations avec l'ITC, qui doivent se renforcer encore, en particulier tout ce qui est laboratoires pour les sciences de la vie, Data Sciences, capacité en informatique avancée. Merci beaucoup !

M. Didier DESPLANCHE, directeur de l'ECAM LaSalle de Lyon
Bonjour madame la ministre, très heureux de participer à cette réunion du Consortium pour la première fois, je tiens à remercier Dr. Om Romny et son équipe de nous accueillir sur le campus de l'ITC.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
So, as you know, not everyone can talk now but however I think most of you have introduced yourself and talked about your institutions. I think we can start because all the important people from ITC are here. I apologize for those who have not yet spoken but you can intervene from time to time. I give the floor to Dr. OM Romny to present the first part of our meeting. We are located in different places. As you know, you have received the documents from the Consortium, we want to collect feedback from you regarding the international program with ECAM, creation for applied sciences

and something else. I think you can present your comments, recommendations or you can even ask questions to the ITC team. The floor is yours, now.

Je crois que cette année est un peu différente des autres années. Comme vous avez les documents sur vous, vous pouvez donc nous communiquer vos commentaires, vos recommandations en ce qui touche le programme international avec ECAM, la création de la faculté des sciences appliquées, la création du nouveau département Transport. Je laisse maintenant la parole à vous tous, membres de droit et membres invités. La parole est à vous maintenant.

M. Bruno DAGUES, Conseiller de l'ITC
Excellence, pour lancer le dynamisme, je crois que nous avons certaines présentations bien préparées pour intervenir. Il y a peut-être une intervention de nos collègues de l'ECAM, pour parler du projet qui est en train de se mettre en place parce qu'il touche différents aspects de la collaboration de l'ITC, puis les départements et les partenaires historiques. Je pense qu'un enchainement normal peut se mettre en place. Je tente la perche à nos amis d'ECAM de Lyon qui souhaitent intervenir et Dr. Sarot en autre qui coordonne l'aspect académique. Je me permets de lancer cette piste.

M. Didier DEPLANCHE, directeur de l'ECAM LaSalle de Lyon
Oui, avec plaisir, comme suggère Bruno DAGUES, je souhaite intervenir avec Dr. Sarot qui est le coordinateur de l'ECAM LaSalle à l'ITC. Je vous propose donc Dr. Sarot de résumer le projet pour que tout le monde le sache. Dr. Sarot, are you ready to present the project?

M. Sarot SRANG, coordinateur du projet de l'ECAM LaSalle de Lyon à l'ITC
First, good afternoon your excellency, good morning and good afternoon all Consortium members and colleagues. So, I am going to give a presentation of international bachelor and master program in partnership with ECAM LaSalle. My name is Sarot SRANG, lecturer from Industrial and Mechanical Engineering, in charge of academic affairs of collaboration from ITC's side. The goal is to train multidisciplinary engineers for industries in Cambodia. It is one of implementations for the policy of the Kingdom of Cambodia. We are to implement ECAM LaSalle to engineer's degree at ITC. It is French engineer degree. In ECAM LaSalle is 5 years program. We adopt 100% of this program and implement 2 years in ITC. We will start this program in October 2021 at ITC.

The target of students is from Industrial and Mechanical Engineering, GIM department and GEE department. I think it will be easy to understand after I finish presenting this slide. So, it is Study path way, we have to offer two degrees, one is diploma and another one is engineering degree. So we are offering 5 years program. So, at the end of 5 years, the student receives bachelor degree and engineering degree equivalent to master 1 and we have also master program for one year and doctoral program. ECAM LaSalle has 5 years program. Most of students do the exchange in the last year. This diploma is equivalent to the master of sciences. For our program, we would be to implement the third year, as I mentioned, we adopted 2 years, the students must finish year 3 from both departments that I mentioned before. In the next year, we can recruit other students from other universities. After 5 years, the student receives the bachelor degree form ITC, called International Industrial and Mechatronic Engineering. If the student wishing continue his study, he can join existing semester in ITC. In this case, he can study one semester and the last semester, he does internship, it is the requirement from ECAM LaSalle. The student can have two degrees, one from ITC and one from ECAM LaSalle, called Master degree of sciences.

Again, the target students is from year 3 of GIM and GEE department. All courses (scientific and engineering) are medium of instruction is in English. Please, note that one semester of mobility of student inbound/outbound ITC/ECAM LaSalle. Regarding the language level, the student must have

level C1 in English and B1 in French, to be a graduate. After having completed 6 years, the student can have a Master of ITC and an engineering degree equivalent to a Master of Science.

Now, for the industrial evolution context, the competencies and skills that we need in developed countries, ENGINEERING SCIENCES: mechanical engineering, materials, Electrical Engineering, digitalization, networks & security, product development, industrial organization, sustainable manufacturing, robotics and IT; The program also includes PERSONAL AND PROFESSIONAL DEVELOPMENT: Entrepreneurship, Innovation management, leadership and professional ethics. In addition, practical courses: scientific and engineering courses. Some projects require the students to join such as eco-design, research, innovation. They can do that in fablabs. Very good facilities for them and it gives the opportunity to the students to conduct products design, manufacturing products and experience team work. The students can know very well the professional life through 10 months of internship. They can also learn the new culture by speaking fluently French and English. They can become products developers, projects manager, leadership in many types of industries, manufacturing industries, through mechatronics, aerospace management. The students also have the opportunity to join the Network that ECAM already have at regional and international level. As they have a good level of French, they can be a good part of the network. So that's all from my part. So if you have any questions, please. Thank you again !

M. Tival CHUM, head of English Section
Good afternoon Madam. I'm Tiva, responsible for the English Section. I has a question, please. As English program in ITC, we have only B2 to deliver When we have one more program like Mr. Sarot presented, we need English level C1. How d you think about this?

M. Didier DEPLANCHE, directeur de l'ECAM LaSalle de Lyon
Yes, Mr. CHUM Tival, it is a good point to bring. We are looking for teachers of ITC and we try to find supports so that they ca get C1 when they are graduated. We have to work together and ECAM provides some support so that students have C1 at the end of their training course. I also would like to take this opportunity to thank Madam GIGAUDAUT from the Embassy of French language and Dr. OM Romny. for their support, because the students have to a good level for French.

M. Tival CHUM, head of English Section
Thank you, sir.

Prof. Jean-Marc LAVEST, directeur régional de l'AUF en Asie-Pacifique
Madame Sackona, j'ai une question. Quand on regarde les figures 1 et 2 du rapport d'activités, il y a le nombre de candidats à l'entrée et le nombre de candidats admis. On voit que la pression est moins forte qu'il y a dix ans, soit 1 étudiant sur 4 entrait à l'ITC mais aujourd'hui 1 sur 2. Bien entendu, il y a plus de filières, plus d'opportunités. Comment traite-t-on cette question et d'après vous, on est sûr du niveau des étudiants sélectionnés? Je pense que monsieur le directeur peut nous apporter quelques éléments de réponse.

M. SOY Ty, directeur adjoint de l'ITC chargé des affaires académiques
Merci madame la présidente, le nombre d'étudiants admis est inférieur à celui des autres années. Mais pour le programme avec ECAM LaSalle, les départements concernés ne sont que GIM et GEE. C'est-à-dire que on ne recrute que les meilleurs dans ces deux départements.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC

Oui merci pour la réponse mais la question de M. Jean-Marc LAVEST est que le nombre d'étudiants admis à l'ITC de cette année est 1 sur 2, alors que les autres années précédentes 1 sur 4. Dans ce cas-là, il souhaite savoir s'il y a de l'impact sur la qualité des étudiants sélectionnés. Pourriez-vous donc apporter plus de détails sur cette question?

M. SOY Ty, directeur adjoint de l'ITC chargé des affaires académiques
Merci madame. En fait, depuis 2014-2015, le ministère de l'éducation a fait une grande réforme sur l'examen du baccalauréat au niveau national. Ceci dit, avant le concours d'entrée à l'ITC, les étudiants ont franchi un passage bien difficile. Nous sommes donc convaincus que la qualité des candidats sélectionnés pour le concours d'entrée à l'ITC reste telle quelle par rapport aux années précédentes.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Oui, je crois qu'il a bien répondu à votre question, monsieur LAVEST. C'est-à-dire qu'il existe depuis la réforme, une pré-sélection, c'est l'examen du baccalauréat bien strict.

S. E. M. OM Romny, directeur de l'ITC
Madame la présidente, je souhaite rebondir la réponse de monsieur SOY. Cette année, c'est encore particulier, à cause de la pandémie du Covid-19. Le ministère de l'éducation, de la Jeunesse et des Sports n'a pas autorisé le concours d'entrée en présentiel. C'est la raison pour laquelle, l'ITC a changé de méthode de recruter les étudiants, soit le concours en ligne leur a été proposé. De ce fait, j'en profite pour vous dire que notre plateforme proposée a été bien appréciée par les étudiants qui étaient présents à ce concours. Sachant que le nombre d'étudiants admis est supérieur à celui des années passées mais nous le faisons ainsi pour maintenir la qualité du niveau des étudiants. Le concours était l'étape une et la présence des étudiants en première et deuxième année est encore plus importante. Si le candidat a fait une fraude, en demandant à quelqu'un de passer le concours à sa place, parce qu'il est plus fort en matières proposées, il ne peut pas poursuivre leurs études pendant la formation au tronc commun. C'est là que nous pouvons trouver les vraies perles rares dont nous avons besoin.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Oui merci Dr. OM Romny. Je suis de votre avis. L'ITC fait le tri des meilleurs étudiants à travers ses méthodes de recrutements bien difficiles et performants, surtout, lorsqu'ils sont su département du Tronc Commun.

M. Bruno DAGUES, conseiller de l'ITC
Nous avons quelques projets pour lesquels l'ITC accorde beaucoup plus d'importances. Dans deux ans, un nouveau département va apparaitre à l'ITC qui correspond au vrai besoin de la société et du secteur industriel au Cambodge et qui est lié au transport et infrastructure associés. Pour ceux qui connaissent un peu le Cambodge, je crois que vous le comprenez bien. Il existe en permanence la construction des ponts et routes associés. C'est un nouveau département appelé « Département de Génie de Transport et Infrastructure (GTI), porté par les enseignants chercheurs du génie civil : Dr. HAN Virak, Dr. LY Hav. Aujourd'hui, nous sommes à la recherche des partenaires. Il est à noter que la formation de chaque département à l'ITC porte sur deux niveau Technicien (Diplôme Universitaire de Technologie-DUT) et Ingénieur. Pour l'instant, nous sommes au stade des contacts avec nos partenaires potentiels : DUT pour……., ingénieur pour l'école nationale des ponts et chaussées et INSA de Lyon, tout à l'heure, il s'est dit prêt à s'y investir et Master pourrait être soutenu par Tokyo Institute of Technology. Voilà ce sont les partenaires prestigieux qui se sont

engagés à coopérer avec l'ITC. Si vous avez des questions, n'hésitez pas. Je crois aussi que Dr. Virak et Dr. POUV sont là pour vous y apporter des réponses.

Mme Karolien CASAER-DIEZ, Country Representative in Cambodia, *Global Green Growth Institute*
Bonjour madame, juste un commentaire. C'est très intéressant par rapport à ce que Bruno vient de dire. Comme je l'ai indiqué au début de la réunion, le transport et l'industrie font partie intégrante des sujets de notre coopération avec l'ITC. C'est peut-être donc suite à cette réunion, on peut mener des discussions bilatérales comment on peut articuler ça dans les accords de coopération.

M. Thibaut Skrzypek, École Nationale des Ponts et Chaussées
Yes, thank you Madam. I'm Thibaut Skrzypek from École Nationale des Ponts et Chaussées. I'm happy to attend this meeting. I would like to cooperate with ITC as mentioned our colleague from Insa de Lyon and Tokyo Tech. I would like to challenges this proposal because the market needs that, according to analysis and professional target in Cambodia. We will look at the curriculum of Transport and infrastructure with colleagues from ITC maybe should more details in the curriculum. ITC's GTI department seeks to train technicians and engineers and some others become researchers and scientists in this field. I would like to recommend to follow the international frame work for this learning approaches, the learning outcomes of the courses and syllabus. The contents seem correct but we have to introduce also soft skill and internship. It is my reflection. That's all for me. Thank you.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Thank you very much. Very interesting. Another comment, from our colleagues !

M. Bruno DAGUES, conseiller de l'ITC
Effectivement, les réponses très intéressantes de l'école des ponts et chaussées sur ce projet : Ouverture du département Génie Transport et Infrastructure. Je ne sais pas si Dr. Virak et Dr. POUV sont en ligne en ce moment pour répondre aux questions. Je ne pense pas qu'ils soient présents, s'ils le sont, qu'ils réagissent.

En fait, d'une manière détournée, la façon dont Thibaut a réagi, j'ai déjà commencé le travail qui doit être mis en place, entre porteurs de ce nouveau département et futurs partenaires. C'est intéressant, être partenaire dans le projet et avoir envie d'aider au développement. C'est aussi ça, être partenaire de l'ITC dans un projet d'enseignement ou un projet de recherche, c'est de savoir poser ces questions-là, savoir dynamiser les équipes locales pour qu'elles aillent chercher des réponses. C'est pas qu'on va faire une réunion préparatoire aujourd'hui, c'est pas le but du jeu, mais c'est dans le sens-là qu'on attend l'intégration du partenaire. Ils peuvent réagir sur les réponses qui ont eu tout à l'heure. Quand on parle du partenaire d'un département, l'ITC est toujours très ouvert, ça veut dire que les portes ne sont pas fermées une fois que les partenaires sont identifiés, ça peut être élargi. S'il y en a qui veulent être associés au département, ils sont les bienvenus. C'est pas limitatif. C'est pas un département, avec un partenaire privilégié. Et au contraire, la preuve, ça était que dans l'histoire de l'ITC, c'est la diversité des partenaires qui soient francophones, anglophones asiatique et au-delà, qui apportaient à l ITC cette richesse dans ses formations et ses activités de recherche. Voilà quelques piste de réponses à l'introduction de Thibaut, bien sûr, j'ai pas de réponse en détails sur l'étude du marché et des partenaires d'industrie en place, ça, c'est plutôt dans la légitimé de la création du département.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC

Merci Bruno. Moi, je voulais ajouter une chose aussi. D'abord, la remarque de monsieur Thibaut est très intéressante. Je suis d'accord avec Bruno Dagues, c'est-à-dire qu'il faut voir la diversité des partenaires. Sachant que les besoins en transport et infrastructure sont énormes actuellement. Le ministère des travaux publics et transports œuvre aussi ce domaine-là. C'est donc important pour l'ITC de travailler avec les partenaires locaux ministères, par exemple le ministère des travaux publics et transports, le ministère du développement rural. Le partenariat au niveau régional est aussi crucial. A ma connaissance, au Vietnam, en Thaïlande, ce domaine transport et infrastructure occupe une place prépondérante. Je crois qu'avec ces deux voisins, nous ne sommes pas tellement différents en termes de climat, de culture, de géographie. Les partenaires internationaux, c'est aussi important mais il s'agit de deux continents et deux climats bien différents, par exemple, au Cambodge, il pleut beaucoup plus qu'en France. Vous comprenez sans doute ce que je voulais dire. Le partenariat se base donc sur les trois niveaux local, régional et international.

Les compétences transversales sont aussi importantes. Nos jeunes diplômés de l'ITC sont forts en leurs spécialités mais il leur manque encore de compétences transversales, gestion, leadership par exemple. Ceci est très important pour nos jeunes qui occupant le poste de responsabilité comme chef de chantier, par exemple.

Bref, en ce qui concerne les partenaires, comme Bruno a dit, ils sont tous les bienvenus à l'ITC.

Dr. HAN Virak, doyen de la faculté de génie civil
Bonjour madame la présidente. En fait, je suis d'accord avec l'avis de M. Thibaut. La première chose est le marché et la seconde est la concurrence. Pour le marché, il manque à l'heure actuelle de ressources humaines dans ce domaine de transports. Pour l'instant, à l'ITC, il n'y a que Dr. PHUN Veng Kheang qui soit spécialiste en transport. Pourtant, nous avons beaucoup de choses à résoudre surtout à Phnom Penh. Nous en avons besoin absolument. Pour ce qui est du curriculum, on n'est pas encore sûr qu'il convient parfaitement au contexte du Cambodge et aux normes internationales, en tant que département transport et infrastructure. C'est pourquoi, comme M. DAGUES l'a mentionné, nous faisons appel à tous les établissements intéressés pour qu'ils puissent venir en aide pour le mettre sur les rails en 2022.

Merci beaucoup.

M. Denis GABRIEL, head of International Relations Office of INSA Toulouse
I have a question. It is important to do a survey for young graduates to find out where they work. Do you have information about that?

S. E. M. OM Romny, directeur de l'ITC
Yes, thank you for your question. Before planning to setup this new department, we also do the survey together with the City Hall and the Ministry of Public Work and Transport. We have had a lot of direct discussions with the Ministry of Public Work and Transport on the need for human resources in transport. We need not only transport but also logistics to the ports and international airports. Based on this discussion, the Minister of Public Work and Transport proposes to ITC to accept and sign agreement to work together and to train students for this field. Beside of this, the City Hall including the department of urban area like Sihanouk Ville and Battambang province, they need the human resources working for.

Beside of this, the problem for us is that when we launch this program, where are the lecturers and human resources to provide this training. According to the current situation in ITC, we asked one key person, Dr. PHUN Veng Kheang, graduated from Tokyo Tech and associate professor for this establishment, I think that Dr. Takada, know him very well. He is one of the persons who is backup

and setting up the program, including the discussions with M. Bruno DAGUES and partners for the possibility for the future collaborations of the building up the human capacity. We plan to implement this program in the next coming year. Beside of this, ITC also have been starting up one internal Master program with our partners to build first our capacity. Now, I think can insert some comment or the kind of information regarding your Master program for building the human capacity for your department.
I also inform you that we also work the City Hall to resolve the traffic jam problem in Phnom Penh.

So, Dr. Kheang, please, you can add some information and what are your perspectives to set up this training program?

Dr. PHUN Veng Kheang, Associate professor from Tokyo Tech and the furfur head of department of transport
Thank you very much, Dr. OM Romny and also his excellency Phoeurng Sackona and lady and gentleman. My name is PHUN Veng Kheang, I got my PhD from Tokyo Tech in Japan. I came back to ITC in 2019 and I discussed with the director of ITC and also the government to build young people in this field of transport. We believe that this area plays an important role in the development of the country's economy, not to mention tourism and others, not only in Phnom Penh. Therefore, last year we started recruiting 7 students for the master's program. They can become lecturers for our department of transport in 2022.

The market job, we can look at: one is consultant company and the second is the Ministry of Public Work and Transport. They can design of road construction for high level of civil engineering.

In terms of research, 4 or 5 students continue research in the field of transport. So, we believe that our students can not only become consultant, designer but also researchers.

Thank you !

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Okay, thank you !

S. E. M. OM Romny, directeur de l'ITC
If we don't have any comment, we can move to the agreement with the ADB and World Bank. I would like to ask Dr. Kimtho to present this part.

Dr. PO Kimtho, directeur adjoint de l'ITC, chargé d'administration, des projets et planning
Thank you very much, the Director and good afternoon all the members.

Regarding to the World Bank Project, we call Higher Education Improvement Project (HEIP), I would like to inform that we have signed partnership agreements 2 in France IMT Paris and INP Toulouse, 2 in Thailand, Chulalongkorn University and Kasesart University and another one in Australia, Cartin University and another one is in Indonesia, Institute of Technology Bandung.

So have priority areas of teaching and learning, the area of research in Partnership with our partners. For example, with Chulalongkorn University, the priority of collaboration is material and Water resource Environment, and Food technology with Kasesart University. So far, even we signed but in terms of activities, not much in progress, due to the Covid-19 pandemic. So, in this regard, I would like to get some suggestion or recommendation. How we can move our activities or our agreements forward in order to improve all research, teaching and learning. So far, we just thinking.

Can we use e-learning, through online training but still we do not how much idea to achieve due to Covid-19 pandemic present at this moment? Thank you very much.

S. E. M. OM Romny, directeur de l'ITC
Dr. Siree, can you share something with agreement that we already signed wit Kasesart?

Prof. SIREE Chaiseri, KASETSART University (GCA)
Regarding the planned activities, I admit that there has been a delay, but our government has planned to reopen our country in July. At that point, with our vaccination passport, we can move around and we can continue our activities, I think.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Okay, thank you ! I would like to know if I go to Thailand with my vaccination passport, I still get 10 days of quarantine or not?

Prof. SIREE Chaiseri, KASETSART University (GCA)
With this passport, for now, we reduce the number of days of confinement, from 14 days to 10 days. In July, the country will be reopened to tourists. For example, for Phuket, it is reopened to tourists because the entire population on this island is vaccinated. So, it is important that our partners are vaccinated and we can resume our activities at the same time. However, for the moment, we can do zoom for meeting. I hope we can restart our normal life in July.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
The new technology is good but our face-to-face meeting is always the best thing.

S. E. M. OM Romny, directeur de l'ITC
Another question for Prof. Watanabe. Professor, I hear that you move very soon to work for JICA, right?

Prof. Watanabe KOICHIRO, KYUSHU University
Yes, I'm moving tomorrow.

S. E. M. OM Romny, directeur de l'ITC
Yes, in this case, the slot of cooperation between ITC and Kyushu university is empty, you know? So, I would like to suggest you, to convey my request to the university to assign someone new to keep in touch for the networking with ITC.

Prof. Watanabe KOICHIRO, KYUSHU University
Yes, I asked Dr. Y to continue relations with ITC. So, I think we have no problem in terms of cooperation. Due to the Covid-19 pandemic, the situation is not normal, I can't promise anything but LBE and the other projects with ITC remain very important to me.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Thank you Professor.

Dr. NGUON Kollika, head of Mechanical and Industrial Engineering department
My respects to his excellency the minister of Culture and Fie Arts. My name is Ngoun Kollika, the new head of Mechanical and Industrial Engineering department. I would like to take this occasion

to have a brief presentation about the project that we have done with the National Museum of Cambodia. It is the research collaboration for the Conservation of Khmer Statues. This is a research carried out in collaboration with Professor Yan Charles, from the University of Paris 13, with financial support of DASSAUT SYSTEMES. I would like to start ma presentation with the background of the projects. We have stared it for the first time in 2018. Again, that is the financial support from DASSAUT SYSTEMES. Our first project focuses on Commercial product mixture that is used for testing the mechanical property to find the best solution to help the Workshop of the sculpture Conservation in the national museum. You can see the leg, on the photo of the Khmer statue. The main purpose is to find the way, the best solution for the museum to find a solution to connect the broken part of Khmer statues. We introduced this project to students of year 5 program and Master program, So that, 2 students of ITC join this project. It is also the collaboration with École française d'Extrême-Orient (EFEO).

Let me introduce collaborators of this project: At ITC, from GIM department, me, Dr. Nguon Kollika, Dr. SIV Easeng, formed from France; Dr. SRY Vannei, formed from Tokyo Tech, Japan; LIV Yi from Spain. We also have Dr. YOS Phanny, geological expert and head of Research unit in Material Science and Structures.

We also have the experts:
- from Paris 13, Dr. Yann Charles from laboratoire des sciences et des procédures des matériaux;
- from EFEO, Dr. Bertraud PORTE, expert in archeological conservation;

To me, it is very fine to have this opportunity to present to his excellency and Consortium members our work. The ITC team and experts from France are working together to reassemble all the important statues that are broken.

For example, the statue of Jayaraman 7 lost its arms. It is therefore up to us to study and see how we can reproduce the lost parts and stick them correctly to the main part of the statue.

From DASSAUT SYSTEMES, we can have a big support, in terms of the Powerful PC for running the simulations, the support for the students and also design some lab activities in ITC.
So, I would like to thank his Excellency Minister of Culture and Fine Arts for his support for his authorization of access to the important places of the national museum and the right to use photos which allow us to review the total forms of the statues when they were in good condition.

For our conclusion, we can get some good inputs from this project. We get the participation from Year 5 students and master student. We can produce technical manuscript and the publications in the internal journals and one publication from the master student in the journal of ITC. This research also allows ITC researchers to develop its advanced capacity to be reused in other projects.

Finally, I would like to invite his Excellency and colleagues to see some activities of our team at the museum. Thank you very much her Excellency and colleagues for your attention.

S. E. M. OM Romny, directeur de l'ITC
You cannot find this presentation in the document, which is why Dr. Ngoun Kollika asked you for permission to make the presentation now. I would like to ask for your permission so that he can continue to do this research in the museum.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC

For authorization, no problem. Actually, this kind of activities is provided by the APSARA authorities. You know, the statue of Jayaraman 7 is studied by Dr. Olivier and he found the broken arm of the statue. I think take the picture and use the computer around statue, this has no problem. So, prepare a letter and send it to the Ministry of Culture and Fine Arts, because the museum also has the internal regulations and the property right. We must also guarantee confidentiality for the results. Another problem is that the Jayaraman 7 statue is already registered and it has a code. If the statue changes its shape, for example, we add the lost arm, it becomes another statue and it requires a new registration. ITC is not the only institute that does this kind of research, but there are many that do the same work. For Siem Reap Angkor, we have more than 10000 parts of the statues. You can join with the ministry team to work on this by using the new technology with the new projects with us. But for the assembly of the lost parts to the original statues, we will discuss later.

Dr. NGUON Kollika, head of Mechanical and Industrial Engineering department
Thank you very much, her excellency for your explanation and I will convey this information to our team.

