Appendix 5.2

Resilient Artificial Intelligence of Things (AIoT) Green Energy System with Real-time Solution for Effective Aquaculture (REAS-SEA)

Face-2-Face Project Review and Field Test Trip

Report Form

I. Proposer:

Name:	Ngo Duc Luu
Position:	Project member
Institution:	Bac Lieu University, Vietnam

II. Objective:

Project meeting:

Face to face meeting:

Collaborate with project members the REAS-SEA project. To enhance knowledge sharing, collaboration, and innovation within the project team and its partners, the seminar aims to conduct a comprehensive project review. To join a meeting face to face and to final reports on the project and facilitate knowledge exchange, collaboration and innovation among project members and partners in future.

The final report from each team and future activities for cooperate with each other:

+ Soitec, UTokyo, IICT, PTIT team: System and algorithm design; Sensing node design and testing; Controllers design and testing, System optimization.

+ NTU, BLU, IICT team: Field test, data analysis.

+ UTokyo & IICT, MMU, LEO, NIPICT team: Gateway design and testing; Cloud and database; System fabrication and verification

Field test trip

Collaborate with project members the REAS-SEA project. To enhance knowledge sharing, collaboration, and innovation within the project team and its partners, the seminar aims to conduct a comprehensive project review. To join a meeting face to face and to final reports on the project and facilitate knowledge exchange, collaboration and innovation among project members and partners in future.
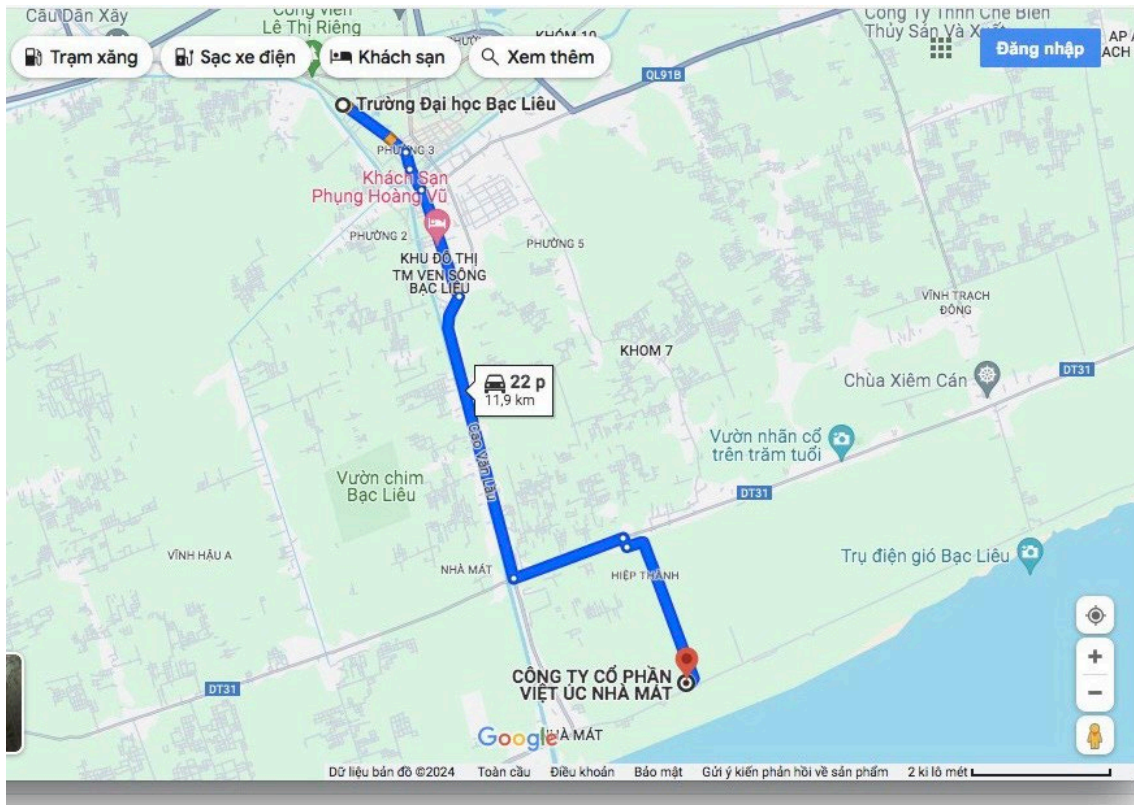
Figure 01: Maps from Bac Lieu University to Viet Uc company.

BLU aquaculture laboratory at 178 Vo Thi Sau, Ward 8, Bac Lieu City, Bac Lieu Province, Vietnam: Experimental area of the Faculty of Aquaculture: research on water quality analysis, shrimp diseases, nutrition, seed production and shrimp farming, we hope share to each member about activity of BLU, we hope share to each member about activity of BLU aquaculture laboratory.

+ Viet Uc Seafood Corporation, Giong Nhan Hamlet, Hiep Thanh Commune, City. Bac Lieu, Bac Lieu Province, Vietnam, https://vietuc.com/en (about 12 km from Bac Lieu University): Viet Uc Company is currently farming shrimp using high technology, having achieved prestigious international certifications such as BAP (Certificate of Good Aquaculture Practices), ASC (an international certification for certified seafood). responsible farming, minimizing negative impacts on the environment), disease-free facilities according to recommendations of the World Organization for Animal Health (OIE), members of the REAS-SEA project want to discuss the advantages and the difficulties the company is facing and directly observe to find solutions together in the near future. At the end of the project, the team still finds resources to further develop the idea to complete the product for the market.

III. Schedule:

Date: March 27-28, 2024

Venue:

Project meeting:

Bac Lieu University (NTU), 178 Vo Thi Sau, Ward 8, Bac Lieu City, Bac Lieu Province, Vietnam.

Address of field test site:

+ BLU aquaculture laboratory at 178 Vo Thi Sau, Ward 8, Bac Lieu City, Bac Lieu Province, Vietnam.

+ Viet Uc Seafood Corporation, Giong Nhan Hamlet, Hiep Thanh Commune, City. Bac Lieu, Bac Lieu Province, Vietnam (about 12 km from Bac Lieu University)

Due to the very tight schedule and requirements for all the preparations, so IICT member did not come Bac Lieu University and join online.

Date and time	Activities	Participant
Day 1: 27/3/2024, F2F Seminar		
14.00 - 15.30	- F2F Seminar for project review + Soitec, UTokyo, IICT, PTIT team: System and algorithm design; Sensing node design and testing; Controllers design and testing, System optimization. + NTU, BLU, IICT team: Field test, data analysis. + UTokyo & IICT, MMU, LEO, NIPICT team: Gateway design and testing; Cloud and database; System fabrication and verification	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo) Nguyen Thi Bich Yen (Soitec)- join online via Zoom Aromhack Saysanasongkham (IICT)- join online via Zoom Foo Yee Loo (MMU)- join online via Zoom Padapxay SAYAKHOT(IICT)- join online via Zoom Phuangkeo Keophengthong(IICT)- join online via Zoom Nguyen Tan Sy (NTU) - join online via Zoom Ngo Van Manh (NTU) - join online via Zoom
15.30 – 16.00	**Break**	

16.00- 18.00	- F2F Seminar for project review, Discuss on results of experiments, Data analysis, System optimization + Soitec, UTokyo, IICT, PTIT team: System and algorithm design; Sensing node design and testing; Controllers design and testing, System optimization. + NTU, BLU, IICT team: Field test, data analysis. + UTokyo & IICT, MMU, LEO, NIPICT team: Gateway design and testing; Cloud and database; System fabrication and verification	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo) Nguyen Thi Bich Yen (Soitec)- join online via Zoom Aromhack Saysanasongkham (IICT)- join online via Zoom Foo Yee Loo (MMU)- join online via Zoom Padapxay SAYAKHOT(IICT)- join online via Zoom Phuangkeo Keophengthong(IICT)- join online via Zoom Nguyen Tan Sy (NTU) - join online via Zoom Ngo Van Manh (NTU) - join online via Zoom
Day 2: 28/3/2024, Field Test Trip & Next Plan Discussion		
8.00- 10.00	- Meeting for review of field test trip, discuss about system at BLU aquaculture laboratory, Bac Lieu city - Discuss together	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo)
10.00 - 10.15	**Break**	
10:15- 12.00	- Meeting for review of field test trip, discuss about system at BLU aquaculture laboratory, Bac Lieu city - Discuss together	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo)
12.00 - 13.00	**Lunch**	
13.00 - 15.30	Visit a shrimp farming company that applies modern technology to listen to the advantages and disadvantages of shrimp farmers when using new	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo)