S. E. M. OM Romny, directeur de l'ITC
According to our agenda, I would like to invite all the members to take a look at our program. The points on which we prefer to have the feedback are as follows:

- *International Program with ECAM;*
- *Creation of the Faculty of Applied Sciences;*
- *Creation of the Faculty of ICT & Cyber University;*
- *Implementation of the engineer program in applied mathematics and statistics;*
- *Creation of the Master in Data Science Engineering;*
- *Creation of the new food engineering department.*

Why we need to request the endorsement of it all? Because under the implementation of World Bank Program including ADB Program for ITC, we are renewing our programs, with the recommendations from the Ministry of Economy and Finance, the Ministry of Education, Youth and Sport and the private partners. Beside of this, we observe that the market needs the human resources who under the specific skills, under the orientation and under planning. The total amount is thirty-five million USD. Please, note that Dr. Kimtho is responsible for those projects from ADB project, World Bank Project and AFD project. We need your feedback on the new proposals. If you think that such or such proposal does not deserve to be implemented, we thank you for giving us reasons or modifications so that we have clearer guidelines. For example, with Kasesart University, we must develop Food processing. In this regard, the Ministry of Economic and Finance asked Khmer Enterprise to push this activity. Even including the projects that Dr. Kimtho presented, with the partners of IMT Paris and INP Toulouse. So please, your comments are appreciated. The floor is yours now.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Dr. OM Romny, c'est encore la création d'un autre département de génie chimique et alimentaire?

Dr. OEURNG Chantha, directeur adjoint de l'ITC
Good afternoon, Madam excellency and members of Consortium. In our perspectives 2021-2022, The Faculty of Chemical and Food Engineering has proposed a new program called "Department of Food Engineering". They proposed both technician and engineering programs. We elaborate in the perspectives report under the section 3-5. We need to create this new department with the support of ADB. The reason is to establish officially.

The information regarding the job market, the Cambodia has a lot development in terms of agriculture, so Food industry is very important. That why the human resources in this field are necessary to train under the new department of "Food Engineering". I think Dr. Sokneang, the dean of Faculty, or Dr. Hasika can provide some more evident support regarding your proposition. Dr. Sokneang, can you elaborate more your proposition to the Consortium members?

Dr. IN Sokneang, Dean of Faculty of Chemical and Food Engineering
Yes, good afternoon his excellency, professors and all the participants! I am Sokneang, dean of Faculty of Chemical and Food Engineering. Yes, like DR. Chantha has mentioned the requirement that why the GCA department needs to establish a new department. Actually, we have faculty but we don't have jet enough the departments under the proper faculty. We have only options: Chemical Engineering and Food Engineering. But under the ADB Project, in ITC, they need us to have the proper structure of department. With the Project, they have a lot of support on Food Processing and Food Manufacturing for our faculty. The also need the proper structure of department of Food Engineering under the faculty. That why, we would like to request to establish this department under our faculty. Actually, it is the same program, we just request to covert this option in department under our faculty. All the documents are in the perspectives and strategies report. Thank you !

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Okay, I understood well. In this regard, you must look at ITC statutes, because when we open a new department, not only for Food Processing but for another also, I think, we need to ask permission from the Ministry of Civil Service. Without that, you can't open.

S. E. M. OM Romny, directeur de l'ITC
Madam, I discussed it with the Minister of Education, Youth and Sports and he agreed with me. This is why it is up to us to convince our members of what we will do in the future.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Yes, I would like to share my experience because, you know, even some authorities existing in the ministry, like APSARA authorities, PREAH VIHEA authorities, SAMBO PREYKOB authorities, when we need to reform something, it takes almost 3 years. So far, we have not had an answer yet, even we had the meetings with the Ministry of Economy and Finance, the Ministry of Civil Service. I have not yet had the Prime Minister's response, because the documents are still in the Ministry of Economics and Finance. So, pay attention to this. I just wanted to share my experience. You can do, first, the technical work but It take time if you want to add more elements and structures, especially with the new rules of the Ministry of Civil Service. Just think about that, not only the Ministry of Education, Youth and Sport decides it.

S. E. M. OM Romny, directeur de l'ITC
Yes Madam. To me, from the beginning, we have to get such as endorsement and then when we have other requirements from the government, we can work with the minister. I exchanged messages with the minister and he gave me the green light to do so. I think, we can do it, the Minister of the Economy encouraged me to do it also, because he wants to support the ITC.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC

Yes, I know, what we are saying so far is the technical part. We also have the green light from the APSARA authorities in terms of statutes. We had meetings with different departments and ministries: Ministry of Economy, Ministry of Civil Service, Ministry of Interior but the administrative procedures take time. What I wanted to say is the technical part but for the rest it takes a lot of time anyway. Just to remind you of this.

S. E. M. OM Romny, directeur de l'ITC
Thank you very much your excellency. Another question asked a long time ago by the members of the Consortium, when we started to set up this new department. That is to say, we want to put together ICT in the Faculty of Electrical Engineering but the members of the Consortium did not agree. They wanted it to be separate because it is not the same. So beside of this one, I asked the minister for permission to set up this faculty separately, but still linked to the cyber-University, linked to the Multimedia Center, linked to the Data center and linked to the ITC Education Center. The minister agreed with me, but as you know, we do not know when we are coming to the end of this pandemic. So, what can be done is to prepare well the means which allow to ensure the online courses in a qualified way so that the students have easy access to theirs course without problem. Beside of this, the upgrading the department of ICT to become a Faculty of ICT. In this regard, we really need your endorsement. Thank you !

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Okay, thank you Dr. Romny. I have the same comment. Pay attention to this. When I reformed the APSARA authorities, I reduced the departments. At the time, we had 16 departments and the Ministry of Economy and Finance and the Ministry of Civil Service asked us to reduce them, from 16 to 8. With new rules of this ministry of Civil Service, it is very difficult to discuss with them. So pay attention to the technical and administrative aspects.

S. E. M. OM Romny, directeur de l'ITC
Yes, your excellency. We try our best to do that. So, we can move to another step unless you have comments or questions.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Dear Consortium members, each of you has the documents in your hands: proposals, creation of new departments, we would like to get the feedbacks for your side. What do you think about perspectives and strategies of ITC? If you have no comments or suggestions, it means you agree.

S. E. M. OM Romny, directeur de l'ITC
Son excellence, je crois que pour l'instant, il n'y a pas de questions mais si vous en avez plus tard, vous pouvez nous les envoyer. Les deux personnes à qui vous pouvez les envoyer sont M. SIEANG Phen et M. Bruno DAGUES. Ils peuvent collecter toutes les informations pour en faire une synthèse.

Prof. VERLEYSEN Michel, Université catholique de Louvain (Programme Master et Doctorat)
I would like to make a comment regarding the new curriculum of Data Science. I would like to congratulate ITC, because it is timely and necessary for the current situation in Cambodia. I think it is excellent. The curriculum you have developed is very similar to that at our university. So, again, congratulations for that. Maybe, I just have one question: Data Science dominates nowadays everything for the Engineering or master level. I agree for that but my question is Data Science is coming the tools in the old engineering discipline, but nowadays we can use for transportation, agriculture, contraction, civil engineering, everywhere. But I would like to know if ITC has an

ambition to include a lite bit of Data Science in teaching, knowledge acquisition, in the curricula because the Soft Skill is also very crucial.

S. E. M. OM Romny, directeur de l'ITC
Thank you, Prof. Michel for your support regarding the initiative to setup Data Science. Why is it becoming important to do this? We have two reasons: First, it is not ITC alone, you know. ITC allocated a budget of 1.2 million USD to setting-up with IMT Paris. So, the Project is going on. It is carrying out of one colleague, Dr. LIN Mongkul Serey who keep in touch for Data Science. Second, the Ministry of Economy and Finance asked us to do it, but it is linked to the industrial revolution 4.0. It is an emergent need for the government side. It is crucial for the Industry- linkage and the country development. Thank you IMT for its support and we have already signed the partnership agreement, to push up the Data Science Project in ITC. Thank you !

Dr. OEURNG Chantha, directeur adjoint de l'ITC
I would like to add, we have also academic support from Télécom Sud-Paris and the Ecole Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise for Data Science Project.

Dr. LIN Mongkulserey, coordinateur de l'ITC Tbongkhmum
Good afternoon Madam and colleagues! I just want to share some comments with Data Science. My name is LIN Mongkulserey. I'm responsible for Data Science Curriculum. Concerning the comment of Michel, yes, I agree with what you comment. At least, Data Science makes part of basic knowledge for Engineering program. So that why, when we proposed the Foundation Year Program with modification. As you can see in the annex 1, on page 49, I have input modified curriculum of Foundation Year. In this document, you can see some courses will be include ICT and Algorithm.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Dr. LIN Mongkulserey. If we introduce Data Science in the first year, I think it's too early.

Dr. LIN Mongkulserey, coordinateur de l'ITC Tbongkhmum
Yes, Madam but it is like an option. The students can choose if they prefer. For example, if they are GIC department, they can choose mathematics instead of chemistry.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
No, I would like to say that Data Science is very important for every field Engineering but for young high school graduates, I think it's too difficult for them to understand as you say.

Dr. SIM Tepmony, directeur de l'école doctorale
Good afternoon Madam. My name is Tepmony SIM. I am director of Graduate School. I Would like to take this opportunity to express my gratitude to our partners, especially those who work with Dr. LIN Mongkulserey, for example, IMT, TSP and ENSIIE. I would like to congratulate that we can enrich our discussion until now.

To Michel, you know, actually, in the current program, we have machine learning but I don't know if the departments have data application or not. But for the machine learning tools, we have fields in Master level, for example for Mechatronic and information technology. We also have in department of IT for master degree. We hope that we can integrate this new training in other disciplinary study and research.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Thank you. Any comment or question?
So now, we have to choose a representative of the Consortium for the board of trustees. We do this meeting in June. We can select a person. Or are there volunteers?

Prof. Didier DESLANCHE, directeur de l'ECAM
Quelle est la mission de cette personne?

S. E. M. OM Romny, directeur de l'ITC
Je pense que d'abord, nous voulons demander un ou une volontaire. Si non, on peut désigner quelqu'un. Précédemment, c'était le professeur Bruno DAGUES mais de nos jours, ce n'est plus possible du fait qu'il est conseiller de l'ITC.

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC
Je voulais préciser que la mission de cette personne est de rapporter aux membres du Conseil d'Administration le bilan de la discussion du Consortium. Elle peut intervenir durant la réunion du Conseil d'Administration si elle s'aperçoit que ce qui est dit n'est pas juste ou ne convient pas à ce qui est mentionné pendant la réunion du Consortium. Dans le cas de M. DAGUES, il occupait ce poste de représentant du Consortium, il profitait de sa mission au Vietnam pour la même période pour venir participer à la réunion du Conseil d'Administration. Au mois de juin, si la situation sanitaire nous permettait, on l'organiserait en présentiel, sinon en ligne.

Prof. Bruno DAGUES, conseiller de l'ITC
Merci madame Sackona d'avoir bien raconté ce que je faisais avant. En fait, je ne peux plus représenter le Consortium, Dr. Romny, du fait que je suis du côté ITC. Effectivement le rôle du représentant du Consortium, pour stimuler les vocations, c'est de rapporter tout ce qui est dit en termes de commentaires ou recommandations au niveau de Consortium et surtout les orientations qui ont été prises. En fait, c'est un rôle certes de porte-parole mais de vérificateurs.

Dans cette optique, au mois de juin, personne ne peut dire si les vols internationaux peuvent se reprendre, du fait que la situation actuelle est compliquée.

Moi, j'ai une idée. Il y a aujourd'hui au Cambodge des partenaires qui participent à cette réunion même, qui sont aussi membres du Consortium. On peut donc leur demander. Par exemple, Adèle MARTIAL de l'IRD?

S. E. Mme PHOEURNG Sackona, Ministère de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC a enfin tenu cette bonne proposition et avec l'avis favorable d'Adèle, elle a été nommée représentante du Consortium International ITC-2021.

Madame la Présidente a remercié tous les membres du Consortium qui ont consacré leur précieux temps à une riche discussion du Consortium international ITC-2021 et elle espère que la situation sanitaire pourra revenir à la normale pour que la réunion du prochain Consortium puisse nous réunir face à face.

Le tableau suivant récapitule tous les points abordés et discutés durant la réunion du Consortium international ITC-2021.

No	Avis du Consortium 2021	Favorable
1	Mise en place du programme international avec ECAM LaSalle	×
2	Création de la faculté des sciences appliquées	×
3	Création de la faculté de l'ICT & Cyber Université	×
4	Création du programme de mathématiques appliquées et statistiques pour les ingénieurs	×
5	Création du Master en génie des sciences des données (Data Science)	×
6	Création du Master en génie des sciences des données	×
7	Création du nouveau département de génie alimentaire	×
8	Création du centre Start-Up	×
9	Création du département Transport et Infrastructure	×

Annex 2. Minutes of meeting of the Board of Trustees Meeting on 23 June 2021

COMPTE-RENDU DE LA RÉUNION DU 29ÈME CONSEIL D'ADMINISTRATION DE L'ITC, LE 23 JUIN 2021, À PHNOM PENH

Membres de droit présents

1. Présidente du Conseil d'Administration, S.E. Mme PHOEURNG Sackona, Ministre de la Culture et des Beaux-Arts,
2. Ministère de l'Éducation, de la Jeunesse et des Sports, représenté par son Excellence YUOK Gnoy, secrétaire d'État,
3. Conseiller du Ministère de l'Éducation, de la Jeunesse et des Sports, M. Murat YINDIZOGLU,
4. Directeur de l'ITC, S.E.M. OM Romny,Ambassade de France au Cambodge, représentée par M. Christophe GIGAUDAUT, Conseiller de Coopération et d'Action Culturelle,
5. ARES-CCD, représentée par M. Philippe BOUILLARDS,
6. AUF, Direction Régionale du Bureau Asie-Pacifique, représentée par M. Jean-Marc LAVEST,Ministère de l'Économie et des Finances, représenté par son Excellence CHOU Kimleng,
7. Ministère des Mines et de l'Énergie, représenté par S.E. PEN Chhorda, Secrétaire d'État,
8. Secteur privé, représenté par le directeur de la SKD, OKNHA LAY Meng Sun.

Membres invités présents

9. M. Thomas Vallée, attaché de Coopération Scientifique et Universitaire, Ambassade de France au Cambodge,
10. M. Pascal MAUSSION, vice-président des relations internationales, INP Toulouse,
11. M. THOEUN Vongdy, program officer for Jica office in Cambodia.

Direction de l'ITC

14. Dr. CHUNHIENG Thavarith, directeur adjoint, chargé de la coopération,
15. M. NUTH Sothân, conseiller de l'ITC, chargé de la pédagogie et des études,
16. Dr. PO Kimtho, directeur adjoint de l'ITC, chargé de l'administration et des projets,
17. M. SOY Ty, directeur adjoint de l'ITC, chargé des affaires académiques,
18. M. OEURNG Chantha, directeur adjoint chargé des plannings et supervisions du Centre de recherche et d'innovation,
19. M. Bruno DAGUES, conseiller de la direction de l'ITC,
20. M. SIEANG Phen, chef de cabinet de directeur et des relations internationales,
21. Dr. OR Chanmoly, directeur du centre de recherche et d'innovation,
22. Dr. SIM Tepmony, directeur du programme de 3ème cycle,
23. M. NGOUN Kollika, chef du département de génie industriel et mécanique,
24. Dr. Kimgnoun, doyen de la faculté de génie géoressource et géotechnique,
25. Dr. CHHUON Kong, doyen de la faculté d'hydrologie,
26. Dr. IN Sokneang, doyenne de la faculté de génie chimique et alimentaire,
27. M. HAN Virak, doyen de la faculté de génie civil,

28. M. LAY Heng, vice-doyen de la faculté de génie électrique,
29. Mme SREY Malis, chef du département TC,
30. Dr. HIN Raveth, vice-directeur du programme de 3ème cycle,
31. M. KHIEV Samnang, responsable du service informatique,
32. M. KHEM Trankrasel, responsable de la section de français,
33. M. CHUM Tival, responsable de la section d'anglais,
34. M. KIM Vannada, responsable de l'assurance de qualité de l'ITC,
35. SRANG Sarot, responsable de mécatronique et robot,
36. M. SRENG Sokchenda, chef de département de télécommunications et réseaux.

Accueil des participants et ouverture de la réunion virtuelle

En introduction, **S.E. Dr. Sackona PHOEURNG**, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**, souhaite la bienvenue à l'ensemble des membres du Conseil d'Administration et les remercie pour leur participation à ce 29ème CA. Le Conseil d'Administration de l'ITC et son Consortium international d'appui se réunissent 1 fois par an, le Conseil des Études et de la Vie Universitaire 2 fois. Les réunions régulières de ces instances témoignent du bon fonctionnement de l'établissement. Au cours du CA, le bilan des activités puis les prévisions sont présentées par le Directeur de l'ITC. Le CA recueille les conseils de ses membres et prend les décisions. C'est le moment pour donner des avis, faire des remarques, des critiques et des encouragements sur le travail effectué par l'équipe de l'ITC.

Nous avons des membres du Consortium fidèles de France, de Belgique, du Japon et du réseau AUN/Seed-Net etc. Comme d'habitude, nous avons un représentant du Consortium qui parcticipe à la réunion du Conseil d'administration. Cette année, madame Adèle GROS MARTIAL, qui est là parmi nous, le présente. Nous avons aussi le partenaire industriel. Je voudrais conclure de ce petit discours d'introduction en laissant présenter certains événements importants. Il y a eu de nombreux événements qui montrent l'évolution et le rayonnement de l'ITC, pa exemple, la 10ème journée scientifique de l'ITC, dont le titre est « Enhancement of Engineering Resources for industry 4.0 », avec 70 publications réalisées de des différentes universités nationales et internationales. À cet événement ont participé plus de 250 participants pour promouvoir la recherche. L'ITC est en train de gagner le pari de son évolution et on est en formation au niveau international compétitif et ce n'est pas fini évidemment. Il nous faut garder le cap maintenu. Un grand merci à tous nos partenaires pour votre fidèlité et grâce à vous l'ITC est devenu ce qu'il est actuellement. Je vous suhaite un bon succès à notre réunion d'aujourd'hui.

Avant de passer à notre ordre de jour, je voudrais laisser son excellence M. YUOK Ngoy, secrétaire d'Etat au Ministère de l'Éducation, de la Jeunesse et des Sports pronocer son discours.

S.E.M. YUOK Ngoy, secrétaire d'État du Ministère de l'Éducation, de la Jeunesse et des Sports

- *Votre Excellence, Madame la Ministre de la Culture et des Beaux-Arts, ancienne directrice de l'ITC,*
- *S.E.M. CHOU Kimleng, secrétaire d'État du Ministère de l'Économie et des Finances*
- *S.E.M. le directeur général de l'ITC,*
- *Mesdames et Messieurs les membres du Conseil d'administration de l'ITC,*

Je suis très heureux d'assister à cette réunion annuelle qui, comme chaque année, souligne le développement de ce bel Institut et le progrès de ses formations déjà de très haute qualité.

La démarche d'amélioration continue adoptée par l'ITC depuis sa fondation est bien sûr derrière cette qualité indiscutable qui a fortement bénéficié des stratégies volontaires de coopération aux niveaux national et international de l'ITC, et de la contribution de tous ses partenaires qui constituent un réseau très dense qui va même au-delà du consortium de soutien.

Nous avons aujourd'hui devant nous un institut qui peut être fier d'avoir plus de 85 docteurs en son sein, d'attirer chaque année plus de 3500 bacheliers de très bon niveau, qui développe chaque année de nombreux projets résolvant des problèmes importants au Cambodge. L'ITC participe aussi aux grands projets de réformes avec le soutien de l'ADB et de la Banque mondiale, ainsi que le JICA et le JST, comme pour le projet SATREPS. L'ITC met régulièrement en place de nouveaux programmes de formation (notamment un nouveau programme doctoral et de nouveaux masters sur dans des domaines émergents comme l'ingénierie des sciences des données) et ses chercheurs publient de nombreux articles académiques chaque année, avec une vraie présence internationale dans les domaines d'excellence de l'ITC.

Nous avons un très grand plaisir de constater tous ces accomplissements encore une fois et désirons exprimer ici nos félicitations à son équipe de direction, et notre fort soutien à cet établissement qui le mérite pleinement. Notre reconnaissance est immense pour vous tous qui démontrez votre soutien à l'ITC par votre présence aujourd'hui.

Votre excellence, Mesdames, Monsieur les membres du Conseil d'administration, je vous remercie de votre attention.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Merci son excellence pour votre discours très encourageant en soulignant le progrès de l'ITC. On revient vers nos collègues français, malheureusement, son excellence madame l'ambassadrice et l'attaché de coopération et d'action culturelle sont pris par autre mission. C'est donc Monsieur Thomas VALLEE qui représente l'ambassade de France. La parole est à vous, monsieur.

M. Thomas VALLEE, attaché de coopération scientifique et universitaire
Madame la présidente,
Monsieur le secrétaire d'État,
Son excellence M. Romny,
Chers collègues,

Je suis très content d'être là au nom de l'ambassade de France, pour ce conseil d'administration qui montrent encore une fois, en regardant les documents, le dynamisme de l'ITC. J'en prendrai pour preuves le nombre record de candidature en première année et le nombre record de réussite à ce concours de première année, aussi qu'il y a une 1709 réussites dont 3747 inscrits. Nul doute que parmi ces jeunes recrutés se trouveront des étudiants brillants et des étudiantes brillantes qui viendront, je l'espère, candidatés aux bourses du gouvernement français. Cette année, se sont encore 8 nouvelles bourses que nous avons offertes aux étudiants de l'ITC pour partir faire leur master en France ainsi que des bourses cofinancées avec le ministère de l'éducation, de la jeunesse et de sports pour faire des docteurs en France. Nous sommes très fiers de cette réussite. Nous sommes aussi très fiers de la coopération que vous avez avec les structures de recherche française, évidemment je pense à l'IRD, représenté par Adèle GROS MARTIAL, qui est aussi présente. Je pense aussi au CIRAD et voilà et donc je voulais dire rapidement combien j'espère que nous pourrons continuer à contribuer à ce fort dynamisme de l'ITC dans les années à venir. Je pense constamment à ECAM LaSalle qui va venir pour potentiellement à la rentrée prochaine avec une filière au sein de l'ITC.

Je pense aussi à une potentielle collaboration aussi à venir et je voulais dire en ces quelques mots que nous serons à vos côtés pour continuer à contribuer à ce dynamisme que nous espérons bien évidemment inarrêtable. Voilà je vous remercie et je vous souhaite à tous un très bon conseil d'administration.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Merci monsieur Thomas VALLEE, représentant de l'ambassade de France au Cambodge. Je laisse ensuite notre collègue de Belgique intervenir, M. Philippe BOUILLARD, représentant de l'ARES-CCD.

M. Philippe BOUILLARD, représentant de l'ARES-CCD
Merci madame la présidente. Je voudrais également partager mon plaisir d'être avec vous malheureusement virtuellement pour ce conseil d'administration. Excellence, et chers collègues, je voudrais attester sur le fait que nous avons pu même à distance suivre l'évolution et c'est toujours un plaisir de voir comment les équipes de l'ITC sont dynamiques et progressent. Si vous me permettez, je vais prendre un petit instant pour souligner le fait que nous sommes un moment charnière de l'apport de la coopération belge avec l'ITC et un projet sur lequel nous travaillons, se termine et comme la plupart des administrations, c'est le moment de réflexion pour la coopération belle qui va légèrement modifier son mode de fonctionnement. Je voudrais attirer l'attention des équipes de l'ITC sur le fait qu'il va se passer durant l'été deux choses :
* la première chose, c'est que l'ARES-CCD va nommer un consultant pour évaluer le résultat du précédent projet et je voudrais quand même souligner que de notre point de vue, nous sommes très très satisfaits de ce que nous avons obtenu tous ensemble. Je pense qu'il y a eu une nette contribution au développement de la recherche à l'ITC puisque nous avons soutenu des projets de recherche, des bourses de de doctorat, des programmes de doctorat de l'ITC. Ça, c'est très positif. On a aussi contribué au développement de la cellule d'interface et à la mise en place d'un système informatique, avec des aspects moins réussis, mais je pense que c'est normal dans un projet dont nous allons faire l'évaluation cet été. L'ARES-CCD va interroger l'ITC pour que ce dernier fasse une lettre d'intention pour dire ce que vous avez envie de faire dans un potentiel prochain projet et je pense que ça c'est un moment très important pour lequel ce serait bien que certains d'entre vous réfléchissent à effectivement quel développement possible que vous entrevoyez et nous allons vous aider à rédiger une lettre plus efficace possible dans le processus. C'est important de noter que l'ARES-CCD a décidé de ne plus financer les dimensions de gouvernance, certains philosophes européens estimes que lorsque l'Europe se mêle de gouvernance dans un pays comme le Cambodge, post-colonialisme, c'est devenu inacceptable mais sommes toujours à vos côtés dans une vision de partenaires égaux, au profit de développement de l'ITC. Merci de votre attention.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Merci professeur pour votre intervention qui manifeste davantage une bonne coopération entre l'ARES-CCD et l'ITC. On sait très bien que tous les projets ne sont pas pérennes, ils s'achèvent un jour mais évidemment les résultats positifs sont toujours là. On en est très contents tous. On attend impatiemment l'évaluation de vos experts. C'est sûr et certain que nous allons mettre l'accent sur d'autres dimensions. Pour ce faire, nous avons notre conseiller, Bruno DAGUES. Je vous demande de veiller de plus près à la mise en place de ce projet sous d'une nouvelle coopération.
Maintenant, je laisse la parole à M. Jean-Marc LAVEST, directeur régional Asie-Pacifique de l'AUF.

M. Jean-Marc LAVEST, directeur régional Asie-Pacifique de l'AUF
Merci madame la présidente. Nous sommes aussi fiers du travail accompli par l'ITC. J'apprécie beaucoup la construction multilatérale de l'ITC qui est propice à son développement. Ce matin même, j'étais en train de signer une tranche supplémentaire destinée à l'ITC. Nous sommes très fiers de vous accompagner. Vous êtes un exemple. On cite souvent « ITC ». Vous inspirez souvent ici beaucoup d'institutions en Asie. Il s'agit d'une trajectoire remarquable pour votre pays.
Merci madame la ministre.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Merci monsieur le directeur. C'est notre partenaire fidèle depuis 1992. And now, the floor is for our colleagues from Japan. As I remember, when we started our relationship with Japan, it was in 2000. The first meeting of AUN/Seed-Net, at Chulalongkorn University, when I was the director of ITC at that time. It was the first time I've been there. AUN/Seed-Net is an integral part of supporting ITC. So, I would therefore like to invite Mr. THOEUN Vongdy, Program Officer for Jica Office in Cambodia, to take the floor.

M. THOEUN Vongdy, Program Officer for Jica Office in Cambodia
Yes Madam, today, our representative is busy today. I'm here just to collect some information. I would like to appreciate ITC's good collaboration with Jica, so far. Now, we are implementing a new project called LBE, Laboratory Based-Education. Thank you so much, Dr. Om Romny, for your good collaboration with our experts. Thank you, Madam for letting me express my idea, today.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you, Mr. Vongdy. Now, the floor is for professor KOICHIRO Watanabe, from Kyushu University. He is our friend since long time ago. He is not only in the AUN/Seed-Net but now the representative of Jica in Japan. He is always with us. I remember that during the meeting of Board of Trustee, it was difficult because the slides was sometimes in French; sometimes in English, but I think you understood what we wanted to talk about. Your presence today is a great honor for us. So, please the floor is yours now.

Professor KOICHIRO Watanabe, Representative of Jica in Tokyo
Bonjour Madame Sackona and everybody. I am KOICHIRO Watanabe, former vice-president of Kyushu University. But now, I am in Jica office in Tokyo. I know the ITC very well. I really appreciate the internationalization of ITC, if we compare it with the past, it is much developed. As you know, ITC is the top university in the ASEAN Countries. So, the internationalization is very important in this university, I think. In this regard, the English language plays a crucial role. For me, I think that the LBE project is a project that exists not only in France but also in Europe. We are promoting such kind of this education.
Anyways, Madam Sackona, I hope to see you face to face soon. Thank you.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you, Professor Watanabe. I would like to thank all kinds of collaboration with all ITC partners. It is thanks to all of you that ITC has become what it is today. Yesterday, I had dinner with the Japanese ambassador. We talked about the Olympic Games in Japan. It's a big global event. We wish you great success at this event.

Le directeur de l'ITC, Dr. OM Romny et le directeur adjoint M. SOY Ty ont présenté les événements marquants et certianes activités. En ce qui concerne la formation des ingénieurs et techniciens, et la

formation du 3ème cycle à l'ITC, elles ne sont pas remises en cause lors de la pandémie en comparant avec d'autres établissements de l'enseignement supérieur, surtout privé.

Est-ce que vous avez des questions par rapport aux activités présentées?
Please, raise your hand when you have questions relating to the exciting events and other activities presented?

Bonjour M. Pascal MAUSSION, vice-directeur des relations internationales de l'ENP-Toulouse. Vous êtes le bienvenu au club. La parole est à vous, monsieur.

Remarques de Pascal MAUSSION, vice-directeur des relations internationales INP Toulouse
Her Excellency, probably in English. Thank you for this very interesting presentation and I would like to congratulate the all the ITC staffs for the very good results that you have regarding the employability of your graduates, your reaction in order to face the covid crisis, the increasing number of Master thesis which is obviously one of the highest ratio in Cambodia. I just have apart from this well thanks and congratulations, I'm quite curious to know if you have any private competitors in Cambodia on the higher education sector, probably on some very narrow nice and how do you face these challenges?

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you for your interesting question. You know that indeed we cannot avoid the competition. For me, this competition started, I think, more than 10 years ago when the private university also decided to open these engineering courses, especially civil engineering, and electrical engineering. In addition, the Ministry of Labor and Vocational Training, also the Polytechnic Institute, provide the same type of training. Recently, the Ministry of Public Works and Transport also decided to open an institute of the same type. What I can tell you is that you can't avoid such competition, under the free market but to dominate our opponents, ITC is more interested in quality. In terms of human resources, according to the statistics, we have three times more than other higher education institutions in the country. Quality is an important indicator that we must consider. When we also talk about infrastructure, we get a lot of support and different projects: ADB, World Bank, our ministry and our own income. I believe all of this can push ITC ahead, in engineering, nationally and internationally. I can assure you that we continue on our good path to maintain our quality of training. We are sure that all graduates coming out of ITC will definitely find work. Once again, we face competition. It's inevitable but we have to stay on track and achieve all the expected goals. I think Dr. Romny can add something else.

H.E.M. Dr. OM Romny, Director of ITC
Thank you, Professor Mascal MAUSSION, for joining the meeting today. Actualy, I would just like to add to what Ms. Sackona mentioned, about the competition. I think that it is good. We look like the palyer of the football. In case we play alone, we have no competition, no effort. So, it is good to have competition from all public and private sectors. We have a lot of candidates now. In this regard, we can judge and see all that can be done to push the ITC ahead. I am sure that due to human resources in terms of facility infrastructure and also in terms of clear mission and clear preparation of all ITC activities, accountability including commitment of board members to administration, we must get the flagship for the university in the country as well as in the region.

S.E. Dr. Sackona PHOEURNG, **Ministre de la Culture et des Beaux-Arts et Présidente du Conseil d'Administration de l'ITC**
I am sorry, you know because sometimes the online meeting is difficult because you can't see all the participants. I would also like to welcome Professor de Takada, Vice-President of Tokyo Tech

Institute of Technology. You are welcome to our team. Please, note that Professor Takada is also our friend from logue date. Our friendships are very important, not only between universities but also between countries. Also the culture I can say, for example, for the Angkor site, we have many Japanese experts who provide technical support on this.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology
Sorry, I couldn't catch the current discussion but obviously I like to just mention that our project (LBE) is ongoing. Although we don't have the physical access to Cambodia but I accept for our colleague, Chikako who is making the best effort to promote this project, because we'd like to promote this laboratory-based-education which connects the education and the research are more practical manner. So, I believe that such kind of education can be can provide in particular the experiences and the practices as well as the soft skills through such kind of activities has a very strong collaboration with the industry to this part of the students to the industry but I think this additional part may I give the opportunity to the students to brush through the education in ITC. I hope that this kind of practice as well as the promotion of the research through the students activities as well. Thank you very much.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you professor for your rich comment. Next up is Dr. SIM Tepmony presenting postgraduate training at ITC.
…
Thank you, Dr. SIM Tepmony. Dear participants, do you have questions or remarks?
… As this part relating to the postgraduate training is important, I would like to hear any question of comment from our participants. For me, I have one remark. For the next meeting, Consortium and Board of Strustee, please, not only do the conclusion but also M&E, because we need to know where our graduates go after postgraduate training at ITC. Maybe, you can provide more information relating to the procedure of recruitment. It is very important for our members to understand more and more. I think that it is very important to assure the quality of the training.
It is my comment and again, I would like that the responsible for this try give more information during the next Consortium and also Board of Trustee. I would like to hear another comment from our participants.

Professor, Takada, please.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology
Thank you. I have two questions.
My first question is about the the organization of the master and the PHD programs because as I understand that you established the program separated from the department and really focusing on the research field. So, I'm just curious about the management of the individual program which is separated from the department. How you coordinate such kind of that educational activities I understand that Dr. Tepmony is taking care of the whole structure but before the individual program I guess that it's apart from the department. So, I'd like to know a little bit about how the program some managed.
My second question is about the PHD. I congratulate that the number of the enrollment is so much increased and I observe that about half of them enroll in the quota program but it means that other half of just enrolling the ITC PhD program that's what I wanted to confirm. Thank you very much.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you professor for your comment. Next up is Mr. Pascal MAUSSION from INP Toulouse.

Remarques de Pascal MAUSSION, vice-directeur des relations internationales INP Toulouse
Yes, thank you, your excellency. I would like to know what types of transportation does the ITC Target in his new master dedicated to transportation. Could you tell me what kind of transportation, air transportation, water transportation, land traportation? Did you conducted the market?

H.E.M. Dr. OM Romny, Director of ITC
Thank you, Professor Mascal MAUSSION. But firstly, I would like to respond to the question of Professor Takada regarding to the program at ITC that we are making separation program from the department. Actually, the graduate degree program and the bachelor degree program is linked together. It means they work together under the control of the academic affairs office. The programs are not really separate. We align them together with the departments.

The enrollment of the students, for the PhD program, is linked together with the current situation of economy of the country. Mostly, from year to year, the PhD's students, the number of students enrolled is not big. Just, this year, we a collaboration, under the initiative of the Ministry of Economy and Finance, one of local higher institution called the National Polytechnic Institute of Cambodia (NPIC) wants to upgrade his human resources to have enough PhD professors to run his training. In this case, the Secretary of State of the Ministry of Labour and Vocational Training asked to send some faculty staffs from the NPIC to PhD program in ITC. Otherwise, the Ministry of Economy and Finances does not pay the scholarships for these doctoral students. This is the decision of the Secretary of State of the Ministry of Economy and Finance, H.E.Mr. Vong Sengvisoth. So, it is a good image that ITC has. You see, we pride ourselves on our quality of training. Biside of this, we have also our condition. For those who do not have enough performance quality, they are not allowed. We have created the selection committee and only 9 candidates are selected.

Relating to the transportation, for now, we must give priority, especially to the development of infrastructure. The emphasis is on land transport and not air transport and also water transport is still limited. That is why we seek to promote this type of land transport. For this, we must train human resources. In this perspective, Mr. Bruno Dagues has worked with the Ecole Nationale des Ponts et Chaussées to support training at master's and PhD level. We are starting slowly step by step. For me, transport ground are the first priority. If we have enough capacity, we start another air transport training. Last year, we hosted the manager of Vincy Airport to talk about the aviation management training. A polytechnic in Singapore is selected for such training. The documents including the MoU are ready but everything is blocked, because of the Covid-19.

Dr. SIM Tepmony, directeur du programme de 3ème cycle
I think, almost all points, our director already pointing out. For the organization, we have for the master program with each program we have the we call responsible person who in charge of the program. Usually they come from the department the closest one to the program and that one will manage and coordinate with the concern department as well as, the research center and has to report directly to a graduate school. So, this is the management, it's a multi-disciplinary so we cannot find one from a particular department. So, this is the arrangement of the program and the for PhD courses. We follow strictly the rule of the regulation of the Ministry of Education, Youth and Sport. Actually, I think the role of our ministry is one of the hardest as well and we have to do a lot of administration and those students normally there they have to meet a critering that they said and we cannot just select them without knowing their background etc and I can currently tell you that most of them receive the degree outside, most of them from France, Belgium, Korea and Japan also. So, the students from NPIC, they hold the degree from Japan and Korea. The quarry of the most snow the things that they don't want to go out because they have the family and the director of NPICS encourage them to do a PhD with a local partner. Thanks to the Ministry of Economic and Finance

that play confidence on ITC. It's our honor and mission as well. Concerning the transport, I think that our director already addressed the message to you and we can let the responsible person in charge on this to respond. Thank you.

Dr. PHUN Veng Kheang, responsable du programme Master du département de transport et infrastructure
Thank you, Madam. I'am PHOUN Veng Kheang and I am in charge of master program in transport engineering. I would like to add to the answer of our director, Dr. OM Romny. Regarding the master program, we allow students to choose any field they want when they come to the program. We're not restricted them to for example land transport or logistics but, as we can see the current situation in Phnom Penh or in Cambodia traffic or land transport and infrastructure are very important and you know everyone know. So, we start with the first promotion focusing on the traffic engineer and infrastructure development. We are not limited them to choose only land transport. We allow them to choose any topic, first and secondly after graduate in transport field, at least we identify three directions: first, they can work in the consultant company and second they can go to the ministry including Ministry of Public Works and Transport and thirst they can become a researcher or academic people like become a lecturer in transport field as you may know that human resource in transport related to the engineer is very few for Cambodia. So, those are the expectation from this program. Thank you very much.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you. I think that it is clear for everyone. Do you have any comment? Okay, no remark. So, I would like to move to other presentations relating to E-Learning Center presented by Mr. Lay Heng and Capacity Building and Cooperation by Mr. SIEANG Phen.
…
Thank you. Do you have any comment from our participants relating to two presentations. Please, Professor Takada.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology
Thank you very much for the presentations. I have one question to the E-Learning Center. Congratulations for Online Examination. I like to know a lit bit more. How they can be implemented? Can you share it with us?

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Yes, Professor. I will give the floor to Dr. OM Romny but I can assure you that it is complicated. You know, because of Covid-19, exams to recruit new employees are canceled in some ministries. However, due to good technological capability of ITC, several types of exams for recruiting students and employees are handled by ITC team. Dr. OM Romny can tell you more.

H.E.M. Dr. OM Romny, Director of ITC
Thank you very much, Professor Takada, for your good question. It is a big concern when most of the people thinking that the examination online is not recognized, because we can not control.

However, ITC can do that and has put a platform. Let's be sure that everything is fine and especially when the number of participants is big. Our platform can guarantee that 50000 candidates. That means that can enter at the same time to take the exam. The number of reserved places is more than 100,000. We tested it several times to be sure. We allowed ITC students and professors to test this system without interruption. Therefore, the results were good.

One more thing, we can develop, for example, 300 questionnaires. They are random. The questions bank and the answers are random. Even, the 'students sit side by side, cannot copy on each other, because the questions and the answers are different.

Another point, the students cannot go back to complete the answers because the time is limited. If the student does not tick the answer, there is no zero but he loses points. It is one of the logic that we already applied. We've tested many times and we've tried many times. Finally, we get the feed-back from the students. We conducted the interviews with the students who passed and failed the exam. They said that everything that ITC offered as part of the exam was acceptable.
The last one, we have no choice. Face-to-face examination is not permitted. Only the online exam is recommended. Beside of this, we know that the number of students is a bit high (1300) because finally for students who have succeeded by cheating, for example, they will have problems when they are in class. At the first year, they can drop out of school automatically. In this case, we can keep only the real deserving students. For me, I think that it is better than nothing to do for the current situation. Thank you.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you. I have also some remarks. We know very well that because of the pandemic, many things are cancelled: mobility of missionaries, students and professors but ITC can survive. We were able to make a good cooperation with École Nationale des Ponts et Chaussées, the IUT of Saints-Nazaires etc. I think it's a good image to get this new department up and running. Note that this Ecole Nationale des Ponts et Chaussées is very famous not only in France but in the world. So, please, keep going one this collaboration for the development of this new department of ITC.

Do I have another comment from the participants? If no, we move to the collaboration with the industries presented by Dr. IN Sokneang and Research Center by Dr. OR Chanmoly.
…

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you. As you can see, from the beginning until now, it is a big part of activities of ITC for 2020-2021. I can give the floor to Professor Watanabe who raises his hand.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology
Thank you very much for your presentation.
Under the Covid period, the online activities are so much in progress, in ITC. I observe and that's quite nice and I congratulate for such progress even under the difficult situation. So, I haven't just you have a lot of activities by utilizing the video conference or you learning activities. I'm just curious about the website of ITC because it seems that not only ITC but I mean several Cambodia Universities I check the website and the website is not freaking the updated and in case of ITC I found the activities and photos in 2014. So, I'm just wondering under this difficult situation as you mentioned the online means is more important and does this kind of condition. So, I'm just curious whether you are not going to utilize the website to put and update more activities during the pandemic, it is very important, I think. It is just my opinion.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you, Professor, for your comment. I would like to give you one reason Professor, you know, in Cambodia, many people use Facebook. It is the most popular platform in this country, but anyway, I let Dr. PO Kimtho response to your question.

Dr. PO Kimtho, Deputy-Director in charge of administration and planning
Thank you, very good afternoon professor. I would like to confirm a little bit about the website. We have discuss among our college to improve the website at the interface but still we need to add some more contents into the website. So, I can say that it is almost ready but still we are not upload to the online yet, to the internet yet. So, we try to speed up this one because we see that this is still very important to us even we have Telegram, WhatsApp and other platforms but still a website is very official one. So, we hope to finish it as soon as possible. Thank you very much, Professor.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology
Thank you very much, I'm looking forward to see that new website.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Yes, exactly. The floor is now for Professor Pascal MAUSSION.

Remarques de Pascal MAUSSION, vice-directeur des relations internationales INP Toulouse
Thank you, your Excellency.
I would like once again to congratulate ITC for this very complete and harness presentation of those activities including the SWOT analysis of the researcher involvement is of important. I'm sure recognition of researchers' involvement is paramount if you want to keep them with ITC, prevent them, the researchers, from going elsewhere, I mean probably the private sector, so my question is what will be your main decision in this area in order to keep the researchers very active and productive at ITC?

Dr. OR Chanmoly, director of Research and Innovation Center
Thank you, Professor Pascal MAUSSION. Yes, right now, the competition of the outsider is a very active. So, we need to provide, to show the very important benefit, especially for the activity researcher. I think that it is the benefit that I talk. I'm talking is not the only about the money but also about the environment. For example, at the ITC, we can have team of the research, equipments and facilities for labs. We have the system. When I would like to write a proposal, you came up easily and after, you get the project. We can fully focus only on research. So,we should reduce the worknote of the researcher in terms of administration. Because of search all day, they don't like the administrative tasks. They like only the technical work. So, I think the environment is a very important for researcher and also we should visualize we have the project for disseminate the research output to value the active researchers and also ITC is working hard on promotion of the faculty staff to have some position, for example, professorship. Right now, I think it almost done. We will have the professorship soon I think, because we already got some information back from the Ministry of Education, Youth and Sport relating to the professorship. Thank you.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Yes, thank you. This answers your question, professor? Okay, from the beguening untile now, we have different activities during the academic year 2020-2021. Now, Dr. OEUNRG Chantha will present the strategies and perspectives of ITC. Not only 2021-2022 but until 2030. We will present to you the strategies and action plans for 2021-2022. We will vote to adopt this document.
Afterwards, Dr. PO Kimtho will present the financial report for this year and the next year and the last one is the nomination of the direction board.

…

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Okay, now, we come back to our meeting. We have two things. The first one it is the regular of our board. That means every time, we will adopt the recommendations of consumption 2020-2021. In the last slide, you can see the 9 comments of Consortium. That means the International Program with Ecam Lasalle, the creation of the faculty of applied Sciences, the creation of ICT and cyber University, the creation the program of applied Mathematics and statistics for engineer, the creation of Master in Data Science, the creation of Data Based Center, the creation of food technology, the creation of center of startup and the creation of department of transport and infrastructure. I think we need the support, we need the adoption of board about this favorable comments from Consortium. So, it is my first my first request.

I got nother thing also as I said from the beginning, actually, after I need to update the statutes of ITC, because it was updated the last time in 2009. That means, we need the board to allow us, you know, a permission to review those statutes of ITC and also transfer Institute of Technology of Cambodia (ITC) into the University of Technology of Cambodia (UTC). So, I need also the support and the permission from the board, you know, to lead our direction to go ahead with this objective.

The last one, we also need the permission of board relating to the recruitment of the first year students. The next year 2021 and 22, ITC would like to recruit engineers:

- In ITC's Phnom Penh: 1,300
- In ITC's Tbongkhmum: 120
- And ITC also wants to recruite 1,000 technicians.

As we can see that the technician program is also important for the development of economy in Cambodia.

About the tuition fee, we keep the same like this year. For the engineers, the tuition free for the students male is 600USD, and 450USD for the female students. So, ITC takes in charge of compensator the 150USD dollar for the female students. For technicians, the tuition fee for the male student is 300USD and for the female 200USD. It is the same way that ITC must compensate for the female student, in order to increase the number of female students at ITC. So, it is the second part of our document. Now, I would like to ask any question or comment if you have, please raise your hand.
Okay, please, Madam Adèle GROS MARTIAL from IRD and after Professor Takada.

Mme Adèle GROS MARTIAL, représentante au Cambodge chez l'IRD et **représentante du Consortium international d'appui à l'ITC 2021**
Votre excellence Madame la ministre, je suis Adèle GROS MARTIAL, représentante du Consortium qui s'est réuni au mois de mars. Tout d'abord pour vous dire que le Consortium est vraiment impressionné par la qualité des projets qui qui qui avait été proposé par l'ITC et son engagement effectivement à l'accompagnement. On voudrait aussi féliciter l'ITC pour la rapidité aussi l'implémentation puisque le directeur nous a indiqué que ce programme allait être mise en place dès cet automne ou alors donc à partir de janvier 2022.

Quelques remarques que je voudrais rapporter du Consortium. Tout d'abord, le Consortium et très sensible et à porter son attention à la qualité des recrutements à l'ITC. C'est donc un point qui a été mentionné et ce point est important pour maintenir la qualité, l'exigence de cette institution du pays et donc ce point a été souligné. Ensuite, nous avons donc également plusieurs remarques sur les différents projets de nouveaux programmes de Master, de Bachelot ou des nouveaux départements qui vont être mises en place et voici les recommandations de ce Consortium international d'appui à l'ITC. Ça a été d'anticiper au maximum surtout le Continuum depuis la formation juste aux aspects de recherche de manière à ce que pour chacun de ces programmes, l'ITC, avec les jeunes qui vont être formés, puisse répondre bien sûr au besoin urgent en matière de formation de ressources humaines pour le pays, par exemple le cas dans le domaine des transports. C'est

donc tout à fait important à court terme, d'aller vers cette formation mais également d'aligner ces formations et l'organisation de ses départements, les curricula sur les standards internationaux de manière à pouvoir faciliter la mobilité à moyen terme avec les grandes institutions dans le domaine dans la région et au niveau international. Ça a été souligné. Et également à long terme de préparer ces jeunes à une capacité d'analyse, à des moyens de recherche pour pouvoir intégrer non seulement l'appui au développement économique du Cambodge mais éventuellement à l'appui à la préservation des ressources du Cambodge. Il a été question également des objectifs du développement durable. Tous ces points ont été soulignés notamment pour le Master de transport mais également dans la formation dans le domaine de technologie des aliments (Food Technology). Ces trois points : à court terme, former des ressources humaines, à moyen terme, respecter les standards internationaux, et à long terme, préparer la relève en matière de recherche, non seulement pour accompagner l'économie mais également pour accompagner la protection des ressources du Cambodge.

Et enfin, je voudrais souligner un dernier point. C'était aussi une recommandation du Consortium sur les compétences transversales, les compétences en matière de management, mais également les compétences en matière de langues, par exemple pour le niveau B1 en anglais ou alors que B2 en français, pour ceux et celles qui vont partir poursuivre leurs études à l'étranger. Donc la maîtrise des langues est intéressante. Et également, ce qui a été proposé de mettre en place des Data Science dans différents programmes de manière très transversale, donc de voir comment on pourra donner ce bagage de technologie numérique et de Data Science dans d'autres programmes que le master qui sera dédié aux Data Sciences. Voilà les trois grands points qui ont été soulignés et que je souhaitais rapporter ici au nom de du Consortium. Merci Madame la présidente.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**

Yes, thank you for summarizing all the important Consortium remarks. I will answer after the remark of Professor Takada.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology

Thank you very much. Really, I don't have any comments of the preferencing the consultant because I also participated in the meeting but I have one question about direction to change the name of ITC. So really, I am just wondering if it decides to transfer from my institute to the university what could be the difference in particular in terms of the present education system because really you have the engineer's program and the technician's program instead of the undergraduate. So, I just imagine that if you transfer to the university, they may change to the bachelor course or you can keep the similar education system but you just transfer from institute to the university and then I'm not so sure what may change by this transition. Thank you very much.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**

Thank you very much. I don't see any remarks. So, maybe, I will try to answer the question 1 and I let Dr. OM Romny response to the second.

Madame MARTIAL Adèle, merci beaucoup pour vos remarques. Bien sûr, la qualité de recrutement de l'ITC est une des priorités. Si je me souviens très bien quand le ministère de l'éducation, de la jeunesse et des sports a commencé à faire la réforme de l'examen du baccalauréat. A ce moment-là, il exigeait que les universités accueillent les étudiants de mention A, B, C, D, E sans examen. Seul ITC qui gardait son mode de recrutement, c'est-à-dire, quelles que soient les mentions, ils devaient passer un concours d'entrée pour assurer la qualité de la formation. L'objectif est de laisser les étudiants méritants poursuivre leurs études dans cette école d'ingénieurs. Ce système existe jusqu'à maintenant. Tous les étudiants qui veulent étudier à l'ITC, doivent passer le concours d'entrée, quel que soit le niveau de mention. Même durant cette période de la pandémie du Covid-19, nous sommes capables d'assurer des cours en ligne avec aisance et qualité. Quant au concours, il est toujours maintenu mais en ligne. Cela témoigne de notre expertise en ce sens.

En ce qui touche les différents projets d'ouverture de nouveaux départements, je tiens remercier tous les membres du Consortium pour cherchent à partager de l'expérience et à nous apporter un soutien incontournable pour les chercheurs de l'ITC. J'en profite pour vous dire qu'avant de monter un projet, d'habitude, nous faisons une étude du besoin du marché du pays et de la société. Par exemple, les nouveaux départements que vous avez cités, la technologie des aliments, le transport et l'infrastructure, Data science, etc. C'est pour cela, d'année en année, nous avons des changements. Et le rôle du Consortium, il est là pour orienter toutes les modifications nécessaires qui conviennent à la situation d'actualité.

En termes de ressources humaines qui composent le Consortium, il est incontestable que nous en avons assez pour donner des recommandations à toutes les nouvelles directives qui méritent d'être mises en place dans les facultés et départements. C'est sûr et certain que nous ne pouvons pas avoir tout de suite les fruits de ces changements mais à long terme. À titre de rappel, nous avons des partenaires qui ont de l'expertise de France, d'Asie qui sont à notre côté pour nous appuyer.

Quant aux compétences des langues étrangères française et anglaise, bien sûr, elles sont obligatoires pour les étudiants et les enseignants de l'ITC. C'est pour non seulement l'enseignement mais aussi pour la recherche. Tout cela, c'est pour assurer la qualité de la formation dans notre institut.

And now, I will let Dr. OM Romny explain which difference between ITC and UTC.