	equipment and tools.	
15:30 - 16:00	**Break**	
16:00 – 18:00	- Back to BLU - Summarize all activities and discuss, final report of project	Ngo Duc Luu (BLU) Nguyen Thi Hong Van(BLU) Tran Thi My Hanh (NTU); Nguyen Ngoc Mai Khanh (UTokyo) Nguyen Thi Bich Yen (Soitec) - join online via Zoom Aromhack Saysanasongkham (IICT)- join online via Zoom Foo Yee Loo (MMU)- join online via Zoom Padapxay SAYAKHOT(IICT)- join online via Zoom Phuangkeo Keophengthong(IICT)- join online via Zoom Nguyen Tan Sy (NTU) - join online via Zoom Ngo Van Manh (NTU) - join online via Zoom

IV. Participants:

Due to the very tight schedule and requirements for all the preparations, so IICT member did not come Bac Lieu University and join online.

No.	Name	Organization
1	Tran Thi My Hanh	Nha Trang University (NTU), Vietnam
2	Ngo Duc Luu	Bac Lieu University (BLU), Vietnam
3	Nguyen Thi Hong Van	Bac Lieu University (BLU), Vietnam
4	Dr. Nguyen Ngoc Mai Khanh	The University of Tokyo, Japan (U-Tokyo), Japan Self-sponsored
5	Ms. Nguyen Thi Bich Yen	Soitec, Singapore- join online via Zoom
6	Aromhack Saysanasongkham	Institute of Information and Communication Technology (IICT), Laos- join online via Zoom
7	Dr Nguyen Tan Sy	Nha Trang University (NTU), Vietnam- join online via Zoom
8	Dr. Ngo Van Manh	Nha Trang University (NTU), Vietnam- join online via Zoom

9	Dr. Padapxay Sayakhot	Institute of Information and Communication Technology (IICT), Laos- join online via Zoom
10	Mr. Phuangkeo Keophengthong	Institute of Information and Communication Technology (IICT), Laos- join online via Zoom
11	Dr. Foo Yee Loo	Multimedia University (MMU), Malaysia- join online via Zoom

V. Summary of the activities corresponding to the objectives

Day 1: 27/3/2024, F2F Meeting

In this aftenoon, F2F Seminar for project review, Dr Ngo Duc Luu introduced Bac Lieu University and its activities. Then each group takes turns introducing its activities: NTU, UTokyo, Soitec, IICT, MMU.

After that, NTU and BLU team presented an overview about field test, data analysis. They use equipment in the shrimp farm include sensors to monitor water quality parameters such as temperature, salinity, and dissolved oxygen, as well as actuators to control equipment such as aerators, feeders, and pumps. The sensors and actuators should be installed in strategic locations throughout the farm, such as in the intake and outflow canals, in the shrimp ponds, and in the feed storage area. The equipment should be connected to a central control unit, which can be a computer, and they use smartphone to control it. There are a number of different states of shrimps' activities recorded in the experiment such as being hungry, eating, and full.

Then, Ms Bich Yen (Soitec) presented about System and algorithm design; Sensing node design and testing; Controllers design and testing, System optimization. Dr Mai Khanh (UTokyo) introduced the gateway design and testing; Cloud and database; System fabrication and verification and the data processing of the sound data collected from the previous experiments for both indoor and outdoor experiments. She has presented about the issue of the presence of noise in the outdoor environment. By cutting the low frequency of the sound (which is normally the noise sound), the quality of the dataset has also been reduced as there was a loss in some features of the data. As a result, she was also working on a method to filter the noise from the input data rather than removing the low frequency method. Furthermore, she has also shown an interesting thing in using deep learning such as convolutional neural networks to perform the feature selection more dynamically and efficiently without having to select the features manually by hand, which is a labor-intensive task. Dr. My Hanh (NTU) presented an overview all activities and results of the REAS-SEA project (experiments, data analysis, field test trip, meeting online, international

conferences Q4, Patents submitted, Societal Impact of project). All members online and onsite discussed the project's contents together.

Day 2: 28/3/2024, Field Test Trip & Final Report.

In the morning of 28 March 2024, we left from the Hotel at 7:00 AM to the field test shrimp farms and we started the journey by visiting an BLU aquaculture laboratory at Bac Lieu City. We look at the equipment. tools used for aquaculture and agriculture experiments. Bac Lieu is a province with a large shrimp farming output in Vietnam, people make a living from shrimp farming and the main services serving the aquaculture industry.