S.E. Dr. Romny OM, **Directeur de l'ITC**

Thank you very much, Professor, for your question, professor. I would like to explain to you what is the difference between ITC and UTC, what is the objective that we want to transform ITC to UTC. The reason is that if we observe the level of the universities in the world, most of them are starting from bachelor >Lam. Then why, except in Cambodia, ITC, as well as the order part of university in the African countries that the program had been mixed together between the technician program and up to the higher degree program. Beside of this, in terms to match the initiative of the members of the University framework, that we want to distinguish different missions of the university to do. One of the ways that because currently we have the kind of the loan budget from the government in term to boost up the specializing under, we call, the skills of the technician level at ITC. So, as in our action plan, you can see that the recruitment is up to 1000 of the requirements of the technician level program. This fits perfectly with the government's IDP program. Beside of this, ITC's going to establish one of the school, called "school of the technician program" and this is so called in the French system that we already have adopted the method from France, that we called IUT (Institut Universitaire de Technologie). This means that the institute is part of the university. But ITC, we already have ITC but we created another IUT it's meaning that is a double scale, in this regard, we cannot be justified that which one is the big name is which one is the small name. If we put IUT on the ITC is to make people confusing of this one and the other one I observe that we already have difficulty in term to working with another partner university outside. In the French system, they know very well that they did not distinguish the level university or institute. They keep almost the same and sometimes, the university covers the general level but the institute covers the specific level. You know, entrance to prestigious universities in France is not easy. Beside of this, in case that we want to work with the partner university outside, they also consider us like a baby. We cannot be getting all but we still the baby so that sometime, the level of cooperation can't be face to face, in term of the university level. It is one of experiences. So that, we try to shapeup this one, providing the specializing in navigation like the skills for apprentices. Only 2 years are offered for them. This is what factories need. We want to help poor people from the rural area. They spend only 2 years that they can be easy to integrate in the job market. So, this is happening already done and the ADB have been providing the part of this one and now we are under the preparation for the contraction of the building factory, a 7-storey building full of equipment including the Fab-Lab. I think that the building will be used like the IUT called the school of technician level program for the providing of apprentices. Beside of this one, they are under the performance of ITC. So, IUT is a part of UTC. I think there are no differences but just to change the name, I to U, in terms of structure, it is not so much different.

Mr. Junichi TAKADA, vice-president of TOKYO Institute of Technology

Thank you very much Dr. Romny. I understand the background yeah because Tokyo Tech is also the Institute of Technology. In fact, Tokyo Tech was Tokyo University before the war but we got a lot of interest from

MIT and we changed the English name to Tokyo Institute of Technology after the war. So, that why we stick on the name of the institute but I also understand that your point and **I don't have objection** for changing the name. Thank you very much.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you, Professor but everything is still the same. Okay, may I have the support from you about the remarks or proposals of the Consortium. We will need this support to submit to the Ministry of Education, Youth and Sport. If you say nothing, it means you adopted them. So, we are listening to the last presentation on the financial report, presented by Dr. PO Kimtho.

…

Comments or remarks:

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**
Thank you very much for the presentation of budget. I would like to hear from everyone. I think that the very difficult for all the members, maybe except the Ministry of Finance, you know. This this year is very difficult because some activities are canceled with the World Bank and the ADB, in terms of procurement, mobility. But it is a reality. Some parts are so difficult with the World Bank and the ADB, in terms of supply, mobility. It has been done today with the transparency with the very careful about the budget to spend this year and also the prevision for the next year. Dr. PO Kimtho said that you can see the number but maybe for you and for me also it is difficult to understand but one thing that we can take from our experience and also our estimation that the most of the budget for next year it comes from the World Bank for infrastructures, equipments, something like that. Due to the difficulty of Covid-19, it is too difficult to make sure that we can achieve 100% but we can show one thing. According to two sources of budget of the Ministry of Education, Youth and Sport and ITC, we can ensure the payment of the courses without problem for the next year. But the rest, we cannot assume because we don't know how we'll be the situation with Covid-19. When you saw this report, I don't know if you have remarks or comments. But I think that you Excellency CHOU Kimleng, present here with us and he really experts on finance maybe he can highlight certain points. So, please, the floor is yours, his excellency.

S.E. CHOU Kimleng, Secrétaire d'État du Ministère de l'économie et des finances
Thank you very much for the presentation

I would like to pay my respects to HE Mme PHOEURNG Sackona, Minister of Culture and Fine Arts, the members of direction board of ITC and colleagues.

First of all, I really appreciate the presentation for the 2020-2021 and 2021-2022 academic year. It is a good presentation, not only this part but also other parts. We can understand everything, it's easy.

Secondly, relating to the budget for the 2020-2021 academic year, I see the consolidated budget which is 9 million but according to your slide, you have made around 5 million, because of the Covid-19 pandemic. I think that's reasonable. For the budget from the Ministry of Education, Youth and Sport and ITC, I can compare the budget for 2020-2021 and 2021-2022, it's almost the same amount of $4 million. This means that even the difficult health situation, we can allocate the same expenses for the next coming year, or a little more. I think it is very good and I really appreciate.

When we take a look in detail 3 components: expenditure for your salary staffs, investment expenditure and operating expenditure, we can see to improve a lot about investment a little bit increase. I believe it can work. I would like to congratulate the members of the direction board of ITC for their efforts and lately, I must thank all the partners for their support and especially financial. Thank you.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**

I don't see the hands up and I can summarize what HEM CHOU Kimleng said.

As you said, the budget for 2019 and 20, we have a lot of impacts but for the next year, we are very keen to carefully looking for that experience and why we are pragmatics to do our budget for the next year. Dr. PO Kimtho is looking for every corner and also why we can assure that if we cannot implement the project from World Bank, or other projects; this would not cause any impacts to the operational courses of ITC. Because, we can assure very important this salary of our teaching staffs, the minimum of function of cost if the Covid-19 still is in our country. But I don't think so, you know. I hope that the next year, we can sit around a table, for 2022, you know. So, I think that this year very difficult to do very clearly with 100% sure about the budget. But, we try our best to assure the operational courses in ITC correctly, and ITC can go smoothly in the next year. Okay, I don't have any comment or question, I would like to give the floor to Professor Watanabe.

Professor KOICHIRO Watanabe, Representative of JICA in Tokyo

Thank you, Madam Sackona. I have a small comment relating to the internationalization. As Dr. Romny and Dr. Chanmoly mentioned international cooperation. I see that these international activities are much developed if we compare them with those of 20 years ago. Regarding financial budgets, I also believe that internationalization is important. I remember last month the Science Day was a great success. It is not international but the activity of the university. Dr. Romny mentioned that you had invited international speakers. Other universities in ASEAN countries have also organized international activities like ITB in Indonesia but online because of Covid-19. I think that the ITC can organize such activities called international event or international symposium in each field but not as a scientific day in the hall of the ITC but knowing that the research and innovation center has 5 research units. Each unit can prepare its annual international symposium. For me, ITC has enough human resources and facilities to do. Only the problem is the preparation. We just need more effort from each of you.

I very much appreciate the international activities carried out by ITC. For me, if ITC can do such activities, I think there will be more collaboration and as well as budgets. I am convinced that ITC can do this. It's just my comment.

S.E. Dr. Sackona PHOEURNG, Ministre de la Culture et des Beaux-Arts et **Présidente du Conseil d'Administration de l'ITC**

Thank you, Professor. We keep your recommendation and we will try our best to promote the internationalization, the next year.

The last thing, it is the nomination of the ITC's team. Normally, we have the procedure to nominate the director, the deputy director, the dean, vice-dean and other leaders for the direction board, offices, faculties, departments and services. If you look at the document, we can that everything seems the same:

1) Dr. OM Romny, directeur général de l'ITC
2) Dr. Ludovic PROTIN, directeur honoraire de l'ITC
3) Dr. CHUNHIENG Thavarith, directeur général adjoint permanent de l'ITC chargé de la coopération
4) Dr. PO Kimtho, directeur général adjoint chargé de l'administration, des finances et des audits
    - Dr. BUN Long, coordinateur du Projet ADB
    - M. CHREA Rada, conseiller technique des constructions
5) M. SOY Ty, directeur général adjoint chargé des affaires académiques
6. Dr. OEURNG Chantha, directeur général adjoint chargé des plannings et supervisions du Centre de recherche et d'innovation
7) M. NUTH Sothân, Conseiller des affaires académiques, de la jeunesse et des sports
    - M. SOY Sokhom
    - M. NHEP Sophal
8) M. PENH San, conseiller de la direction pour l'administration, les finances et les services internes
9) M. PHOL Norith, conseiller de la direction des plannings et des projets avec l'Union Européenne
10) Prof. Bruno DAGUES, conseiller de la direction de l'ITC
11) Dr. SIM Tepmony, directeur du programme de 3ème cycle

- Dr. HIN Raveth
- Dr. SRANG Sarot, responsable du programme international ECAM LaSalle et du Start-Up Center

12) Dr. OR Chanmoly, directeur du Centre de Recherche et d'Innovation
- Dr. SUONG Malyna
- Dr. TAN Reasmey
- DR. SIEANG Chansopheak, chargé du développement Fab-Lab et du concours de robots

13) Dr. IN Sokneang, doyenne de la faculté de génie chimique et alimentaire
- Ms. KHOEURN Kimleng

14) Dr. HAN Virak, doyen de la faculté de génie civil
- Dr. LY Hav
- M. CHHOUK Chhayhorng
- M. CHA Chanly, chargé de l'architecture

15) Dr. NGOUN Kollika, chef du département de Génie Mécanique et Industriel
- M. UNG Amata
- Dr. Pech Rotna, chargé du programme Master

16) Dr. CHRIN Phok, chef du département de Génie Électrique et Énergétique
- Dr. AM Sokchea

17) Dr. SRENG Sochenda, chef du département de Télécommunication et Réseaux
- Dr. Thoun Kosal

18) M. LAY Heng, chef du département de génie Informatique et Communication
- M. YOU Vandy

19) Dr. CHHOUN Kong, doyen de la faculté d'hydrologie
- Dr. ANN Vannak
- Dr. KET Pinnara, chargée du programme Master

20) Dr. BUN Kimgnoun, doyen de la faculté de géoressource et géotechnique
- Dr. ENG Chandoeurn

21) Dr. PHUN Veng Kheang, responsable du programme Master du département de Transport et Infrastructure

22) Mme SREY Malis, chef du département de TRONC COMMUN
- M. LONG Sovann, responsable du programme de physique
- Dr. LIN Mongkulserey, responsable du programme de mathématiques
- Mme KHEM Trankrasel, coordinatrice de la section de français
- M. CHUM Tival, coordinateur de la section d'anglais

23) Dr. LIN Mongkulserey, responsable du campus ITC à Tbongkhmum et à Kampong Cham

24) M. KHIEV Samnang, chef du service informatique
- M. SIENG Chamroeurn

25) M. KIM Vannada, chef du bureau d'assurance de qualité et des relations avec ACC

26) Mme HANG Vinchorthy, chef du bureau du personnel

27) M. MOEUNG Noi, chef du bureau du projet PB

28) M. EARM Kosal, chef du bureau de comptabilité et finances
- Mme KOY Sophary

29) M. SIEANG Phen, chef du bureau des relations internationales et chef du cabinet du directeur

30) M. KOE Chhomsethy, chef du bureau du service technique

31) M. SRENG Vichet, chef de bibliothèque et du centre d'exposition

So, in fact, the direction of ITC consists of 31 people. According to ITC's statutes, these people are appointed by the Board of Trustee. With the approval of the Board, these people will lead the ITC for the next year. I believe you all agree. Okay, you applause, that means you've adopted this nomination.

Before leaving us, I would like to thank all the members of the Board of Trustee very much for your precious presence and your support. We hope to meet you all face to face for the next year.

Le tableau suivant récapitule tous les points abordés et l'avis du Consortium après la discussion et la présentation de tous les responsables de départements.

No	AVIS DU CONSORTIUM 2021	Favorable
1	Mise en place du programme international avec ECAM LaSalle	√
2	Création de la faculté des sciences appliquées	√
3	Création de la faculté de l'ICT & Cyber Université	√
4	Création du programme de mathématiques appliquées et statistiques pour les ingénieurs	√
5	Création du Master en génie des sciences des données (Data Science)	√
6	Création du Master en génie des sciences des données	√
7	Création du nouveau département de génie alimentaire	√
8	Création du centre Start-Up	√
9	Création du département Transport et Infrastructure	√

Relevé de décisions du CA 2021

Ce tableau ci-dessous illustre les décisions (l'approbation) du Conseil d'Administration 2021.

No	RELEVÉ DE DÉCISIONS DU CA 2021
1	Mise en place du programme international avec ECAM LaSalle
2	Création de la faculté des sciences appliquées
3	Création de la faculté de l'ICT & Cyber Université
4	Création du programme de mathématiques appliquées et statistiques pour les ingénieurs
5	Création du Master en génie des sciences de données (Data Science)
6	Création du Master en génie des sciences des données
7	Création du nouveau département de génie alimentaire
8	Création du centre Start-Up
9	Création du département Transport et Infrastructure

À part ces neuf points adoptés, le Conseil d'Administration a sollicité également quelques recommandations complémentaires :

a) Mettre à jour le site web de l'ITC et le rendre plus attractif;
b) Possibilité de transformer ITC en UTC;
c) Organiser le symposium international pour chaque unité de recherche.

Annex 3. Overview of Recommendation of Consortium and CA 2021.

No	AVIS DU CONSORTIUM 2021	2021-2022
1	Mise en place du programme international avec ECAM LaSalle	Réalisé
2	Création de la faculté des sciences appliquées	En réalisation
3	Création de la faculté de l'ICT & Cyber Université	En réalisation
4	Création du programme (département) de mathématiques appliquées et statistiques pour les ingénieurs	En réalisation
5	Création du Bachelor en génie des sciences de données (Bachelor of Engineering in Data Science)	En réalisation
6	Création du Master en génie des sciences des données	En réalisation
7	Création du nouveau département de génie alimentaire	Réalisé
8	Création du centre Start-Up	En réalisation
9	Création du département Transport et Infrastructure	Réalisé

No	RELEVÉ DE DÉCISIONS DU CA 2021	2021-2022
1	Mise en place du programme international avec ECAM LaSalle	Réalisé
2	Création de la faculté des sciences appliquées	En réalisation
3	Création de la faculté de l'ICT & Cyber Université	En réalisation
4	Création du programme (département) de mathématiques appliquées et statistiques pour les ingénieurs	En réalisation
5	Création du Bachelor en génie des sciences de données (Bachelor of Engineering in Data Science)	En réalisation
6	Création du Master en génie des sciences des données	En réalisation
7	Création du nouveau département de génie alimentaire	Réalisé
8	Création du centre Start-Up	En réalisation
9	Création du département Transport et Infrastructure	Réalisé

À part ces neuf points adoptés, le Conseil d'Administration a sollicité également quelques recommandations complémentaires :

a) Mettre à jour le site web de l'ITC et le rendre plus attractif; *(En réalisation)*
b) Possibilité de transformer ITC en UTC; *(En réalisation)*
c) Organiser le symposium international pour chaque unité de recherche. *(Au niveau RIC)*

Annex 4. List of Master Thesis.

Nº	Name	Sex	Research Topic	Promo.	Defense Date	Remark
M-MSE (MGCI) *(Two group of students: register only at ITC, register in double degree program with INSA Rennes)*						
5	KEO Pisey	M	Vérification de stabilité selon l'en 1993. Mise au point d'un logiciel d'application et d'abaques de dimensionnement	1	2011	Double Degree
6	LIM Songly	M	Vérification de stabilité des poteaux hybride. Evaluation de l'applicabilité de l'eurocode 4 et de l'eurocode 2	1	2011	Double Degree
7	REE Nim	M	Etude numérique du comportement des structures des chaussés pavées sous charges de trafic	1	2011	Double Degree
8	HENG Socheat	M	Simulation expérimentale d'écoulement multiphasique dans les milieux poreux	1	2011	Double Degree
9	Y Maneth	M	Simulation numérique de la modification du sol compressible environnant sous l'effect de la mise en place de colonnes balastées	1	2011	Double Degree
10	KAN Kuchvichea	M	Simulation numérique du comportement hydro-mécanique des colonnes ballastées et du sol environnant	2	2012	Double Degree
11	CHHENG Sochanavong	M	Réutilisation des sédiments de dragage dans la fabrication des écociments	2	2012	Double Degree
12	SAYASANE Phettavanh	M	Intensification des échanges thermiques par l'utilisation de nanofluides à base de nanotube de carbone ntc/eau	2	2012	Double Degree
13	HIN Sovannara	M	Modélisation de l'évolution de l'endommagement dans une poutre constituée de matériaux quasi-fragiles tel que béton	2	2012	Double Degree
14	CHAO Ang Puth Both	M	Simulation numérique des écoulements et du transport granulaire sur les sols urbains-modèle de réseau de microcanaux	2	2012	Double Degree
15	CHHORN Chamroeun	M	Valorisation de sédiments : l'influence d'un traitement thermique	2	2012	Double Degree
16	PROK Narith	M	Influence de la pluie dans le transport de sédiment en ruissellement	2	2012	Double Degree
17	EA Lysothearin	M	Recherche de la plus haute résistance du béton en utilisant des matériaux locaux (en province de Kompong Speu)	2	2012	Double Degree

18	SOK Sim	M	Recherche de la plus haute résistance du béton en utilisant des matériaux locaux (en province de Siem Reap)	2	2012	Double Degree
19	LIM Samreth	M	Contribution à la détection, à la localisation et au suivi, par méthode d'évaluation dynamique, de l'endommagement des câbles du génie civil	3	2013	Double Degree
20	HENG Piseth	M	Développement d'un modèle (simple et multi-ddl) d'un poteau soumis à une charge du type impact (véhicule, projectile)	3	2013	Double Degree
21	DIM Sreyleak	F	Etude numérique du comportement de poutres de couplage	3	2013	Double Degree
22	HUOT Makara	M	Caractérisation et modélisation du comportement mécanique d'un alliage binaire titane-molybdène	3	2013	Double Degree
23	KAN Socheat	F	Simulation numérique du comportement mécanique des structures de chaussées pavées	3	2013	Double Degree
24	LAN Rathanak	M	Etude des échanges thermiques dans les échangeurs thermiques et microchannels par l'utilisation de nanofluides à base de nanotube de carbone	3	2013	Double Degree
25	BAK Davan	F	Comportement d'un rupteur thermique à la ruine -détermination d'un critère de ruine combiné	3	2013	Double Degree
26	CHHANG Sophy	M	Développement d'un modèle (simple et multi-ddl) d'un poteau soumis à une charge du type impact (véhicule, projectile)	4	2014	Double Degree
27	KY Sambath	M	Etude des échanges thermiques dans les échangeurs thermiques et microchannels par l'utilisation de nanofluides à base de nanotube de carbone	4	2014	Double Degree
28	CHEA Kim	M	Contribution à la détection, à la localisation et au suivi, par méthode d'évaluation dynamique, de l'endommagement des câbles du génie civil	4	2014	Double Degree
29	HIN Raveth	M	Identification the indentation behavior of chemically tempered glasses	4	2014	Double Degree
30	SIM Viriyavudh	M	Simulation numérique du comportement mécanique des structures de chaussées pavées	4	2014	Double Degree
31	EAR Bunpo	M	Etude numérique du comportement de poutres de couplage	4	2014	Double Degree

32	TO Theany	M	Comportement d'un rupteur thermique à la ruine -détermination d'un critère de ruine combiné	5	2015	Double Degree
33	TENG Kongou	M	Simulation numérique du comportement mécanique des structures de chaussées pavées	5	2015	Double Degree
34	SOK Tetsya	M	Etude des échanges thermiques dans les échangeurs thermiques et microchannels par l'utilisation de nanofluides à base de nanotubes de carbone	5	2015	Double Degree
35	HO Lyeng	M	Etude numérique du comportement de poutres de couplage	5	2015	Double Degree
36	LEANG Enghok	M	Contribution à la détection, à la localisation et au suivi, par méthode d'évaluation dynamique, de l'endommagement des câbles du génie civil	5	2015	Double Degree
37	HEANG Longseng	M	Développement d'un modèle (simple et multi-ddl) d'un poteau soumis à une charge du type impact (véhicule, projectile, ..).	5	2015	Double Degree
38	LENG Khundadino	M	Caractérisation et modélisation du comportement mécanique d'un alliage binaire titane-molybdène	5	2015	Double Degree
39	CHHUN Kean Thai	M	Modifications de comportements mécaniques et physiques de sols gonflants par un ajout de chaux	6	2016	Double Degree
40	DUCH Monirak	M	Etude géotechnique des fondations profondes des éoliennes terrestres	6	2016	
41	HUY Samphorstra	M	Etude des caractéristiques géométriques et géotechniques des berges de rivière pour analyser sa stabilité, application au Cambodge (Mékong, Bassac...)	6	2016	
42	SAO Sopanha	M	Etude comparative entre les essais triaxiaux et les essais en cisaillement direct sur les sols Phnom Penh non remaniés et remoulés	6	2016	
43	NUTH Vattanak	M	Recherche de la plus haute résistance du béton en utilisant des matériaux locaux (en province de Kampong Cham)	6	2016	
44	SARAY Putheara	M	Etude comparative entre les comportements d'un graveleux latérique et d'un sable argileux en technique routière au Cambodge	7	2017	
45	SENG Nora	M	Analyse numérique de l'interaction sol-pieu	7	2017	Double Degree

46	MUY Meng Lay	M	Repairing of cracked concrete structural elements using fibrwrap® : experimental study	7	2017	
47	MOM Sokvisal	M	Dimensionnement de structures de chaussées bitumineuses avec utilisation d'agrégats d'enrobés régénérés	7	2017	Double Degree
48	MENG Try	M	Poteaux hybrides	7	2017	Double Degree
49	SONN Sokhom	M	Etude de comportement de la liaison d'acier-béton sur l'ancrage de slabe bz : expérimental via modèle élément fini	7	2017	Double Degree
50	MUY Yeak Leang	F	Durabilité des bétons d'ouvrages: carbonatation et perméabilité	7	2017	Double Degree
51	CHHORN Bun Theng	M	Optimisation de prix de plancher pour le bâtiment	7	2017	Double Degree
52	LAY Sinnara	M	Réparation d'élément béton armé avec fibrwarp	7	2017	Double Degree
53	SOK Sithpisey	M	Renforcement de la résistance des éléments structuraux en béton avec le système fibrwrap	7	2017	Double Degree
54	SAROU Lynita	F	Modeling soil-pile interaction using Macro-element approach	8	2018	Double Degree
55	HORM Rithymarady	F	Strength of silicate glass for aerospace application by biaxial flexure method, ring-on-ring configuration	8	2018	Double Degree
56	HOURN Phanvichet	M	An energy momentum integration scheme for the nonlinear dynamics of 3D Timoshenko beam formulation	8	2018	Double Degree
57	REM Sokkheang	M	Modélisation du comportement à basse température des enrobés bitumineux recyclés	8	2018	Double Degree
58	CHENG Kim Chhoung	M	Development of connection of glass beam: a numerical study	8	2018	Double Degree
59	KAO Sophea	F	Bearing capacity of pile foundation in frictional soil	8	2018	Double Degree
60	CHHAY Lyhour	M	Behavior of concrete pavement in Cambodia ender temperature effect	8	2018	Double Degree
61	HENG Sounean	F	Développement d'un essai accéléré pour la Réaction Sulfatique Interne	8	2018	Double Degree
62	CHHANG Vandeth	M	Traitement des graveleux latéritiques au ciment en technique routière au Cambodge	8	2018	Double Degree
63	CHOR Phearin	M	Renforcement de la résistance des éléments en béton armé en utilisant de Fibrwrap: Études expérimentales	8	2018	Double Degree

64	Y Sovann	M	Comportement thermodynamique des enrobés bitumineux régénérés	8	2018	Double Degree
65	CHEA LEANGHENG	M	Effect on Capacity of RC Beam and Column Strengthened with Fibrwrap® System by Cyclic Exposure to Water and Salt Water	9	2019	Double Degree
66	PHOEUK MENGHAY	M	Numerical study of the mechanical behavior of the innovative CLT-Concrete composite floor	9	2019	Double Degree
67	CHHOENG OUDOM	M	Finite element model for linear analysis of pipe elbow element subjected to in-plane/out-of-plane loading and internal pressure	9	2019	Double Degree
68	NUT SOVANNETH	M	Experimental study of lime additive and temperature effects on the mechanical characteristics of hma	9	2019	
69	CHAP HUYSEA	M	Mechanical Properties of RC Beam and Column Strengthened by Fibrwrap® System after being submerged into Different Exposure Solutions	9	2019	Double Degree
70	CHORN MAKARA	M	Contribution à l'étude des scellements de galerie dans les ouvrages de stockage des déchets radioactifs à vie longue	9	2019	Double Degree
71	NGET PHEARA	M	Stress measurements of granular flow on the inclined plane using sensitive sendor	9	2019	Double Degree
72	LEANG CHHAINAN	M	Experimental contribution to the characterization of concretes reinforced with high temperature organic fibers	9	2019	Double Degree
73	LIM CHHOUNG	M	The influence of temperature on the fracture toughness of glasses with different transition temperatures	9	2019	Double Degree
74	LOV PENG AN	M	Parametric study of mechanical properties of mixture of commercial polymers-sikadurs	9	2019	
75	CHHOM KANHARA	F	Cyclic test and characterization of mechanical properties of Laser welded joints: Application to dual phase steels	9	2019	Double Degree
76	PANG CHHAY NARAK	M	Improvement of mechanical behaviors of the Reclaimed Asphalt Pavements	9	2019	
77	HEU REAKSMEYVATANA	M	Optimization by comparative study of PT and steel-mixed floor prices for building	9	2019	Double Degree
78	NGUON LEANGSRENG	M	Modification of Behavior of Soft Clay soil by using sand columns	9	2019	Double Degree
79	CHREA MAKKONAKUN	M	Etude Expérimentale De L'amélioration Des Sols Meubles Par Des Colonnes De Sable	9	2019	

80	KEN KOEMHONG	M	Experimental Study of Compaction Effect on Expensive Soil	10	2020	Double Degree
81	LONG HOK SOENG	M	Cost Effective Foundation for Low-Rise Building	10	2020	Double Degree
82	LEAV MENGHUY	M	Numerical Study of Permeability Influenced by Tortuosity in Porous Media	10	2020	Double Degree
83	KHEN CHANTHORN	M	Development of Self-Healing Repairing Mortars	10	2020	Double Degree
84	OUCH VANTHET	M	Experimental study on the behavior of mixed cross-laminated timber (CLT)-concrete slab	10	2020	Double Degree
85	OENG THAILENG	M	Seismic and Soil Structure Interaction (SSSI)	10	2020	Double Degree
86	SUY SAMNANG	M	Study of the Mechanical Behaviour of Bamboo "BAMBUSA BURMANICA"	10	2020	Double Degree
87	MEAS CHANBROSOEU	M	Thermo-Mechanical Modelling for Massive Structures	10	2020	Double Degree
88	HOEUN SELA	M	Study of contact conductance between aggregate and matrix in cementitious materials	10	2020	Double Degree
89	LINH SUNHOK	M	Estimate the efficiency of bottle plastic pieces reinforced subgrade soil by experimental method	10	2020	Double Degree
90	HOK RATHANARAINGSEY	F	Thermal behavior of double skin facades	10	2020	Double Degree
91	SOURN NAVY	F	Effect of Different Solution Submersion Exposure on Concrete Beam Strengthening with Fibrwrap® System and on Fiber Composite Laminate	10	2020	Double Degree
92	RE RORNG	M	The Effect of Column Offsets in Reinforced Concrete Structure	10	2020	
93	SOK SOPHEAKDEY	M	Effect of Cyclic Exposure of Water and Salt Water to Concrete Beam Strengthening with Fibrwrap® System and to Fiber Composite Laminate	10	2020	Double Degree
94	MUT MESA	M	Numerical Study of Rail Stresses Induced by Wheel-Rail Contact using ABAQUS	10	2020	

95	OEUNG KIMHENG	M	Assessment study of energy demand in multi-story steel moment frames	11	2021	Double Degree
96	HENG KIMHONG	M	Optimization of the ion exchange processing parameters for strengthening of a soda-lime silicate glass	11	2021	Double Degree, Link with HEIP
97	HEM BELLYDETH	M	Experimental study of the effectiveness of TyfoÒ fibr anchors under tensile load	11	2021	Link with Company Fibrwrap ®
98	YUN RITH PAGNA	M	Study on mechanical and microstructural properties of smaw butt-welded joints using various welding electrodes for structural steel fabrication	11	2021	Double Degree
99	MONG PHANNA	M	Study on mechanical properties characterization of tempered glass	11	2021	Link with LBE/JICA
100	MEAS CHANDARA	M	Design and build a lightweight chassis of a mini electric vehicle	11	2021	Link with LBE/JICA
MIM (MGIM)						
101	NGETH Hongneng	M	Experimental study on butt joints using shielded metal arc welding	1	2017	
102	EM Sophat	M	Experimental study on butt joints using mig welding	1	2017	
103	CHEA Vabotra	M	Effect of heat source temperature on organic Rankine cycle (ORC)	3	2018	
104	THEANG Sothy	M	Dynamic modeling and simulation for a parallel-mechanism-mounted UAV	3	2018	
105	PHAL Vannak	M	Mass charge effect on organic Rankine cycle	3	2018	
106	PICH Yanghav	M	Development of Plastic Shredder for Recycling Plastic	3	2018	
107	CHHAM REAKSMEY KHEMRA	M	Study on Performance and Emission of Gasoline Engine by Using Ethanol-Blended Super Gasoline	4	2019	
108	YEAN SOPHEAK	M	Control Performance for Parallel-Mechanism-Mounted UAV	4	2019	
109	TENG VAN OEURN	M	Study on Performance and Emission of Gasoline Engine by Using Ethanol-Blended REGULAR Gasoline	4	2019	
110	MIN CHENG HORN	M	Study on Performance and Emission of Gasoline Engine Using Liquefied Petroleum Gas (LPG)	4	2019	

111	SETHY BORETH	M	Pose Estimation of WMR using Multi-Sensor Data Fusion	5	2020	
112	KEO CHIVORN	M	Flight Controller and Structural Design for Fixed-Wing UAV	5	2020	
113	LY LEANGCHHENG	M	Modeling, Control and Simulation on 3DOF Robot Manipulator	5	2020	
114	TEM LYHOR	M	CNC-Mill Construction and Automatic Control to Shape the Specimen by CAD/CAM	5	2020	
115	MORK TONGLY	M	Simultaneous Localization and Using Intel Realsense Camera	5	2020	
116	LIM BUNVIREAK	M	Development of Smart Irrigation Controller for Gravity Irrigation System in the Rural Area	5	2020	
117	TIM HOKSONG	M	Preliminary design and performance prediction of mini hybrid rocket motor for a sounding rocket	6	2021	
118	THOK PISETH	M	Study of sensorless control of permanent magnet synchronous motor in solar E-Tuktuk application	6	2021	Link with HEIP
119	YONRITH PHAYUTH	M	Path planning and control of wheeled mobile robot with occupancy grid map	6	2021	
120	CHAO VANYI	M	Development of landing site tracker for UAV	6	2021	
ETM (MGEE)						
121	THY Selaroth	M	Dynamic economic dispatch using model predictive control algorithm	1	2015	
122	PHOU Ty	M	Path planning for four omni-directional wheel robot	1	2015	
123	CHAN Sopheap	M	Development of multipoint vehicle tracking system	1	2015	
124	SON Chanvathana	M	Implementation of GSM network using openbts and gnu radio with universal software radio peripheral	1	2015	
125	ROS Vannak	M	Computer controlled electronic watt-hour meter via radio frequency	1	2015	
126	NONG Sovanneth	M	Impacts of grid connected PV on distribution network (low voltage)	1	2015	

127	YOU Hong	M	Cost optimization of a hybrid power system for rural communities in Cambodia	1	2015	
128	ING Sothy	M	Comparison of using artificial neural network and decision tree to do short term load forecasting	1	2015	
129	CHEA Vutha	M	Optimal placement of autorecloser and sectionaliser on radial distribution system 22kv	1	2015	
130	LAY Romnea	M	Bio-security controller for chicken farm (takeo province)	2	2015	
131	HUOT Samnang	M	Monitoring system for excavator base on sms technology	2	2015	
132	LENG Por	M	Development of metal detector to seek landmine unexploded ordinances (uxos)	2	2015	
133	CHHANG Vutha	M	Conversion of pork lard to biofuel	2	2015	
134	SOM Chanthla	M	The conversion of jatropha to bio-fuel	2	2015	
135	HENG Sok Meng	M	Customized kits for automobile and OBD using k-line protocol communication	2	2016	
136	UL Dara	M	Home connekh integration over smart home	2	2016	
137	CHHUO Kreng	M	Car security using Bluetooth tag and GPS	2	2016	
138	PHUNG Tolany	M	Modeling of inter-turn faulty 3 phases transformer	1	2016	
139	SAM Tetra	M	Improvement of solar power efficiency by cooling solar panel with water spray	1	2016	
140	CHRENG Sarin	M	Conversion of used cooking oil to biofuel	1	2016	
141	ROATH Kulika	M	Inter-turn short circuit fault detection of 3 phases transformer	1	2016	
142	SENGCHHORN Rady	M	Conversion of fish oil to biofuel	2	2016	
143	MOUN Phat	M	Conversion of oil used from KFC restaurant	1	2016	
144	SAR Tikhett	M	Smart energy management system	2	2016	
145	CHHORN Sengchheang	M	Implementation of wireless connectivity of upper secondary school in remote area	4	2017	
146	HEANG Latin	M	Experimental Investigation on Sawdust and Tree Leaves Briquette Using Fish Residue Oil and Waste Deep Fried Oils as Binder	5	2020	
147	CHOENG Porchaing	M	Experimental Investigation on Rice husk and Bagasse Briquette Using Fish Residue Oil and Waste Deep Fried oil as Binder	5	2020	

M-WEE (MGRU)						
148	SY Hayean	M	Assessment of crop water use in Chreybak river catchment using cropwat mode	1	2014	
149	OUN Sreymao	F	Sustainable solid waste management in Cambodia, case study in Pursat	1	2014	
150	SOT Ratha	M	Plastic wastes recycling as a means to waste management in Phnom Penh, Cambodia.	1	2014	
151	PIN Bora	M	Phnom Penh waste collection roadmap development	1	2014	
152	CHUM Sokhey	M	Understanding the impacts of dam development in the 3 s rivers, Cambodia	1	2015	
153	SUONG Sila	M	Sediment load estimate in Chreybak river: the implication for integrated watershed management	1	2015	
154	OU Sothea	M	Assessment of water use for improved water governance under climate changes, using weap model	2	2015	
155	KIM Mengsreang	M	Assessment of urban runoff for improved strom water management in Phnom Penh	2	2015	
156	PHENG Ty	M	Water supply management in Phnom Penh city	3	2017	
157	SIM Sen	M	Modeling of storm water network in a part of Pursat Town, Cambodia for performance improvement	3	2018	
158	Vong Dara	M	Assessment of rice water use by CROPWAT model and water allocation management the irrigation system in Taing Krasaing catchment	1	2018	
159	VUTH Sivorng	M	Enhancing Kampot Municipality Solid Waste Management System with 3R Option	3	2018	
160	Sor Chhaya	F	Water Quality Analysis for Agricultue in Sourtr Nikom District, Siem Reap Province a Comparison with National Standards	2	2018	
161	Y PUTHEALY	M	Modelling drinking water distribution system at Pursat province using EPANET	5	2019	
162	SREU BORA	M	Digital Terrain Model (DTM) creation by different measurement methods for water resources study	5	2019	

163	CHUM KIMLEANG	M	Assessment of Climate Change Impact on Urban Stormwater Quality in Boeng Trabaek Drainage Catchment	5	2019	
164	KE SEREYVATH	M	Lab scale of arsenic adsorption in synthesis water using iron ore as an absorbent	5	2019	
165	MENG KEA	M	Water Resource Management in Detention Places of Cambodia	5	2019	
166	SVAY CHHALY	M	Long-Term Urban Drainage Modeling in Phnom Penh	5	2019	
167	SEANG KIMSOUR	M	Characterization of the Quality of Domestic Wastewater Discharge into Kob Srov Lake	5	2019	
168	SUONG CHANMEAKARA	F	Assessment of Environment Flow under Climate Change Scenarios – Case study of Stung Chinit Basin	5	2019	
169	HUOT SYRADETH	F	Multidrug-Resistant Bacteria (MRD) in Tonle Sap Lake, Tonle Sap River, Mekong Rivers, Bassac River and Discharged Wastewaters	5	2019	
170	NORNG SOPHA	F	Understanding Role of Women in Improving Access to WASH of Phnom Penh Urban poor	5	2019	
171	THOUN LIEANG	F	Spatial Variation of Water Quality in Boeng Tamouk Lake, Northern-part of Phnom Penh, Cambodia	5	2019	
172	CHOUN LYHOR	F	Effectiveness of PAC and Calcium Hypochlorite Dose in Surface Water Treatment at Tonle Sap River	5	2019	
173	PHOEUK SOKNY	F	Microbial colonization distribution in a large tropical flood pulse ecosystem - Tonle Sap Lake, Cambodia	5	2019	
174	KOL PONLOK	M	Application of SWMM to explore possible climate change impact on urban stormwater drainage	5	2019	
175	PHOEURN SOKHIM	M	Groundwater Assessment in Siem Reap-Angkor Region	5	2019	
176	EM SOPHEALEAKSMY	F	Studying on the efficiency of three natural coagulants for water treatment at Tonle Sap River water	5	2019	
177	KEO SAMPHORS	F	Characterization of Tonle Sap River water quality as influent by untreated domestic wastewater	5	2019	
178	CHEA SYPHA	M	Assessment of Land Use Change Impacts on Stormwater Runoff and Water Quality in Boeng Trabek Catchment, Cambodia	5	2019	

179	CHHEN ROTANAK	M	Mapping of groundwater vulnerability at coastal area of Preah Sihanouk province, Cambodia	5	2019	
180	LIM DALIKA	M	Development Municipal Wastewater Treatment Management with Lagoon System in Kampot Town	5	2019	
181	MELVIN FRICK	M	Pesticide Distribution in the Hydrological Compartments in Koh Thum district, Kandal, during the dry season	6	2020	
182	LAI CHENDA	F	Evaluation of Wastewater Treatment Efficiency Utilizing Coconut Fiber as Filter Media	6	2020	
183	SDEUNG OUK SOVANNARITH	M	The Spatio-Temporal downscaling of rainfall under changing climate, focusing on the sub-daily (hourly) rainfall over Phnom Penh City area	6	2020	
184	CHEA CHANDINAN	M	Micro-Scale Flood Hazard Assessment under Climate Change Scenarios: Case Study of Boeungkak 1 and Boeungkak 2	6	2020	
185	KHEANG RATANA	F	Chemical Distribution Assessment of well Water in the Floodplain Areas along the Tonle Sap Lake	6	2020	
186	SOU PHALLA	M	Correlation between physicochemical and microbiological properties of sewage and flooded water in Boeung Trabek Sewage Canal	6	2020	
187	MAO THEARA	F	Comparative Study of Polyvinyl Alcohol Gel and Coir Coconut Fiber Bio-Carriers in Moving Bed Bioreactor for Treating Wastewater from Institute of Technology of Cambodia	6	2020	
188	SAM SOKYIMENG	M	Application of Electrocoagulation Process in Removing Turbidity and Bacteria of Water in Choeung Ek Lake	6	2020	
189	HOK SREYRORTH	F	The Preliminary Study of Arsenic Removal from Groundwater by Utilizing ElectroChemical Arsenic Remediation (ECAR)	6	2020	
190	CHHAM AMRET	M	Assessment of the Impact of Climate Change on Hydrological Processes in Stung Sen Catchment of the Tonle Sap 6Sub-Basin, Cambodia	6	2020	
191	VORNG SAY	M	Pollutants Removal by Chemical Coagulation and Filtration of Textile Dyeing Wastewater	6	2020	
192	SENG SOPANHA	M	Influence of Water Quality on Microbial Colonization Distribution in a large Tropical River-Lake System	6	2020	

193	MATH ALPY	M	Water Quality Study of Prek Te River, a Mekong River Tributary in Cambodia	6	2020	
194	SAM SOCHEATA	F	Study on Microbiology in Wastewater and Virus Treatment Method	6	2020	
195	KHEAM CHHENG LY	M	Comparison of the Effectiveness of Alternative Bio-Adsorbents in Phosphate and Nitrogen Removal from Wastewater	6	2020	
196	KHIM DARA	M	Design New Urban Drainage Network by Using PCSWMM	6	2020	
197	YOU RANY	F	Arsenic removal from groundwater by utilizing Electro-Chemical Arsenic Remediation (ECAR) technology at Koh Thom district, Kandal province, Cambodia	7	2021	
198	MAY PHUE WAI	F	Assessment of dissolved silicon in surface water and its relation to ecosystem productivity in Tonle Sap lake: a case study around Chhnok Tru area	7	2021	Link with LBE/JICA
199	YENG SOVANN	M	The study of urban drainage system and urban flood modeling in Battambang town, Battambang province, Cambodia	7	2021	
200	MONIROTH SOPHEAVATTEY	F	Presence and characteristics of antibiotic-resistant Aeromonas spp. and Escherichia Coli in Pangasius aquaculture system in Cambodia	7	2021	
201	RUOS BUNHUOT	M	Hydrogeochemical identification and quality assessment of groundwater at the floodplain area around Tonle Sap lake	7	2021	Link with LBE/JICA
202	HENG CHHENGLANG	F	Effects of watershed land use and land cover changes on total suspended sediment in Tonle Sap lake	7	2021	
203	CHOUN CHAKRIYA	F	Development of aerated electrocoagulation-flotation reactor for color, turbidity and oil removal from slaughterhouse wastewater	7	2021	
204	SAING KIMLENG	M	The assessment of multi-pathway exposure to fecal contamination of urban poor settlements in Municipality of Phnom Penh (MPP)	7	2021	
205	CHEM VIBOL	M	Seasonal assessment of silica on in surface sediment fractions and its correlations to the productive ecosystem of Tonle Sap lake: a case study around Chhnok Tru area	7	2021	
206	OR THAYBONA	M	Improving removal efficiency of natural organic matters from drinking water treatment plant by powder activated carbon injection in coagulation process	7	2021	
207	ENG KHUN	M	Recovery nutrient from aquaculture wastewater: an aquaponic recirculation system	7	2021	Link with LBE/JICA

208	SENG PHAYA	F	Optimization of Anaerobic Baffled Reactor (ABR) and Anaerobic Filter (AF) as low-cost wastewater treatment system	7	2021	Link with HEIP
209	HEANG BORIN	M	Comparative study of septic tank, anaerobic baffled reactor, anaerobic filter for treating domestic wastewater	7	2021	Link with HEIP
210	KIM CHINA	M	The assessment of waste flows and plastic leakage into the environment in Kep municipality	7	2021	
211	SEM SOVANDY	M	Assessment groundwater quality in the coastal area of Preah Sihanouk province, Cambodia	7	2021	
212	CHAN SAKDANUPHOL	M	Impacts of land use change on hydrology of the Tonle Sap lake basin using SWAT	7	2021	Link with LBE/JICA
213	ROTHA VISAL	M	Assessment of hydraulic performance of water supply system in Takhmao city, using modeling approach	7	2021	
214	CHHUN MENG	M	Formulizing the design criteria for the piped water supply system in urban area of Cambodia	7	2021	
215	RANN SOPHEARON	M	Assessment of pesticide residues in water from Kampong Thom, Cambodia	7	2021	Link with LBE/JICA
216	VENG VISAL	M	Application of autodesk storm and sanitary analysis model on hydraulic modeling for urban storm drainage at Siem Reap city	7	2021	
217	PUOK SREYKEO	F	Hydraulic modelling of suspended sediment transport through a sluice gate of Prek system in Kandal province, Cambodia	7	2021	
218	Y SONA	M	2D-fluvial hydraulic characteristic assessment at Chaktomuk junction, Phnom Penh city	7	2021	
219	SEK SREYMAO	F	A survey of household water use and groundwater quality index assessment in a rural community of Cambodia	7	2021	
220	PHOEUK SOPHORN	M	Urban flood modelling in Preah Sihanouk city using Storm Water Management Model (SWMM)	7	2021	
221	PHY KOSORL	M	The application of PCSWMM to access the potential impact of urbanization on storm water flood at Dangkor district, Phnom Penh, Cambodia	7	2021	
222	KUOCH THEARY	F	Distribution and ecological risk of heavy metal from artisanal gold mining in Chong Plah village Memang district Mondulkiri province, the north-east of Cambodia	7	2021	

223	HAK NALIN	F	Pesticide distribution in the hydrological compartment system in Koh Thum district, Kandal province during the dry and rainy seasons	7	2021	
224	SUN BUNNETH	F	Optimization on wastewater treatment efficiency using activated charcoal and coconut fiber as porous media	7	2021	
225	SARET SOVANDARA	M	Hydraulic design of storm drainage system in Siem Reap city, using Autodesk Storm and Sanitary Analysis (ASSA)	7	2021	
226	KOH SOMALAY	F	Evaluation on wastewater treatment system using Sewage Treatment Operation Analysis over Time (STOAT)	7	2021	Link with LBE/JICA
M-AIE						
227	HUOT Kimneng	M	Quantification of restricted substances in textile produced in Cambodia	1	2015	
228	EUNG Theara	M	Regeneration process of the resin haix used for arsenic affected community in Cambodia	1	2015	
229	MOANG Darachampich	F	Production of beverage from red glutinous rice	1	2015	
230	TUY Phearun	F	Assessment of the nutritional components, total phenolic compounds and antioxidant activities in jamune	1	2015	
231	SENG Kong	F	Methane generation in Dangkor landfill of Phnom Penh	1	2015	
232	HONG Kim Eang	F	Optimisation de la fermentation de radis blancs avec son de riz	2	2016	
233	MENG Sophang	F	Aroma analysis of Cambodian traditional dark purple rice wine	2	2017	
234	CHE Ratana	M	Survival of escherichia coli k12 and detection of antibiotic-resistant bacteria in tonle sap river, Mekong river and Bassac river	3	2017	
235	EAV Chenda	F	Seasonal variation and distribution of heavy metal in lake water and bottom sediment of Tonle Sap lake	4	2017	
236	SEN Veasna	M	Mitigation of heavy metal from Dangkor landfill to groundwater	3	2017	
237	TAING Bun Leang	F	Production process and quality control of fish sprinkle product	3	2017	
238	YAN Thary	F	Dietary exposure assessment of nitrite from food streets in population in Phnom Penh	3	2017	

239	TANN Sarann	M	Assessment of nutrient load from Chhnok true community of Tonle sap lake, Cambodia	3	2017	
240	LONG Samavatey	F	Conversion of coconut oil to biofuel	2	2017	
241	VORN Thary	F	Evaluation of DEWATS performance base on hydraulic with organic load and modify the grain filter system using Drainblock filter for School Base Sanitation in Cambodia	2	2018	
242	BEANG Polingkong	F	Effect of the combination of pure strains on ethanol production during red rice fermentation process	2	2018	
243	Kong Channy	F	Study of technology for alcohol production from cane molasses	2	2018	
244	Thour Sokundara	M	Determination of food additive in soft drink and pickle fruits by using high performances liquid chromatography (HPLC)	2	2018	
245	Keo Rachana	F	Determination of eleven colors and three sweeteners in soft drink and sauce products by using high performance liquid chromatography	2	2018	
246	Suon Mala	F	Distribution of Arsenic in water and sediment in Mekong and Bassac river of Cambodia	2	2018	
247	Oeng Sivgech	F	Selection of plants species for plant-gravel-filter in DEWATS	2	2018	
248	HOEUN SEANGHAI	F	Optimization of White Pepper (Piper Nigrum L.) Processing by Enzymatic Activity	5	2020	
249	VANTHA DAROTH	F	Identification and Susceptibility of Antibiotic-Resistant Enterococcus Spp. in Fermented Vegetable	5	2020	
250	KAI SOKHENG	F	Analysis of pesticide residues in sediment from Chhnok Tru, Kampong Chhnang	5	2020	
251	PHOEM VISAL	M	Cambodian rice liquor product development: using Rhizopus Oryzae, Saccharomyces Cerevisiae and Alpha-amylase	5	2020	
252	LY LUKA	M	Market study and quality analysis of soy sauces sold in markets	5	2020	
M-ECS (MGIC)						
253	TITH Dara	M	Predicting user access goal based on user's	1	2015	
254	CHUOR Porchourng	M	Khmer optical character recognition using	1	2015	

255	LAY Vathna	M	Mobile document capture indexation and information retrieval	1	2015	
256	TENG Dola	M	Khmer and Latin optical character	1	2015	
257	HAN Sama	F	Agent-oriented mobile application	1	2015	
258	SEAK Leng	F	User centric travel recommendation system: case study tourist locations in Phnom Penh, Cambodia	2	2016	
259	PHAN Neth	M	Long short-term memory based for Khmer optical character recognition	3	2016	
260	THUON Nimol	M	Khmer semantic search engine	4	2017	
261	KUY Movsun	M	Data protection in IOT system: under context of lora network technology	4	2017	
262	DUCH Dynil	M	Romanization of Khmer language: automatic Latin-to-Khmer based text conversion	3	2017	
263	HENG Piseth	M	Performance analysis and implementation of the data protection algorithms between portable devices and temperature sensors in the area of internet of things	2	2017	
264	TAL Tong Sreng	M	Automatic Latin-to-Khmer-based text conversion	5	2018	
265	HEN Sodet	M	Synthetic data for Khmer ancient document analysis	5	2018	
266	HUY Viriya	M	Security and Privacy for the IOT Network by Block Chain	5	2018	
267	KHON Khemrin	M	Keyword Extraction Method on Khmer Digitialized Documents	5	2018	
268	HUY Ketya	M	Security and Privacy for the IOT Network by hyperledger	5	2018	
269	CHHUM Heng	M	Centralise Policy Administration Point for Smart Home system	5	2018	
270	HOURK Savet	M	Design and Implementation of metahub for Smart Home System	5	2018	
271	LENG Chanratanak	M	Ios Mobile Development: e-Komnob Platform: content management	5	2018	
272	NHIK KIM SANG	M	Cooperatives' Agricultural Products Mobile Application (CAP): Users & Transaction Management	6	2020	
273	CHOU SEAKNY	M	Cooperatives' Agricultural Products Mobile Application (CAP): Product Management & Seller Management	6	2020	
274	BORN SEANGHORT	M	Khmer language model for handwritten text recognition on historical documents	7	2021	Link with HEIP

275	LAY LEANGSROS	M	Designing blockchain application for information exchange of blood banks	7	2021	
276	NOP PHEARUM	M	Digital platform for Cambodian agricultural produce based on social and human values	7	2021	
277	CHOM SREYLAM	F	Mobile development for GIC department (GIC mobile app)	7	2021	
278	LY SIVHENG	F	Blockchain application for transparency, traceability and accessibility of the donated blood information for voluntary blood donors	7	2021	Link with LBE/JICA
M-TIE						
279	YANG PANHA	F	Impact of COVID-19 on paratransit services operating with ride-hailing apps : the Phnom Penh case	1	2021	
280	CHHENG RATHA	M	A study on improvement of traffic flow along Russian boulevard: from 5 Makara skybridge to Kdan Pir intersection	1	2021	
281	CHHIEV VANDA	M	Impact of COVID-19 on food delivery service in Phnom Penh city	1	2021	

Annex 5. List of Master Graduates Continued PhD Degree

Nº	Name	Sex	Promo.	Year in Master	Specialty	PhD			Source of Finance
						Year Start	Year Finish	Country	
1	Keo Pisey	M	1	2010-2011	MGCI	2013	2016	France	
2	Chhorn Chamroeun	M	2	2011-2012	MGCI	2013	2017	S. Korea	
3	KAN Kuchvichea	M	2	2011-2012	MGCI	2015	2020	Belgium	ARES
4	PROK Narith	M	2	2011-2012	MGCI	2013	2017	Japan	
5	HIN Sovannara	M	2	2011-2012	MGCI	2012	2016	France	
6	HENG Piseth	M	3	2012-2013	MGCI	2013	2017	Sweden	
7	Chhang Sophy	M	4	2013-2014	MGCI	2014	2018	Sweden	
8	Hin Raveth	M	4	2013-2014	MGCI	2014	2017	France	AUF
9	Sim Viriyavudh	M	4	2013-2014	MGCI	2015	In progress	S. Korea	
10	Ky Sambath	M	4	2013-2014	MGCI	2013	2017	France	AUF
11	Leang Enghok	M	5	2014-2015	MGCI	2015	2019	France	
12	Ho Lyheng	M	5	2014-2015	MGCI	2016	Drop	China	
13	Leng Khundadino	M	5	2014-2015	MGCI	2017	2021	France	BGF
14	Sok Tetsya	M	5	2014-2015	MGCI	2015	2020	S. Korea	
15	To Theany	M	5	2014-2015	MGCI	2015	2018	France	
16	Chhun Kean Tha	M	6	2015-2016	MGCI	2016	In progress	S. Korea	
17	Meng Try	M	7	2016-2017	MGCI	2017	2021	France	
18	Muy Yeakleang	F	7	2016-2017	MGCI	2017	In progress	France	BGF
19	Tith Dara	M	1	2014-2015	MGIC	2017	2021	Japan	MEXT
20	Lay Vathna	M	1	2014-2015	MGIC	2018	In progress	ITC	NIPTIC
21	Mom Sokvisal	M	7	2016-2017	MGCI	2018	In progress	France	BGF

22	Heng Sounean	F	8	2017-2018	MGCI	2018	In progress	France	BGF/ITC
23	CHUM Kimleang	M	5	2018-2019	MGRU	2019	In progress	China	
24	LIM Chhuong	M	9	2018-2019	MGCI	2020	In progress	South Korea	
25	YEAN Sopheak	M	4	2018-2019	MGIM	2020	In progress	Cambodia	NPIC
26	LAI Chenda	F	6	2019-2020	MGRU	2020	In progress	Belgium	HEIP
27	HEANG Latin	M	5	2019-2020	MGEE	2020	In progress	Cambodia	CCCA
28	LY Luka	M	5	2019-2020	MGCA	2020	In progress	Cambodia	HEIP
29	KUY Movsun	M	3	2016-2017	MGIC	2020	In progress	Belgium	ARES
30	OENG Thaileng	M	10	2019-2020	MGCI	2020	In progress	France	BGF
31	OUCH Vanthet	M	10	2019-2020	MGCI	2020	In progress	France	BGF
32	HENG Kimhong	M	11	2020-2021	MGCI	2021	New enrolment	France	HEIP
33	CHAO Vanyi	M	6	2020-2021	MGIM	2021	New enrolment	Korea	

Annex 6. List of PhD students enrolled in 2021-2022

No.	Name	Sex	Type of degree	Year of Study	Source of Funding	Research Topic	Remark
Field: Materials Science and Structures							
1	BUN Polyka	F	Local degree	PhD 5	ITC	Valorisation de ressources naturelles et sous-produits locaux pour la fabrication d'éco-matériaux durables	Staff of ITC
2	HENG Sounean	F	Double degree with INSA de Rennes	PhD 4	BGF and ITC	Étude des matériaux de réparation pour les structures en béton armé via une approche performentielle	
3	MOM Sokvisal	M	Double degree with INSA de Rennes	PhD 4	BGF	Modélisation multi-échelle des proprétés thermatiques des matériaux cimentaires : Influence des états d'endommangement	
4	KETH Kannary	F	Double degree with ULB	PhD 2	ARES-COMBOdIA	The Managing Collaboration between Architecture, Structure and MEP in the Service of Contruction 4.0: Workshop at ITC case	
5	TAING Kimnenh	F	Double degree with U.Liege	PhD 2	ARES-COMBOdIA	Analysis of a BIM Approach for designing of a Bioclimatic building	
6	OENG Thaileng	M	Double degree with INSA de Rennes	PhD 2	BGF	Analysis of Composite Beams Taking into Account of Uplift at The Interface	
7	OUCH Vanthet	M	Double degree with INSA de Rennes	PhD 2	BGF	Behavior of Timber-concrete Composite Slab with new Notched Connectors	
8	HOUR Sokaon	M	Local degree	PhD 2	NPIC	Prediction of Properties Change of Materials Induced by Plastic Deformation	Staff of NPIC
9	KEAT Rayuth	M	Local degree	PhD 2	NPIC	Study on Furnace Glass Heat Treatment Technology	Staff of NPIC
10	HENG Kimhong	M	Double degree	PhD 1	HEIP	A study of high strength-to-weight ratio glass beam	
11	LONG Makara	M	Double degree with U.Liege	PhD 1	ARES-ITC	Sustainable design conception integrated in	

						architecture project in BIM environment	
Field: Food Technology and Nutrition							
1	PHUONG Hengsim	F	Double degree with Univ. Nantes	PhD 5	BGF, AUF and ITC	Valorisation, par extrusion réactive et/ou enzymatique des algues : extraction des différents composés et valorisation des extraits en en Agroalimentaire	Staff of ITC
2	YIN Molika	F	Double degree with Univ. Montepellier Sup. Agro	PhD 3	BGF and ITC	Improvement High-Value Food Product in Cambodia: Drying Herbal and Spices	Staff of ITC
3	NGET Sovannmony	M	Double degree with Univ. Nantes	PhD 2	BGF	Comparative study of conventional and innovative technologies for a better conservation of meat and animal fish products of interest in Cambodia	
4	LY Luka	M	Local degree	PhD 2	HEIP	Evaluation of the quality of soy sauces sold in Cambodia	
5	THANH Channmuny	F	Double degree with U. Montepellier	PhD 1	BGF-ITC	Nutritional Interest of Different Fish Species and Valorization of By-Products	
6	CHIN Lyda	F	Double degree with Kasetsart U.	PhD 1	BGF-ITC	Impact of initial compositions and processing techniques on aromatic quality of Mango	
7	PHAL Sivchheng	F	Double degree with Kanazawa U.	PhD 1	BGF-ITC	New insights into Pharmaceuticals and Personal Care Products (PPCPs) removal from waters	
8	SAY Manit	M	Local degree	PhD 1	HEIP	Development of cooking oil processes for commercialization	
9	MAO Socheata	F	Double degree with U. Toulouse	PhD 1	ITC-Erasmus+	Lactic Acid Bacteria Strain Diversity Depending on the Origin of the Product	

10	OEUM Kakada	F	Double degree with Chungnam National U.	PhD 1	IRD	Exploration and exploitation of root-associated bacteria for a sustainable rice agriculture in Cambodia	
Field: Water and Environment							
1	MUON Ratha	F	Double degree with Sorbonne Université	PhD 3	BGF and ITC	Termite bioturbation in Cambodia – From characterization to application	Staff of ITC
2	SANG Davin		Double degree with Ecole Nationale Supérieure de Chimie de Rennes	PhD 3	BGF and ITC	Micropollutant removal by activated carbon power injected at the flocculation-coagulation-settling step in drinking water plants	Staff of ITC
3	LAI Chenda	F	Double degree with U.Liege	PhD 2	HEIP	Optimization of Soil Nutrients for Rice Cultivation Using Experimental and Modeling Approach	
4	PHOEURN Chan Arun	F	Double degree with U.Liege	PhD 2	HEIP	Integrated approach of precise irrigation and sustainable Soil management to improve crop water productivity in Cambodia: the focus on rice farming	Staff of ITC
5	HIN Chandara	F	Local degree	PhD 2	NPIC	Development of Eco-Friendly and Low-Cost Wastewater Treatment System as an On-site Product	Staff of NPIC
Field: Energy Technology and Management							
1	KHON Kimsrornn	M	Double degree with Univ. Grenoble Alpes.	PhD 4	BGF and ITC	Planning and Architecture of Mirco-grid low voltage direct current (LVDC) system with integration of PV sources and storage means	Staff of ITC
2	ETH Oudaya	M	Local degree	PhD 3	ITC	Study on Impacts of the Integration of Renewable Energy Resources to Distribution System in Cambodia	Staff of ITC
3	PECH Sopheap	F	Local degree	PhD 3	ITC	Source Rock Evaluation and Depositional Environment of Sediments in Western	Staff of ITC

						Tonle Sap Lake, Onshore Cambodia	
4	SIO Sreymean	F	Local degree	PhD 3	ITC	Applied Geophysics for Investigation Hydrocarbon Potential on the west and southwest of Tonle Sap Lake, Onshore Cambodia	Staff of ITC
5	HEANG Latin	M	Local degree	PhD 2	CCCA	Study on Heat Stress impact to Construction workers by Investigating and Simulating the Optimum Work-rest schedule: case study in Phnom Penh, Cambodia	
6	CHEA Vabotra	M	Local degree	PhD 2	MoE	Study on Impact of Heat Stress on Human Productivity and Economics in Cambodia	Staff of NPIC
7	MEAS Saran	M	Local degree	PhD 2	NPIC	Study on Taking charge of electric vehicles both in the vehicle and on the grid	Staff of NPIC
8	CHHLONH Chhith	M	Double degree with ITSN	PhD 1	BGF-HEIP	Optimal faut location, isolation, and restoration procedure for LV microgrids	Staff of ITC
9	NEAK Kimhak	M	Local degree	PhD 1	HEIP-ITC	The impacts Assessment of Gasoline and Diesel Quality in Cambodian Fuel Market on Economic and Environment	
10	CHHENG Monyvathna	M	Local degree	PhD 1	HEIP	Design and Techno-economic analysis of plug-in electric vehicle-integrated Hybrid solar PV charging system for Cambodia	
Field: Mechatronic and Information Technology							
1	HEAN Samboeun	M	Local degree	PhD 4	NIPTICT	Research & development mathematical model as a machine learning system for Cambodia's digital economy	Staff of NIPTICT
2	LAY Vathana	M	Local degree	PhD 4	ARES	Secure and interoperable communication protocols for industrial automata	
3	SIV Ratha	M	Double degree with UMONS	PhD 4	ARES and ITC	Crowds Analysis and Augmentation	Staff of ITC

4	SOK Kimheng	M	Double degree with Univ. Namur	PhD 4	ARES and ITC	Building trustable and privacy aware IoT systems using blockchain and smart contacts	Staff of ITC
5	BAN Sam	M	Double degree with IMT Mines Albi	PhD 3	BGF and ITC	Developing Countries' Transportation Enhancement through the Application of Physical Internet Paradigms	Staff of ITC
6	KEAN Judy	M	Toulouse INP	PhD 3	BGF and ITC	Etude et dimensionnement d'une chambre réverbérant à méta-matériaux pour les études Compatibilité Electromagnétique CEM	Staff of ITC
7	SOK Song	M	Local degree	PhD 2	HEIP	Development of Non-Intrusive Appliance Load Monitoring and Diagnostic System for Residential Home	Staff of NUBB
8	TEP Sovichea	M	Double degree with INP Toulouse	PhD 2	HEIP	Power quality monitoring based on the deployment of sensors in the grid and parameter measurement	Staff of ITC
9	KUY Movsun	M	Double degree with UMONS	PhD 2	ARES	Automatic security assessment of IoT devices using machine learning	Staff of ITC
10	KARTHIKEYAN Dinesh Kumar	M	Local degree	PhD 2	KIT-ITC	Image or Video Visualization of Text (Book) using Deep Convolutional Generative Adversarial Networks (DCGAN) Approach	Staff of KIT
11	CHHOUR Vongchivorn	M	Local degree	PhD 2	NPIC	Real time control of Electromyography on forearm	Staff of NPIC
12	PEOU Thura	M	Local degree	PhD 2	NPIC	Mobile robot navigation with machine learning implementation	Staff of NPIC
13	SREY Sophyn	M	Local degree	PhD 2	NPIC	Intelligent prosthesis for Above knee amputees	Staff of NPIC

14	SRUN Channareth	M	Local degree	PhD 2	NPIC	FPGA-Based Integrated Control Unit for Micro/Home Grid Scale Power Supply Equipment	Staff of NPIC
15	THUOK David	M	Local degree	PhD 2	NPIC	Multi agency communication and distributed computing	Staff of NPIC
16	UN Sok Oeun	M	Local degree	PhD 2	NPIC	Cambodia Disaster Back up Connection by Amateur Radio Operator	Staff of NPIC
17	YEAN Sopheak	M	Local degree	PhD 2	NPIC	Paramater Identification and Automatic Control for a System with Friction	Staff of NPIC
18	PICH Reatrey	M	Double degree with KMITL	PhD 1	ARES-ITC	Anomaly Detection in networks based on DNS's data analysis	
19	BUN Menghorng	M	Double degree with SIIT/TU	PhD 1	HEIP	Study of feasibility and control of solar electric tuktuk	

Abbreviations:

ARES	Académie de Recherche et d'enseignement Supérieur
ARES-COMBOdIA	Académie de Recherche et d'enseignement Supérieur-COMBOdIA
BGF	Bourse du Gouvernement Français
CCCA	Cambodia Climate Change Allian
HEIP	Higher Education Improvement Project
KIT-ITC	Cofunding Kirirom Institute of Technology - Institute of Technology of Cambodia
MoE	Ministry of Environment
NPIC	National Polytechnic Institute of Cambodia
LBE	Laboratory Based Education

Annex 7. ITC lecturers in overseas post-graduate program (2021-2022)

No	Nom et prénom	Sexe	Dépt.	Diplôme préparé	Université	Pays	Financement
1	LIM Phing	M	GEE	Master	Chulalongkorn University	Thailande	Thai Govt
2	NAT Yukleav	F	GCA	Master	Sirindhorn International Institute of Technology, Thammasat University	Thailand	
3	Seng Theara	M	GEE	Master	Grenoble INP	France	BGF
4	VANN Veasna	M	GEE	Master	National Chung Cheng University	Tawain	National Chung Cheng University Scholarship
5	MUON Ratha	F	GRU	PhD	Université Paris-Sorbonne	France	Cofinancement (BGF+MEJS)
6	Ban Sam	M	GIM	PhD	IMT Mines Albi-Carmaux, UniversitéFédérale Toulouse Midi-Pyrénées	France	BGF
7	BUN Menghorng	M	GEE	PhD	ITC-Toulouse INP	Cambodge +France	HEIP+ITC
8	Chheng Monyvathana	M	GEE	PhD	ITC	Cambodge	ITC
9	Chhlonh Chhith	M	GEE	PhD	Grenoble INP	France	BGF
10	CHHORN Sopheaktra	M	GEE	PhD	TIT	Japon	Jica
11	ETH Oudaya	M	GEE	PhD	ITC	Cambodge	ITC
12	HOR Mangseang	M	GEE	PhD	Hokaido University	Japon	AUN/Seed-Net
13	HOUNG Peany	F	GCA	PhD	Tokyo Institute of Technology	Japan	
14	KEAN Jeudy	M	GEE	PhD	Toulouse INP	France	BGF+ITC
15	KHON Kimsrornn	M	GEE	PhD	INP-Grenoble	France	BGF+ITC
16	SANG DAVIN	F	GRU	PhD	École nationale supérieure de chimie de Rennes	France	Cofinancement (BGF+MEJS)
17	SAO Sochan	F	GRU	PhD	Yamagata University	Japon	MEXT-JAPAN

18	Seng Sunhor	M	GIM	PhD	Kanazawa Univeristy	Japan	MEXT
19	SENG Theara	M	GRU	PhD	Kyoto University	Japon	MEXT-JAPAN
20	SOK Vattanak	M	GEE	PhD	Myongi University	Corée du sud	Laboratory
21	TEP Sovichea	M	GEE	PhD	ITC-Toulouse INP	Cambodge-France	HEIP+ITC
22	THENG Vouchlay	F	GRU	PhD	Tokyo Institute of Technology	Japon	AUN-SeedNet
23	Chhun Chanmaly	F	GGG	Post-Doctor	Khyushu University	Japan	JICA
24	Mao Pisith	M	GGG	Post-Doctor	China University of Mining and Technology (CUMT)	China	CUMT
25	Ngo Ichhuy	M	GGG	Post-Doctor	China University of Mining and Technology (CUMT)	China	CUMT

Annex 8. ITC students in overseas post-graduate program (2021-2022)

No	Name	Sex	Dept.	Degree	Receiving University	Country	Financing
1	CHHAY Ly An	M	GIC	Engineering	Telecom SudParis	France	Programme de bourses Eiffel
2	KHENG Piseth	M	GIC	Engineering	ENSIIE	France	Project's budget
3	YOU Borachhun	M	GIC	Engineering	ENSIIE	France	Programme de bourses Eiffel
4	CHIEN Sothearath	M	GRU	Master	Hohai university	Chine	Mekong Lancang Cooperation
5	CHROEUN Sokay	M	GIM	Master	Université Sorbonne Paris Nord (UP 13)	France	BGF
6	Hak Guekleang	F	GRU	Master	Kyoto University	Japan	MEXT Scholarship
7	HARN Norak	M	GRU	Master	University of Liège	Belgique	Erasmus+
8	HENG Seangmeng	F	GRU	Master	Hohai university	Chine	Mekong Lancang Cooperation
9	Im Polymey	M	GIM	Master	Kyushu Institute of Technology	Japan	MEXT
10	KET Dydarong	M	GRU	Master	Chulalongkorn Universtiy	Thailand	ASEAN countries program
11	Khan Sopanha	M	GEE	Master	Sepuluh Nopember Institute of Technology (ITS)	Indonesia	KNB-ANU Seed Net
12	KHEN Chanlyda	F	GRU	Master	Universiti Teknologi Malaysia	Malaysia	AUN/SEED-NET scholarship
13	KONG Leangkim	F	GRU	Master	Universiti Teknologi Malaysia	Malaysie	AUN/SEED-NET scholarship
14	KONG Phearun	M	GRU	Master	Hohai University	Chine	Mekong Lancang Cooperation

15	KUN Vicheka	F	GRU	Master	Tokyo Institute of Technology	Japon	MEXT scholarship
16	LANN Tongsan	M	GGG	Master	Chang'an University	China	Chinese Government Scholarship
17	LORM Rathana	M	GEE	Master	Sirindhorn International Institute of Technology, Thammasart University	Thailand	EFS-Excellent Foreign Students
18	MAN Sokseyla	M	GRU	Master	Chulalongkorn University	Thailande	CU ASEAN
19	NAI Chhaiheang	M	GRU	Master	Hohai University	Chine	Mekong Lancang Cooperation
20	NY Sithy	M	GRU	Master	Chulalongkorn Universtiy	Thailande	ASEAN countries program
21	PANG Sreynich	F	GRU	Master	Chulalongkorn Universtiy	Thailande	ASEAN countries program
22	PECH Ponleu	M	GRU	Master	Chulalongkorn Universtiy	Thailande	ASEAN countries program
23	PHY Sophea rum	M	GRU	Master	Kyoto Univesity	Japon	MEXT
24	ROEUN Daro	M	GGG	Master	Chulalongkorn University	Thailand	Asean and Non-Asean Scholarship
25	RY Nakrin	M	GRU	Master	Hohai University	Chine	Chinese Government Scholarship program
26	SAVOEURN Nary	M	GIM	Master	King Mongkut's University of Technology of Thonburi	Thailand	TAIST-Tokyo Tech program “Automotive and Advance Transportation”
27	SAY Sokvireak	M	GGG	Master	Gadjah Mada University	Indonesia	AUN/SEED-Net Scholarship
28	SENG Ou	M	GEE	Master	Sepuluh Nopember Institute of Technology (ITS)	Indonesia	KNB-ANU Seed Net

29	SOEURN Prasal	M	GIC	Master	Sirindhorn International Institute of Technology (SIIT)	Thailand	Thai Royal Scholarship for Cambodia
30	SOKHAL Aylik	M	GIM	Master	IMT Mines Alès	France	Eiffel
31	SUK Sievlong	M	GEE	Master	Sepuluh Nopember Institute of Technology (ITS)	Indonesia	KNB-ANU Seed Net
32	SUON Sophy	M	GIM	Master	Institute Technology Sepuluh Nopember (ITS)	Indonesia	KNB Scholarship AUN/Seed-Net Scheme "Mechanical Engineering"
33	THOY Sophon	M	GRU	Master	Hohai University	Chine	Mekong Lancang Cooperation
34	VET Sreyla	F	GRU	Master	Kanazawa Univesity	Japon	MEXT
35	Viseth Putsaccada	M	GIM	Master	King Mongkut's University of Technology of Thonburi	Thailand	TAIST-Tokyo Tech program "Automotive and Advance Transportation"
36	YOS Chantharath	F	GRU	Master	Chulalongkorn University	Thailand	ASEAN countries program
37	Yune Thearith	M	GIM	Master	Institute Technology Sepuluh Nopember (ITS)	Indonesia	KNB Scholarship AUN/Seed-Net Scheme "Mechanical Engineering"
38	CHUY Voucheng	F	GRU	Master	Chulalongkorn Universtiy	Thailand	ASEAN countries program
39	ANG Raksmey	M	GRU	PhD	Tokyo Institute of Technology	Japon	MEXT Scholarship
40	CHAO Van Yi	F	GIM	PhD	Kyushu Institute of Technology	South Korea	UTS Scholarship
41	CHIN Lyda	F	GCA	PhD	L'Institut Agro Montpellier SupAgro	France	BGF
42	CHUM Kimleang	M	GRU	PhD	Hohai University	Chine	Chinese Government Scholarship
43	KAING Vinhtang	F	GRU	PhD	Tokyo Institute of Technology	Japon	MEXT Scholarship

44	LY Steven	M	GRU	PhD	Kyoto University	Japan	MEXT Scholarship
45	OEUM Kakada	F	GCA	PhD	University of Montpellier	France	IRD
46	PHAL Sivcheng	F	GCA	PhD	INSA Toulouse	France	BGF
47	SOK Kimhuy	M	GRU	PhD	Chulalongkorn University	Thailand	AUN/SEED-NET
48	THA Theara	M	GRU	PhD	Chulalongkorn University	Thailand	Joint CU-SEI PhD program
49	THANH Channmuny	F	GCA	PhD	L'Institut Agro Montpellier SupAgro	France	BGF
50	TRY Sophal	M	GRU	Post-PhD	Kyoto University	Japan	Japan Society for the Promotion of Science (JSPS)

Annex 9. Short-term overseas capacity building for lecturers (2021-2022)

No	Nom et prénom	Dépt.	Université d'accueil	Titre	Date de mission	Financement
1	Am Sokchea	GEE	University of Colorado	Visiting Researcher	28 août - 28 décembre 2021	Fulbright U.S.-ASEAN Visiting Scholars Initiative
2	CHHUON Kong	GRU	UNIVERSITAS GADJAH MADA	13th AUN/SEED-Net Regional Conference on Geological and Geo-Resource Engineering	20-21 décembre 2021	JICA
3	CHHUON Kong	GRU	University of the Philippines Diliman	15th Regional Conference in Environmental Engineering	17-18 janvier 2022	N/A
4	CHHUON Kong	GRU	Universidad de Guanajuato	18th World Lake Conference	9-11 novembre 2021	N/A
5	CHHUON Kong	GRU	Asian (ASEAN) Science Diplomats and Environmental and Climate Change Research Institute (ECCRI)	3rd Climate Smart and Disaster Resilient ASEAN International Conference	23-25 novembre 2021	N/A
6	Dr. Eng Chandoeun	GGG	Kyushu University	Xray diffraction	mars 2022	JICA-LBE
7	EANG Khy Eam	GRU	Asian Institute of Technology	Inception Work on Strengthening Groundwater Governance in Rapidly Urbanizing Areas of the Lower Mekong Region	19 janvier 2022	GIRA/SUMMER 4 ALL
8	EANG Khy Eam	GRU	Kimdaejung Convention Center, Gwangju, Republic of Korea	35th Congress of the International Society of Limnology (SIL 2021 conference)	22-27 décembre 2021	SATREPS/JICA
9	Eng Chandoeun	GGG	University of Liege	Geophysics equipment training	juin 2022	HEIP Project

10	Hang Leakhena	GRU	University of the Philippines Diliman	15th Regional Conference in Environmental Engineering	17-18 janvier 2022	AUN-Seed/net-JICA
11	Hang Leakhena	GRU	Youth International Cooperation Development Center (CYDECO)	The ASEAN virtual young scientist conference 2021	8-9 décembre 2021	MOEYs
12	Kret Kakda	GGG	Kyushu University	Remote Sensing	mars 2022	JICA-LBE
13	Ms. Heng Mouy Yi	GGG	University of Liege	Geophysical application on geotechnical engineering	septembre 2021-janvier 2022	Impulse Program, Bulgium
14	OEUM Kakada	GCA (FTN)	University of Montpellier	Ph.D student	1 février - 31 juillet 2022	IRD
15	SONG Layheang	GRU	Université Toulouse III - Paul Sabatier	Doctoral Defense: Land use, surface runoff, soil erosion: multi-scale impact assessment of teak tree plantation management in a tropical humid mountainous agro-ecosystem	23 novembre 2021	BGF cofinancé par MoEYS
16	TITH Dara	GIC	Université de Namur	Attending the Mid-term evaluation of Doctoral students. Explore new research skills	29 octobre - 15 décembre 2021	Erasmus+

Annex 10. Short-term overseas capacity building for students (2021-2022)

No	Nom et prénom	Sexe	Dépt.	Université d'accueil	Titre	Date de mission	Financement
1	Buth Chitra	M	GGG	Kyushu University	Join international conference and lab training	22 novembre – 2 décembre 2021	JASSO
2	Chan Chhayo	M	GGG	Kyushu University	Join international conference and lab training	22 novembre – 2 décembre 2021	JASSO
3	Chork Sokheng	M	GGG	Kyushu University	Join international conference and lab training	22 novembre - 2 décembre 2021	JASSO
4	Heng Ratha	M	GGG	Kyushu University	Join international conference and lab training	22 novembre - 2 décembre 2021	JASSO
5	Kov Rathanak	M	GGG	Kyushu University	Join international conference and lab training	22 novembre - 2 décembre 2021	JASSO
6	Ly Suytry	M	GGG	Kyushu University	Join international conference and lab training	22 novembre - 2 décembre 2021	JASSO
7	OEUM Kakada	F	GCA	University of Montpellier	Ph.D student	1 février - 31 juillet 2022	IRD

Annex 11. Local capacity building for lecturers and students in form of seminar (2021-2022)

No	Titre du séminaire	Objectif du séminaire	En coopération avec	Nombre de participants	Venant de
1	Practical Knowledge, Career Path and Prospect of Thermal Energy Engineering	to provide a helpful resource for students who are unsure about which field is the best choice for their future careers.	AUF	The total number of registered participants was 109 persons—44 persons for the intensive and 65 persons for the discussion panel	GIM (95%) + GRU (2%) + RUPP (2%)
2	Soft-Skills Training	to share your experience and to provide training on soft skills to students and faculty staff	AUF	21 participants. Most of them are students of the department GIM	students and staff of department GIM, ITC
3	Training of Trainer Workshop on “Installation and Maintenance of Air-conditioning System”	to fill gaps of practical work for mechanical staff on the Installation and troubleshooting arising in the air-conditioning systems	AUF	18 Participants	Private AC companies and students and staff of department GIM

Annex 12. Dispatch Professor at ITC (2021-2022)

No	Nom et prénom	Université d'origine	Matière enseignée	Date	Départ. d'accueil
1	Yann Charles	Université de Paris Sorbone Nord (UP13)	Discussion on Numerical simulation using Abaqus	21-30 novembre 2021	GIM-Embassy of France
2	HENG Samedi	University of Liège, Belgique	Digital Transformation, Business Process	10-14 janvier 2022	GIC

Annex 13. Research Topics in 2021-2022 of ETM Unit

No.	Project/Research Topic	Name of Researcher	Funding sources	Period (2020-23)	Objectives	Outputs
1	Applied geophysics for investigating hydrocarbon potential and depositional environment of sediments at onshore prospect, southern Cambodia	Dr. Or Chanmoly Dr. Eng Chandoeun Dr. Kret Kakda Mrs. Sio Sreymean Mr. Kan Rithy Ms. Heng Mouy Yi	HEIP	2021-2023	Intergrade geophysics and geological data for investigating the geological structures, the hydrocarbon system and depositional environment of sediments in Southern Cambodia	2 PhDs candidate, facility building-resistivity and extend collaboration with petroleum company
2	ASEAN Factori 4.0	Dr. Thourn Kosorl Dr. Vai Vannak Dr. Kim Bunthern	Erasmus+	2020-2022	1) To introduce manufacturing and processing subject areas in partner country HEI using an innovative approach, a set of pedagogical labs and a dedicated center of excellence for vocational and classical learners , 2) To enhance the impact of the project	1) Capacity building of at least 6 staffs in both GIM and GEE in the field of industrial automation 2) A center of excellence equipped with a set of PLC system and 8 PCs (planning to set up at the existing room 316-B)
3	Design and Installation of Off-Grid PV System for Clean Water and Electricity Supply in Ta Mat Primary School, Cambodia	Dr. Vai Vannak Ms. Eng Samphors Mr. Chhith Chhlonh	JASTIP	2021-2022	1) To design and analysis of PV pump system 2) To install the proposed system 3) To analysis quality of life	1) One international peer-reviewed conference 2) PV pumping system in a rural village
4	Development of a Virtual Cambodian Power System-Towards an Innovation Micro-Grid in Cambodia	Dr. Vai Vannak Ms. Eng Samphors Dr. Bun Long Mr. Eth Oudaya Mr. Khon Kimsrornn Mr. Chhith Chhlonh	HEIP	2020-2024	1) To develop tools for distribution system architectures 2) To develop tools for microgrid architectures 3) To develop tools for self-healing operation of distribution systems and microgrids 4) To set-up a testbed for distribution system and microgrid	1) Upgrade three ITC staffs from master to Ph.D., 2) At least four master students will graduate 3) At least five international peer-reviewed journals will be published 4) At least ten international peer-reviewed conferences will be published 5) A testbed platform at ITC
5	Integration of Landsat-8, ASTER, and Sentinel-2 for mapping of mineral prospective, hydrothermal alteration and geological structures for porphyry copper and epithermal gold deposits in the north Cambodia.	Dr. Kret Kakda Dr. Seang Sirisokha Dr. Kong Sitha Dr. ENG Chandeoun Dr. Boeut Sophea Dr. Boeut Sophea	JICA-LBE	2021-2023	1. To analyze band ratios and Principal Component Analysis (PCA) using Sentinel-2, Landsat-8, and ASTER datasets for delineating of hydrothermal alteration mineral 2. To delineate mineral prospective zones	- Exploration of potential mineral deposits in Cambodia using remote-sening datasets - Journal publications, research cooperation with local and international companies and Universities - Capacity building for students and

					using weight of evidence method 3. To verify remote sensing results by laboratory analysis and field observation	researchers mining company and train students to work and do research
6	Investigation of mixing ratio of biomass and wasted cooking oil used as binder for producing solid fuel for community use in Cambodia	Dr. Kinnaleth Vongchanh Dr. Sarin Chan 3. Mr. Latin Heang	JICA-LBE	2020-2022	1. Turn waste to energy. City waste such: tree leaves, saw dust, waste papers, bagasse. 2. Reuse of the waste cooking oil as binding material 3. Investigate gas emission of the new biomass briquetting, CO, CO2, N, SO 4. Continue to improve system of the production process for producing briquettes 5. Study on possibility of applying the briquettes in the Cambodia's society	1. Improve knowledge background on biomass briquettes, skill on machine design and product processing 2. Reduce waste in ITC, save cost for waste management, obtain energy sources 3. Publications 4. Local briquette machine technology
7	Investigation on Source and Reservoir of Geothermal, Te Tek Pos Hot spring, Kompong speu Province	Dr. NGO Ichhuy Ms. HENG Muoy Yi Dr. ENG Chandeoun Dr. KRET Kakda Dr. KRY Nallis	JICA-LBE	2020-2022	Exploring the source and reservoir of hot spring	Capacity building, Increase the number of researches and train students to work and do research
8	Investigation the production potential of the Cambodian offshore reservoir considering effects of phase behavior and rock-fluid interaction	Dr. Ngo Ichhuy Dr. Or Chanmoly Dr. Eng Chandoeun Dr. Boeut Sophea -Dr. Mao Pisith -Ms. Pech Sopheap	HEIP	2021-2023	Integrate phase behavior, rock-fluid interaction and numerical simulation to determine the production potential of Cambodian offshore reservoir	Facility building-PVT equipment, extend collaboration with ministry and private company
9	Planning and Operation of Active Distribution Systems	Dr. Vai Vannak Ms. Eng Samphors Mr. Chhith Chhlonh Dr. Bun Long	JICA-LBE	2021-2023	1) To improve the algorithms of optimal phase connection, reconfiguration, and restoration 2) To develop algorithms for improving the unbalanced system 3) To develop algorithms for the quality and reliability of services through fault location and isolation 4) To develop a small scale prototype	1) Four undergraduate students will graduate under this project 2) Three international peer-reviewed journal will be published 3) Seven international peer-reviewed conferences will be published 4) GUI of an active distribution system will be developed 5) Small scale prototype of the active distribution system
10	Pushing Energy Efficiency in Cambodia	Dr. Chan Sarin Dr. Kinnaleth Vongchanh	CCCA3	2020-2022	The creation of a self-sustaining, multi-year building Energy Efficiency contest to help EE adaptation in Cambodia,	1-Showing active role in EE in Cambodia for supporting country energy sector and the Climate Change

		Dr. Vai Vannak			development of awareness and capacity on climate change mitigation and adaptation amongst the youth and a policy advocacy work.	Strategic Plan 2014-2023 2-Development of awareness and capacity on EE and Climate Change to students 3-Creating partnership with private sector and related ministries 4-Providing 1 topic for master student and 2 topics for undergraduate students 5-Providing incentives for lecturers who develop training materials
11	Quality Assurance of Concrete Pile Integrity Soil Properties Investigation in Phnom Penh City using Seismic and Electrical Resistivity Tomography Approaches	Dr. Eng Chandoeun Dr. Ngo Ichhuy Dr. Kret Kakda Dr. Boeut Sophea Dr. Mao Pisith Ms. Heng Muoy Yi	HEIP	2021-2023	Integrate seismic and electrical resistivity methods to qualify concrete pile integrity Progress/ status: Start in 01/2021	Facility building-seismic and resistivity equipment, extend collaboration and private company
12	Study on impact of heat stress to human productivity and economic in Cambodia	Dr. Kinnaleth Vongchanh Dr. Sarin Chan Mr. Latin Heang	CCCA3	2020-2023	1. Build human resources in the heat stress field 2. Investigate the impacts of heat stress on productivity 3. Develop an economic model on the impact of heat stress 4. Build evidence on the impacts of heat stress on productivity in three selected sectors including the construction, garment, and education sectors. 5. Identify the work rest schedule for the construction worker.	1. Min. 2 international journal 2. 2 Ph.D. candidates, 1 master student 3. Establish the measurement tools/devices in Cambodia for investigation of heat stress 4. Create local experts on economic forecasting for heat stress 5. Introduce research area on heat stress to Cambodia. 6. Enhance and strengthen activities between ITC and MoE. 7. Expand the research and academic collaboration with research partners 8. Publications 9. Collaboration with Local and international institution 10. Collaboration with garment, construction, and education sectors
13	Study on the Impact of Phase Reconfiguration in Unbalanced Distribution System	Dr. Vai Vannak Ms. Eng Samphors Mr. Chhith Chhlonh	ZE	2021-2022	1) Develop a novel algorithm for phase arrangement 2) Compared to existing algorithms in terms of economic and quality	1) One international peer-reviewed journal 2) Simulation tool for phase arrangement

Annex 14. Research Topics in 2021-2022 of FTN Unit

No.	Project/Research Topic	Name of Researchers	Fund	Period (2016-2023)	Objectives	Outputs
1	SATREPS Project on Establishment of Environmental Conservation Platform of Tonle Sap Lake	Dr. TAN Reasmey Dr. IN Sokneang Dr. PHAT Chanvorleak Dr. YOEUN Sereyvath Dr. MITH Hasika Ms. HENG Soukim	JICA/JST	2016-2022	To develop a water environment analytical tool for Tonle Sap Lake (TSL) and establish an environmental conservation platform through the elucidation of the lake and the tool development	- Technical book - Publications - Abstract and extended abstract to international conference/symposium - Graduation of undergraduate and graduate students - Staff capacity building - Platform for Aquatic Ecosystem Research is established
2	Biotechnology for Integrated Pest Management towards pesticide reduction in Cambodia	Dr. SUONG Malyna Ms. HENG Soukim Ms. SIENG Sreyvich	Government of Cambodia (HEIP)	2019-2023	To rescue all Cambodian crops from pest and diseases by integrating biotechnology into IPM approach	- Lab equipment - Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposium
3	Valorization of high-value dry food products (agricultural products including herbal and spices) and other by-products in Cambodia	Dr. IN Sokneang Dr. PHAT Chanvorleak Ms. Heng Soukim Dr. KHOEURN Kimleang	Government of Cambodia (HEIP)	2019-2023	To set up the drying excellence center (the pilot scale of drying processing center) of agricultural products, by-products, to develop the capacity building of human resource on drying technology (including technology transfer and industrial collaboration) for agricultural products in Cambodia	- Drying excellence center - Lab equipment - Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposium
4	Improvement and development of rice-based products toward the growth of SMEs/Industries in Cambodia	Dr. MITH Hasika Ms. MOM Vattana Ms. CHIN Lyda	Government of Cambodia (HEIP)	2019-2023	To set up a rice-based product development platform, improving the quality of rice-based products locally produced and available in markets and to diversify rice-based products, human resource development, and enhancing collaborative research between university and SMEs	- Center for training of rice-based products - Lab equipment - Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposium

5	Development of Cambodian Soy Sauce by Fermentation Method	Dr. TAN Reasmey Mr. LY Luka	Government of Cambodia (HEIP)	2019-2023	To produce Cambodian soy sauce by fermentation method with good quality and transfer the developed technology of soy sauce to the private sector	- Lab equipment - Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposiums
6	Development of Cooking Oil Processes for Commercialization	Mr. KONG Sela Ms. NAT Yukleav	Government of Cambodia (HEIP)	2021-2023	To develop cooking oil processes in order to produce cooking oils with good quality, to transfer the technology to private sectors for commercialization, to develop cooking oil research platform and to develop human resource in cooking oil processing	- Graduation of undergraduate and graduate students - One manual of cooking oil research will be done including hierarchy diagram - Staff capacity building - Oil processing Research platform at ITC - Collaboration with university partner - Publications - National and international conferences
7	Improvement and development of fish and meat products for better preservation using innovative technology	Dr. PENG Chanthol Dr. SROY Sengly Dr. MITH Hasika Ms. THANH Channmuny Mr. NGET Sovanmony	Government of Cambodia (HEIP)	2021-2023	To improve the quality, and add-value to the existing fish and meat products which are available on Cambodian market by applying different preservation technique	- At least one international peer reviewed paper is expected by the end of the project - Two peer reviewed papers published at local journal are expected - 10 local SMEs and local producer will be informed the research finding - Fish and meat processing lab will be established - Graduated students - Human resources capacity building
8	Valorization of agricultural by-products in Cambodia through extractions and formulations of essential oils and bioactive compounds	Dr. HOUNG Peany Mr. LAY Sovannmony	Government of Cambodia (HEIP)	2021-2023	To identify and screen essential oils/bioactive compounds in extracts obtained from varieties of Cambodia agricultural food products and wastes; then evaluate its applicability to be used as aromatherapy, food preservatives and active ingredients and to promote institutional Chemical Engineering Field, through university-SME technology transfers and strengthen university-university research collaborations	- Database of essential oils/bioactive compounds in agricultural by-products - Lab equipment - Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposiums
9	HEALTHYRICE	Dr. SUONG Malyna Ms. SIENG Sreyvich	IRD	2019-2022	To identify diversified agricultural rice systems allowing an increase in soil and	- Lab equipment and Lab set up

					plant health, and a decrease in pesticide use and their occurrence as residues in consumption products	- Graduation of undergraduate and graduate students - Staff capacity building - Publications - Abstract and/or extended abstract to international conference/symposiums
10	FOODI (MSc course in Food Processing and Innovation)	Dr. TY Boreborey Dr. TAN Reasmey Dr. MITH Hasika	Erasmus+ KA2	2019-2021	To educate aspiring food entrepreneurs, healthcare professionals, government officials, and food industry professionals in the end-to-end value chain of food processing: from understanding the elements of food, to starting a new venture for disrupting and enriching the food processing industry in Asia	- E-learning courses for master degree are developed - Mobility of staff - Strengthening network/collaboration
11	Training a new generation of entrepreneurs in sustainable agriculture and food engineering (FoodSTEM)	Dr. IN Sokneang Dr. HOR Sivmey	Erasmus+	2019-2022	To build the partnership between Cambodian and European universities, and to create a favourable condition in the 4 partners universities for the emergence of student entrepreneurship and micro or small enterprises	- Setting up of food safety lab - E-learning classroom is set up - E-learning courses are developed - Innovation challenge program for students - Strengthening network/collaboration
12	Agroecology and Safe Food System Transitions (ASSET)	Dr. HOUNG Peany Dr. SOUNG Malyna	EU/AFD and GRET	2020-2025	To make food and agricultural systems in Southeast Asia more sustainable, safer and inclusive, through harnessing the potential of agroecology to transform them	- Training/staff capacity building - Staff mobility - Strengthening network/collaboration
13	Nutritional profile of freshwater fish and fish powder from Tonle Sap Lake in Cambodia	Mrs. SROY Sengly	BGF	2018-2022	To analyze the nutritional profile of freshwater fish and fish powder from Tonle Sap Lake	- Graduation of one Ph.D. student - Publication - International conference
14	Impacts of Smallholder Farmers' Agriculture Practices on Water quality in Kampong Thom, Cambodia	Dr. PHAT Chanvorleak	ARES	2020-2021	To provide evidence-based recommendations to public and relevant stakeholders for policy decision-making process in Cambodia in order to influence water quality monitoring processes, positive interventions and regulations to control the use of chemical fertilizers and pesticides and to promote agroecological practices of smallholder farmers	- Publication
15	Micropollutant removal by powdered activated carbon injected at the flocculation-	Dr. TAN Reasmey	EU/AFD	2020-2021	To eliminate trace micropollutants from the drinking water treatment plant in an ecologically friendly way using powdered	- Graduation of undergraduate and graduate students - Publications

	coagulation-settling step in drinking water treatment plants				activated carbon as the same time with coagulation and flocculation process	- Abstract and/or extended abstract to international conference/symposium
16	Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement	Dr. PENG Chanthol	USAID	2020-2024	To reduce the prevalence and incidence of foodborne pathogen contamination of vegetables produced and sold in Cambodia	- Strengthen collaboration with local and international research institute - Capacity building of researcher - Human resource development through involvement of Engineering and Master students in the project
17	Development of Cambodian Fermented Cucumbers by using Freeze-Dried Lactic Acid Bacteria with their Potential Use as Aromatic and Bacteriocin-producing Starters	Dr. TAN Reasmey	LBE/JICA	2021-2023	To develop fermented cucumbers by using freeze-dried LAB that are useful for taste and preservation	- Graduation of undergraduate and graduate students - Publications - Abstract and extended abstract to international conference/symposium
18	ASEAN Network for Green Entrepreneurship and Leadership/ ANGEL	Dr. YOEUN Sereyvath	Eramus +	2021-2024	Green entrepreneurship and leadership	- IT equipment - Training/staff capacity building - Staff mobility - Strengthening network/collaboration

Annex 15. Research Topics in 2021-2022 of MIT Unit

No.	Project/Research Topic	Name of Researcher	Fund	Period (2017-2023)	Objectives	Outputs
1	Toward Production Innovation via Fablab-ITC	Pec Rothna (Dr.)	RGC	2019-2023	(1) Install Measurement lab, workshop lab, PCB fabrication and assembly lab. (2) Develop management, control, and data collection system for smart agriculture	- One (1) Fablab at ITC and prototype controller and data collection system for mushroom house. - One (1) journal paper
2	Non-intrusive appliance load monitoring and diagnostics in residental homes	Thourn Kosorl (Dr.)	JICA research grant for LBE	2020-2022	(1) Develop inexpensive device (hardware) to measure current, voltage, power and EMI signal. (2) Create machine learnig algorithm for energy disaggregation	- A prototype of inexpensive smart energy meter that provide information of energy consumption for each individual appliances - One Journal paper and two international conference papers
3	Initiative towards electrical and electronic products testing and certification by EMC Laboratory	Thourn Kosorl (Dr.)	HEIP, MoEYS	2019-2023	1) To set up an anechoic chamber at ITC. This chamber will be used for conducting research and development (R&D) on related EMC issues. 2) To analyze and design electromagnetic wave absorber using time domain techniques. 3) To study a new topology of reverberation chamber by using meta-material to improve spectral richness, reduce size and control direction of arrival.	Output 1.1: EMC laboratory is built (one conference paper and one seminar) Output 2.1: a design method using time domain technique for electromagnetic wave absorber is archived (one conference paper and one seminar) Output 2.2: a composite material is developed for application of electromagnetic wave absorber (one conference paper) Output 3.1: the meta-material is designed for application in reverberation chamber (one conference paper, and one seminar) Output 3.2: a new topology of reverberation chamber for EMC measurement application is designed (one conference paper, one journal, and one workshop)

4	"Flight Controller and Structural Design for Small Unmanned Aerial Vehicle.	Keo Chivorn (Mr.)	AOARD	2021-2023	-Objective 1: Design of aircraft body and autopilot simulation. -Objective 2: Design and implement autonomous flight controller and equip surveillance sensors.	-Output 1.4: State Estimation for fixed-wing UAV (accepted bachelor thesis). -Output 2.1: Operational autonomouse self-made VTOL fixed-wing UAV (Accepted local journal paper/ conference paper).
5	Development of Nanosatellite	SRANG Sarot (Dr.)	MoEYS	2021-2024	1. To conduct background research and formulate mission objective 2. To create concept design of the satellite and create a report 3. To submit the CubeSat mission application form to KiboCube program	Three B.Eng thesis is expected. One international conferences is expected
6	Indoor mobile robot localization using multisensor data fusion	YONRITH Phayuth Boreth (Mr.)	Takahashi Foundation	2020-2021	1. Implement and evaluate robot's localization and planned trajectory 2. Focus on multiple sensor scenarios 3. Established methods relying on sensor fusion	- A new prototype of indoor navigation system for autonomous robot approach - One local journal paper/conference paper
7	Investigation of configuration issues related to SDN/NFV deployments	KUY Movsun (Mr.)	ARES-CCD	2020-2024	1. Design NFV testbed with cluster of Raspberry Pi. 2. Benchmarking the testbed. 3. Investigate the various deployment issues.	1. Demo of using RPi for NFV deployment 2. Publication
8	Building trustable and privacy aware IoT systems using blockchain and smart contracts	SOK Kimheng (Mr.)	ARES-CCD	2017-2021	The objective of our research work is focusing on security, privacy and iteroperability of the IoT network, which could take into account the architecture model, authentication, authorization, access control, policy and data protection.	Decentralized access control system using blockchain and smart contract
9	Building Blood bank eco-system using blockchain technology	TITH Dara (Dr.)	-	2020-2022	Apply blockchain technology for decentralized system to store those data and proposed using existing secure technique.	Blockchain for exchange the blood bags data
10	Smart card with blockchain system for decentralization of the patient identification	TITH Dara (Dr.)	JICA/LBE	2021-2022	1. Store patient's id in the smart card 2. Secure storing those id in the blockchain for validation	Apply smart card ISO/IEC 7816 part 4 to store patient's id

11	Ancient Manuscript Digitization and Indexation	VALY Dona (Dr.)	HEIP	2020-2023	- Standardized manuscript digitization and dataset construction - Improvement of existing content analysis approaches - Design of an interactive search engine - Knowledge transfer to potential institutions and users	A centralized system to store digitized palm leaf manuscripts with text search capability and publicly accessible
12	Applied Control and Automation for Agriculture in Cambodia.	Kim Bunthern (Dr.)	HEIP, MoEYS	2019-2023	Simulation study of electric drive using BLDC/PMSM motor. Study of new technique of senorless vector control for BLDC/PMSM motor.	Simlated model and build as a prototype
13	Impact of Time-To-Live in Resource Record of Top-Level-Domain in Domain Name System	PICH Reatrey (Mr.)	ARES-CCD	2021-2025	Defining Dynamic TTL updating methods	Dynamic TTL updating methods
14	Development of Small Solid Fuel Rocket for Experiment	TIM Hoksong (Mr.)	MoE	2021-2022	Make a 300N solid fuel rocket	A rocket prototype that can be launched for avionic data recording

Annex 16. Research Topics in 2021-2022 of MSS Unit

No.	Project/Research Topic	Name of Researchers	Fund	Period	Objectives	Outputs
1	Cambodian natural rubber/different minerals composites for floor mat shock absorbing application	Dr. YOS Phanny Dr. SEANG Sirisokha Dr. RATH Sovannsathya	HEIP	2020-2023	To optimize mechanical and physical properties of Cambodian natural rubber composites by varying common clay mineral and limestone fillers content for shock absorbing applications such as floor tile.	- Rubber will be convert into value-added products
2	Initiative on the development of wind load for design of building structures in Cambodia	Dr. DOUNG Piseth	HEIP	2021-2023	To evaluate the wind load and establish its calculation procedure associated with low-rise and regular structures in Cambodia, which can serve for the structural analysis and design and to create collaborations with professionals and private company (SNP International) by providing training and workshop on how to apply the proposed calculation procedure in practice, and to promote research activities in civil engineering at Institute of Technology of Cambodia (ITC).	- Bachelor students graduated - Master student graduated - Conference and journal publications - Technical guidelines on wind load development in Cambodia
3	Testing of internal steel diaphragm in box column connections	Dr. DOUNG Piseth	KMUTT	2020-2021	To verify the tensile strength of internal diaphragm connections	- Conference and journal publications - New design method for internal diaphragm is developed
4	Steel ring damper for seismic application - collaboration with King Mongkut's University of Technology Thonburi	Dr. DOUNG Piseth	KMUTT	2020-2022	To develop a novel steel ring damper; To apply to a system called 'knee-brace frame' for seismic resistance	- Conference and journal publications - New seismic steel dampers are developed
5	Energy-based design for buildings - collaboration with King Mongkut's University of Technology Thonburi	Dr. DOUNG Piseth	KMUTT	2020-2021	To develop energy design method for knee-braces frames	- Conference and journal publications - New seismic-based design is developed
6	Design and built a lightweight chassis of mini electric vehicle	Dr. SIV Easeng	LBE/JICA	2021-2022	To study the EV structure and its power consumption through the design and built a prototyping of a lightweight vehicle.	NA

7	Composite 3D Printing based on Filament Developed from Natural Fiber	Dr. SRY Vannei Mr. MUT Mesa	LBE/JICA	2020-2022	To develop filament from natural fibers as reinforcement and Polylactic acid (PLA) as the matrix for composite 3D printing material	- Conference publication: November 2021 - Student thesis: End of July 2021 for Year 5, and early August 2022 for master student
8	Durability of Concrete Beam Strengthening with GFRP	Dr. PROK Narith Dr. RATH Sovann Sathya	Fyfe Asia Pte Ltd	2020-2021	To study the durability of concrete beam strengthening with GFRP and GFRP laminate under different conditions and durations.	NA
9	Effectiveness and formulating of Tyfo FibrAchors with the Tyfo Fibrwrap Systems	Dr. PROK Narith Dr. RATH Sovann Sathya	Fyfe Asia Pte Ltd	2020-2021	To study the effectiveness and possibly formulating design formula for anchorage of Tyfo Fibranchor with the Tyfo Fibrwrap systems.	NA
10	Hydrothermal alteration, Mineralization, Fluid inclusion, Geochemistry, and Geochronology of Porphyry Cu-Mo-Au Prospect in Kampot and Ratanakiri, Cambodia	Dr. SEANG Sirisokha	LBE/JICA	2020-2022	-To identify the lithology and geochemistry of the host sequence and mineralized intrusion; - To delineate the spatial and temporal distribution of porphyry intrusion, hydrothermal alteration and Cu-(Au-Mo) mineralization; -To study in detail the origin of hydrothermal fluid responsible for alteration and mineralization; To determine the Zircon U–Pb	- To make geological map and alteration map in Koh Sla, Kampot - To confirm the deposit type in Canada Wall, Andoung Meas Ratanakiri - To identify the deposit type in Koh Sla, Kampot - Four undergraduate Thesis - Four proceeding paper - Two international journals and two conference publication
11	Development and optimization of ceramic tile using Cambodian clays incorporating with industrial wastes	Dr. BUN Kimngun Ms. BUN Polyka	HEIP	2019-2023	To develop high quality clay roof tile using local raw materials such as clay, alternative feldspar (waste rock) and silica sand and fired in different firing temperatures and to produce scientific manual for ceramic production technology and plus organizing dissemination workshop to share the research findings and technology to the private and public sectors.	- Raw samples for ceramic roof tile body formuation are collected, - Mixture design formulation for optimizing formulation of ceramic roof tiles is being done, - Firing shrinkage, water absorption and bending

						strength of the ceramics are determined.
12	Chemical Strengthening of Large-scale glass Pieces for Construction and Other Engineering Applications	Dr. HIN Raveth Dr. SEANG Chansopheak	HEIP	2020-2024	To study on a glass strengthening process, which is chemical tempering, and its applications.	- Working on tempering optimization, preparing a publication - Submitting for bidding, - Designing 1 of them, - Waiting until next 2 years to be started. 1 master and 1 phd students are registered at GS of ITC
13	Green BIM - Analysis of BIM approach for designing a bioclimatic building	Ms. Taing Kimnenh	ARES	2020-2024	How to achieve bioclimatic design in building specific in tropical region by using BIM as instrument which take into account traditional, cultural and social aspect and to analyze how we can use BIM to facilitate and improve at the early stage for this design process	- New project
14	Managing the collaboration between architect, structure, and MEP in service of construction 4.0: ITC's workshop case	Ms. Keth Kannary	ARES	2020-2024	L'objectif principal de cette recherche est de proposer une méthodologie de projet pour l'enseignement de la conception intégrée en ingénierie architecturale : • qui soit alignée au contexte actuel de la construction au Cambodge, • qui prenne en compte les évolutions technologiques dans le domaine du CSCW et de la construction 4.0 • qui met la collaboration au centre de la question relative au management de projet	- New project

Annex 17. Research Topics in 2021-2022 of WAE Unit

No.	Project/Research Topic	Name of Researchers	Source of Funding	Period (2016-2023)	Objectives	Outputs
1	SATREPS: Establishment of Risk Management Platform for Air Pollution in Cambodia	Dr. OR Chanmoly Dr. PENG Chanthol Dr. KHOEURN Kimleang	JST/JICA	2022-2027	To contribute to the creation and establishment of a safe and comfortable living environment from the viewpoint of air pollution, essential for the sustainable development of tourism, which leads to economic benefits to the Cambodian people and to creation of a far better and comfortable environment for residents and tourists from all over the world.	- New Project
2	SATREP: Establishment of Environmental platform of Tonle Sap Lake	Dr. TY Boreborey, Dr. PHAT Chanvorleak Dr. YOEUN Sereyvath Dr. MITH Hasika Dr. ANN Vannak Dr. TAN Reasmey Dr. PENG Chanthol Dr. IN Sokneang Ms. HENG Soukim Ms. CHANTO Monychot Tepy Dr. KHOEURN Kimleang Mr. KIM Leangthong Mr. LUN Sambo Dr. CHHIN Rattana Dr. HEU Rina Dr. Sith Ratino	JST/JICA	2016-2022	To establish a framework to realize long-term environmental conservation of Tonle Sap Lake (TSL)	- Submitted a manuscript to Sustainability: "Sediment characteristics and water quality of Tonle Sap Lake, Cambodia" Chompey Den *, Boreborey Ty , Sokly Siev , Eden Gan Mariquit , Winarto Kurniawan , Hirofumi Hinode - Accepted to The 11th International Conference on Environmental and Rural Development: "Investigating hydraulic load with organic load for evaluation DEWATS and redesign DEWATS by using Drainblock as filter materials" 3. Submitted to SIL2020-Korea (international conference): Bacterial community structure and its relation to water quality in a large tropical flood pulse ecosystem - Tonle Sap Lake. Anna*, V., P. Ung, B. Ty, K. Miyanagad, M. Fujii, C. Yoshimura, Y. Tanji - Submitted to SIL2020-Korea (international conference): Assessment of Well Water Quality in the Floodplain Area around the Tonle Sap Lake Khy Eam EANG* , Kong Chhuon , Ratino SITH , Ratha DOUNG , Bunhuot RUOS, Ratana KHEANG , Sengheing, HUL, Boreborey TY , Sokly SIEV, and Chihiro YOSHIMURA

						- Policy recommendation book : Environmental Changes in Tonle Sap Lake and its Floodplain: Status and Policy Recommendations. - International symposium: (Wai M., Heu R.*, Chem V., Sen S., Thai K., EANG K., SIEV S. Assessment of Particle Size Fraction Distribution of Surface Sediment of Tonle Sap Lake, Cambodia: A Case Study in Chhnok Tru) and (Chem V., Heu R.*, Wai M., Sen S., Thai K., EANG K., SIEV S. Assessment of Particle Size Fraction Distribution of Surface Sediment of Tonle Sap Lake, Cambodia: A Case in Chhnok Tru)
3	Addressing Water Scarcity in a Rural Community of Cambodia through Groundwater Use	Dr. Chan Rathborey (Co-PI) and Dr Bun Saret (PI), Mr Hong Penghour	LBE/JICA	2020-2022	To observe the groundwater quality from Rural communities and define treatment process in purpose of drinking water use	- Field investigation at Prey Veng Province. - Completed 362 sheets of questionnaire survey and sampled 28 samples of ground water. - Joined the 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (3 Oral presentation and 2 posters) - Research students are working on varies treatment processes.
4	Collaborative Research Platform to Manage Risk and Enhance Resilience of Coral Reef in Southeast Asia	Dr. CHHIN Rattana	APN	2019-2021	- Understand the present and future scenario of the coral reef abundance and diversity - Assist in capacity development and policy formulation with evidence-based scientific outputs in managing coral reef and marine ecosystem services.	- Process and analyze the sea surface temperature (SST) data - Process and analyze the bathymetry data over Gulf of Thailand
5	Water Evolution and Vulnerability Under Global Changes in Coastal Catchments of Cambodia	Dr. DOUNG Ratha Dr. PEN Sytharith	IRD	2019-2022	To assess surface water resource and groundwater resource in the coastal area; Groundwater salinity monitoring and mapping	- Field investigation and analysis - Installation of water level monitoring - Salinity contour map of the region
6	Understanding and Managing the Cambodian	Dr. CHHUON Kong, Dr. ENG Khyeam, Mr. LUN Sambo		2019-2022	To understand and manage the floodplains in Kandal province	- Mapping flooding extension

	Floodplains, The Preks of Kandal Province					
7	Spatio-temporal assessment of surface and groundwater quality affected by urban wastewater: case study in Tamouk Lake Area	Dr. Chan Rathborey, Mr. Sok Ty, Mr Rathboren Chan	EU/AFD	2020-2021	To assess the spatial and temporal variability of water quality in term of physicochemical characteristics in Tamouk Lake.	- One conference paper and oral presentation in the 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 - 7 times of data collections (11 samples from Tamonk Lake and 4 samples from urban and aquaculture farms) - Progress on the first manuscript - Engaging student in the project (Real application and knowledge transfer) - Propose 2nd sub-topic on fate and transport of nutrients
8	Assessment of Silicon (Si) in water and bottom sediment in Tonle Sap Lake: an implication for highly productive ecosystem.	Dr. Heu Rina		2020-2021	The proposed study aims to investigate role of Si in TSL by field observation and laboratory analysis. The following specific objectives are set: - To measure basic water quality and chlorophyll-a (biomass indicator of phytoplankton) - To characterize Si and other available nutrients (N and P) in water and bottom sediment of TSL - To explore and discuss the statistical relationship between those nutrients with water quality parameters and Chlorophyll-a	- Submitted and gave presentation in AUN/SEED-Net conference: - Wai M., **Heu R.***, Chem V., Sen S., Thai K., EANG K., SIEV S. Assessment of Particle Size Fraction Distribution of Surface Sediment of Tonle Sap Lake, Cambodia: A Case Study in Chhnok Tru. - Chem V., **Heu R.***, Wai M., Sen S., Thai K., EANG K., SIEV S. Assessment of Particle Size Fraction Distribution of Surface Sediment of Tonle Sap Lake, Cambodia: A Case in Chhnok Tru. - Meas M., Heu R.*, Eang K, and Siev S. Occurrence, Transportation, Regulation and Treatment Methods of Contaminant in Surface Water: A Review on Case of Well Water around Tonle Sap Lake. - Ma L., Heu R.*, Meas M., Eang K, and Siev S. Occurrence, Transportation, Regulation and Treatment Methods of Heavy Metals in Groundwater: A Review on Case of Well Water around Tonle Sap Lake20. - Field survey - Data of water quality analysis
9	Assessment of Flood Risk on Urban Areas due to Flow Alteration of Lower Mekong and Rapid Urban Development	Dr. Sith Ratino Mr. KIM Lengthong		2020-2021	The main purpose of this research proposal is to identify the flood dynamics in Cambodian lower Mekong and its impacts on urban areas under extreme historical flow	- Modeling setup with iRIC model - Fail to simulate the model

					of Mekong river in combination with recent land reclamations.	
10	Formulizing the design criteria for the piped-water system in Cambodia	Mr. Lun Sambo		2020-2021	- Accessing consumption pattern of piped-water network - Determining the electricity consumption in water supply system - Determining the connection rate	- Field survey report (Takeo and Kandal) - Review method and mapping - Waiting reply from supplier on monitoring equipment
11	Arsenic removal from groundwater using ECAR treatment technology	Dr. TY Boreborey Ms.SIENG Sreyvich		2020-2021	To optimize the best condition for Arsenic removal from groundwater using ECAR technology.	- 2 masters and bachelor student graduated - Submission an extended abstract for regional conference of AUN/SEED-Net. - Submission a paper to ITC journal.
12	Impact of climate and land use change on hydrology pattern in the Coastal Zone of Cambodia	Dr. DOUNG Ratha		2018-2021	Assess the hydrological characteristic of the coastal region under the landuse and climate change scenario	- Established water table, pH, ORP, and EC map - Figure out the potential zoon of groundwater water. - Product 3 catchent map. - Weather data are input into model for trail running. - Update landuse data from google earth digitalization for 2020 and figure out the location of changes and validate by site observation at the site.
13	Antibiotic-resistant bacteria in wastewater and their impact on receiving freshwater system	Dr. PENG Chanthol Ms.Chanto Monychot Tepy		2020-2021	To quantify the antibiotic-resistant bacteria in wastewater and the receiving freshwater systems	One proceeding in The 13th AUN/SEED-Net Regional Conference on Chemical Engineering 2020 (RCChE-2020) Jointly held with The 5th International Symposium on Conservation and Management of Tropical Lakes

14	Application of Alternative Bio-adsorbents in Wastewater Treatment	Dr. Khoeurn Kimleang		2020-2021	- To evaluate the characteristics of bio-adsorbents, wastewater, and leachates - To study on the effectiveness of contact time, particle size and dose of bio-adsorbent on domestic wastewater treatment and leachates - To compare the effectiveness of three different bio-adsorbents domestic wastewater treatment and leachates - To study on the isothermal and kinetic model of adsorption process	- One master student graduated under support of this project - Submitted a paper to Journal of Cambodian Chemical Society (CCS) - Prepare a paper to ITC journal
15	Enhancing green capability in HEI to foster sustainable development in Cambodia (GREENCAP)	Dr. TY Boreborey Dr. ENG Khyeam Dr. CHHUN Kong	Erasmus	2020-2022	1.Enhancing green Capacity in higher education, 2.Increasing awareness of green business among students, 3. Improving student's employability for existing and future greens Jobs	- Finished green survey among students - Published green job platform - Finished first green conference - Ongoing on green course training design and integrating green course with existing course in HEI - Ongoing on preparing for green career fair for 2021 Ongoing on 2nd green conference preparation
16	Air pollution in Phnom Penh/East Asia-Nanoparticle monitoring network (EA-Nanonet)	Ms.Thanh Channmuny	Kanazawa University	2011-2021	Through monitoring of ambient aerosol nanoparticles at more than 20 sites in 10 countries in East Asia, 1) Evaluation of status and characteristics of ambient nanoparticles in East Asian area, 2) Discussion on contribution of emission sources and possible trans-boundary transportation	Monthly sampling, monitoring source of air pollution in Phnom Penh area
17	Development of a bio-filter system model to control air pollution toward industrial application	Ms. Hang Leakhena	HEIP	2021-2023	- Characterization of air pollutant - Development of biofiltration system - Efficiency testing - Technology transferring to industries/SMEs	- Two conference proceeding - Two peer reviewed paper - Two undergraduate students involved and graduated from this project - One master student involved and graduated from this project

						- To host one dissemination seminar on air pollution control and technology transfer with participation of local industries and SMEs by the end of the project - To demonstrate testing of a biofiltration system at ITC to industries - Air pollution lab equipment will be installed at ITC
18	Improving Sustainable Water Supply and Sanitation in Cambodia: Case of Tonle Sap Lake's Floating Villages	Dr. Heu Rina		2021-2023	The objective of this research to provide a sustainable water supply and sanitation that are adapted to the socio-economic and environmental contexts of TSL by using pilot scale of advanced water treatment technologies.	- Revising proposal, budget and procurement plan. - Submitted and gave presentation in AUN/SEED-Net conference: Ma L., Heu R.*, Meas M., Eang K, and Siev S. Occurrence, Transportation, Regulation and Treatment Methods of Heavy Metals in Groundwater: A Review on Case of Well Water around Tonle Sap Lake.
19	Integrated approach of precise irrigation and sustainable soil management to improve crop water productivity in Cambodia through ITC soil laboratory development: the focus on rice farming	Dr. TY Boreborey Dr. Ket Pinnara Ms. Pheoun Chanarun		2021-2023	Develop advanced technology on irrigation system for rice farming	New project (co supervise a Ph.D student and 2 BS students)
20	Development of Eco-Friendly and Low-Cost Wastewater Treatment System as an On-Site Product	Dr. Chan Rathborey, Dr Bun Saret, Mr Sok Ty, Mr. Hong Penghour, Mr Heng Borin, Ms Seng Phaya,		2021-2023	To compare removal efficiencies of varies anaerobic reactors, optimize operation condition and observed removal efficient of pilot-scale anaerobic reactor	- Submitted revised proposal to HEIP coordinator - Learned about the processes for preparing procurement of HEIP project in joint meeting - Re-prepared budget plan and submitted specification of all lab equipment. - Signed contract - Assigned master and bachelor students to conduct experiment
21	Development of Climate Data Information System for Cambodia	Dr. CHHIN Rattana Dr. Chhuon Kong Mr. Song Layheang		2021-2023	- To construct gridded climate data from the historical point observation data over Cambodia. - To provide reliable climate data and downscaling climate data in Cambodia to users by using bias-	- Prepare procurement document to purchase the equipment of the project. - Recruit research assistant and engineering students work in and support the project.

					correction method and climate downscaling method, respectively. - To share climate data and software developed in the sub-project with relevant governmental agencies and partner institutions by launching training workshops and supporting on utilizing the output herein for policy	- Review necessary literature of the interpolation methods, bias-correction methods, climate downscaling methods. - Climate data collection for both observation and climate model data.
22	Strengthening Flood and Drought Risk Management and Early Warning System in Lower Mekong Basin of Cambodia	Dr. Oeung Chantha Mr. Sok Ty Mr. Song Layheang Mr. Chhin Ratana		2021-2023	The main goal of the project is to improve flood risk management through integration of technical and institutional linkage into policy, and reducing vulnerability of local community livelihoods.	The study will be delivered as below: Flood risk assessment improved through integrating modelling and social approaches, and Capacity built on flood risk management and adaptation to climate change provided to local government and communities
23	Termite bioturbation in Cambodia-From Characterization to Application (PhD project)	Ms. MUON Ratha	ITC, BGF, and IRD	2019-2022	-To identify the abundance of termite mounds -To analysis soil physico-chemical properties of termite mound soil -To study the impact of Termite mound soil on vegetable growth	- 70% progress of Statistical analysis on physic-chemical of soil properties - Completed 4 soil profiles at Chrey Bak - 80% completed on Soil sampling and analysis - Completed field survey on the Termite Mound distribution and completed 80% survey on farmer perception termite mound soil for agricultural sector. - Co-authorship of submission a paper to Geoderma, "Is bioturbation by termites always significant? A functional group approach for the characterization of soil sheeting properties." Corresponding Author: Dr Pascal Jouquet Co-Authors: Ajay Harit; Vincent Hervé; Hemanth Moger; Tiago Carrijo; David A. Donoso; David Eldridge; Hélida Ferreira da Cunha; Chutinan Choosai; Jean-Louis Janeau; Jean-Luc Maeght; Thuy Doan Thu; Alexia Briandon; Myriam Dahbi Skali; John van Thuyne; Ali Mainga; Olga Patricia Pinzon Florian; Oumarou Malam Issa; Pascal Podwojewski; Jean-Louis Rajot; Thierry Henri-des-Tureaux; Lotfi Smaili; Mohamed Labiadh; Hanane Aroui Boukbida; Rashmi Shanbhag; Ratha Muon; Vannak Ann; Sougueh Cheik; Saliou Fall; Saran Traoré; Simon Dupont; Thomas Chouvenc; Aaron J. Mullins; Syaukani Syaukani;

						Rainer Zaiss; Tran Minh Tien; Jan Šobotník; Apolline Auclerc; Rongliang Qiu; Ye-Tao Tang; Hermine Huot; David Sillam-Dussès; Nicolas Bottinelli
24	Impact of Land Use Change and Climate Change on Surface Runoff and Suspended Sediment in the Mekong Basin (PhD project)	Mr. Song Layheang		2019-2022	- To assess surface runoff and soil loss on the microplot scale in the teak tree plantation, - To assess soil loss and trapping efficiency of surface runoff and sediment on the hillslope scale, and - To assess soil loss and sediment transport in the small headwater catchment.	- 1st paper was published - An oral presentation in the international conference (EGU2020) - Writing result for 2nd paper - Performing multiple analyses
25	Dynamic Transport of the Sediment and Nutrient in the Mekong River Basin and the Role of the Tonle Sap: Assessment Coupling Data and Modelling Approaches (PhD project)	Mr. Sok Ty		2019-2022	Present a quantification of annual, seasonal and monthly nitrate the sediment and nutrient transport exchange between Tonle Sap Lake and the mainstem Mekong River and sediment study of Mekong River basin	- Paper accepted: *Sok, T.; Oeurng, C.; Ich, I.; Sauvage, S.; Sánchez-Pérez, J.M. Assessment of Hydrology and Sediment Yield in the Mekong River Basin Using SWAT Model. Water 2020, 12, 3503.* - Two paper is under reviewed in Catena and Ecological Engineering - One presentation in international conference. - One paper is drafting for Science of Total Environment.
26	Aquaculture in Cambodia: Sustainability and Risk Prevention (Aquacam)	Dr. Peng Chanthol	French Embassy	2020-2022	To contribute to Cambodia's public policies for the development of sustainable aquaculture, through adapted methodological tools shared between main stakeholders of the sector.	- Survey of aquaculture perception from different stakeholders was conducted
27	Development of Electrocoagulation Reactor Integrated Sedimentation for Turbidity and Color Removal from Industrial Wastewater	Dr. Chan Rothborey, Dr. Bun Saret, Mr Hong Penghour, and Mr. Chan Ratboren	LBE/JICA	2021-2023	To develop and evaluate the hybrid Electrocoagulation Reactor (ECR) combining both EC and sedimentation units in terms of design criteria and operation condition in both batch and continue mode for decolorization and turbidity removal	Proposal accepted
28	Prototype of Low-cost and Smart In-vessel Composter for	Dr. Ty Boreborey Dr. KET Pinnara Mr. HEL Chanthan	LBE/JICA	2021-2022	-To calibrate and validate mathematic modelling of compost	Proposal accepted

	converting Spent Mushroom Substrates to Bio-Organic Fertilizer				process of spent mushroom substrates (SMS) -To prototype an automatic composter for rapid fermentation of spent mushroom substrate from mushroom production And To implement the prototyped composter at mushroom farm to evaluate the quality of the SMC produced	
29	Study of Acid Mine Drainage (Amd) In Cambodia And Its Countermeasures	Dr. Khoeurn Kimleang	LBE/JICA	2021-2022	To evaluate on the effectiveness of low-cost adsorbents on the acid mine drainage from three active mining provinces, Mondulkiri, Ratanakiri, and Kratie.	Proposal accepted

Annex 18. List of publications in Techno-Science Research Journal in Volume 9 (2021)

No.	Title of papers published in volume 9 (2021)	Research Unit
1	Evaluation of Wastewater Treatment Efficiency Utilizing Coconut Fiber as Filter Media (Chenda Lai, Thary Vorn, Khy Eam Eang, Boreborey Ty)	WAE
2	Groundwater Arsenic Contamination and Social Needs of Economical Arsenic Removal Technology in Rural Areas of Cambodian Mekong Delta (Pisey Neang, Seingheng Hul, Ginro Endo, Keisuke Miyauchi)	WAE
3	Isolation and Characterization of Lactic Acid Bacteria from Soy-based Products (Samnes Chuon, Monychot Tepy Chanto, Reasmey Tan, Chanthol Peng)	FTN
4	Study on Nutrients and Heavy Metals in Bottom Sediment of Tonle Sap Lake (Darong Heng, Boreborey Ty, Seingheng Hul)	WAE
5	Urban Flood Modeling in Phnom Penh Using Flo-2D: Consideration of Climate Change Effect (Sokchhay Heng, Kimleng Kheav, Panha Hok, Kong Chhuon, Sarann Ly, Tsuyoshi Kinouchi)	WAE
6	Changes on Qualities of Gluten-free Chalky Rice Breadstick during Storage (Molika Yin, Wannasawat Ratphitagsanti, Nantawan Therdthai)	FTN
7	Development of Spicy Sweet Chili Sauce (Molika Yin, Soukim Heng, Saravdy Rem, Lyda Chin)	FTN
8	Design and Implementation of the Commercial Off-the-shelf Electrical Power System for the Satellite Training Kit – Demosat (Soun Dalin, Sakal Morokot, Sor Hokly, Srang Sarot)	MIT
9	A Study on Traffic Signalization to Improve Traffic Flow at Kdan Pir Intersection in Phnom Penh City (Ratha Chheng, Pharinet Pheng, Sovanndeth Hun, Veng Kheang Phun, Panha Yang)	Other
10	Re-Engineering Kdan Pir Intersection to Improve Traffic Flow in Phnom Penh (Panha Yang, Veng Kheang Phun, Ratha Chheng)	Other
11	Application of SWMM to Explore Possible Climate Change Impact on Urban Stormwater Drainage (Ponlok Kol, Ratha Doung)	WAE

12	Hydrological Components and Catchment Scale Sediment Delivery in Prek Thnot River Basin, Cambodia (Chanlyda Khen, Ilan Ich, Ty Sok, Sophal Try, Chantha Oeurng)	WAE
13	Effects of Solvent and Time on Extraction of Bioactive Compounds from Cambodia Black Turmeric Using Ultrasound-Assisted Extraction (Sovannmony Lay, Peany Houng, Sokneang In)	FTN
14	Effects of Cambodian Clay on the Physical and Mechanical Properties of Natural Rubber Latex Foams (Laymey Sreng, Azura A. Rashid, Phanny Yos)	MSS
15	Preliminary Investigation on Organic Petrology of Shale in Phnom Mrech, Angkor Chum District, Siem Reap Province, Onshore Cambodia (Chandoeun Eng, Meta Chorn, Sopheap Pech, Muoy Yi Heng, Pidao Choon, Ratha Heng, Chita Buth)	MSS
16	Design and Prototyping of Solar Hybrid Switch Controller and Monitoring System (Sok An Siek, Sarot Srang, Hokly Sor, Dalin Soun)	MIT
17	Development of Orbital Simulator for Cambodian CubeSat Mission in LEO (Penghuy Srean, Morokot Sakal, Maximilien Berthet, Sarot Srang)	MIT
18	Helipad Detection for UAV based on YOLOv4 Transfer Learning Model (Vanyi Chao, Sarot Srang, Morokot Sakal, Chivorn Keo)	MIT
19	Mobile Robot Localization using Extended Kalman Filter with Kinematic Model (Phayuth Yonrith, Sarot Srang, Morokot Sakal, Boreth Sethy)	MIT
20	Simulation and Numerical Characterization of Gaseous Oxygen Injector for ABS/GOX Hybrid Rocket Motor (Hoksong Tim, Sarot Srang, Morokot Sakal)	MIT

Annex 19. List of Foreign Students at ITC

No	Nom et prénom	Départ.	Date d'arrivée	Date de départ	Université d'origine	Pays	Thème (Quel est le sujet du stage?)	Financement
1	Antoine Paul Baptiste SAILLOUR	GIC	20 sept. 2021	1 mars 2022	Le Mans Université	France	Exchange Program Scheme	Le Mans Université
2	DALLEINNE Eve	ECAM	08 février 2022		ECAM LaSalle	France	Programme international	Personnel
3	GONIN Maeva	ECAM	03 février 2022		ECAM LaSalle	France	Programme international	Personnel
4	LASSERRE Adrien	ECAM	22 janvier 2022		ECAM LaSalle	France	Programme international	Personnel
5	ROUCHOU Maxence	ECAM	08 février 2022		ECAM LaSalle	France	Programme international	Personnel
6	DAVAL POMMIER Lucas	ECAM	04 février 2022		ECAM LaSalle	France	Programme international	Personnel
7	CARTIER Alexandre	ECAM	18 janvier 2022		ECAM LaSalle	France	Programme international	Personnel
8	BOANA Louise	GCI	14 février 2022	18 juillet 2022	INSA Rennes	France	Exchange year 4	Personnel
9	PAUTREL Arthur	GIC	15 février 2022	14 juillet 2022	INSA Rennes	France	Exchange year 4	Personnel

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