After we completed a visit to the laboratory, we had a group photo before moving to the shrimp farming company. In shrimp farm, Viet Uc Seafood Corporation, Giong Nhan Hamlet, Hiep Thanh Commune, City. Bac Lieu, Bac Lieu Province, Vietnam, https://vietuc.com/en (about 12 km from Bac Lieu University): Viet Uc Company is currently farming shrimp using high technology, having achieved prestigious international certifications such as BAP (Certificate of Good Aquaculture Practices), ASC (an international certification for certified seafood). responsible farming, minimizing negative impacts on the environment), disease-free facilities according to recommendations of the World Organization for Animal Health (OIE), members of the REAS-SEA project want to discuss the advantages and the difficulties the company is facing and directly observe to find solutions together in the near future. At the end of the project, the team still finds resources to further develop the idea to complete the product for the market. If the project continues to research and bring products to market, Viet Uc company will accompany the project. **After that, we went back to Bac Lieu University to have a meeting: Discuss the final report of project and networks.** Each team exchanged ideas and contributed to the project.

VI. Others
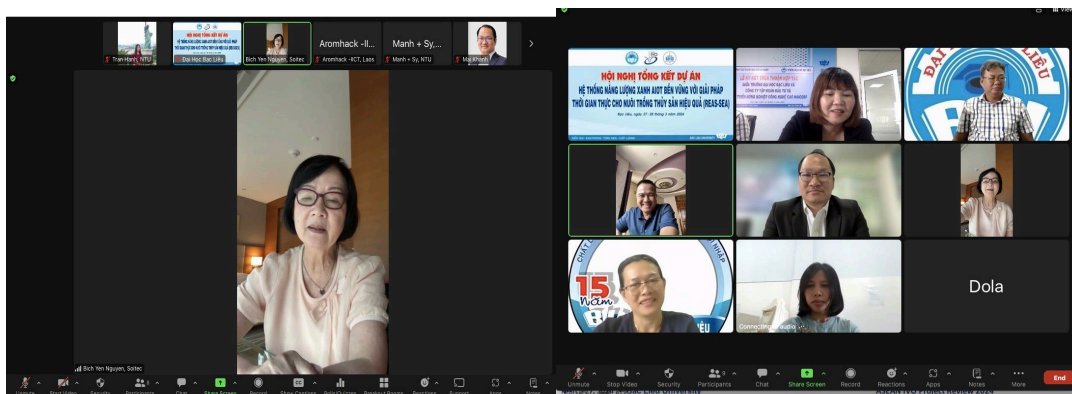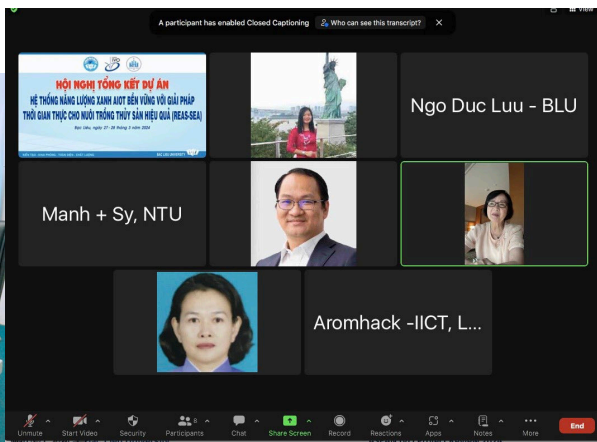
Appendix 5.2

Resilient Artificial Intelligence of Things (AIoT) Green Energy System with Real-time Solution for Effective Aquaculture (REAS-SEA)

Face-2-Face Project Review and Field Test Trip

Report Form

I. Proposer:

Name:	Tran Thi My Hanh
Position:	Project leader
Institution:	Nha Trang University, Vietnam

II. Objective:

Project meeting:

Collaborate with project members to complete Prototype of the REAS-SEA project. To enhance knowledge sharing, collaboration, and innovation within the project team and its partners, the seminar aims to conduct a comprehensive project review.

Following the challenges posed by the Covid-19 pandemic, this seminar provides an opportunity for in-person interaction to deliberate on project activities and reinforce global networking endeavors.

To join a meeting face to face and to share the progress on the project and also discuss our next plan.

To review on the project and facilitate knowledge exchange, collaboration, and innovation among project members and partners.

Field test trip:

Participating in the field test expedition at NTU aquaculture laboratory will enable project members to both showcase project advancements and engage in discussions regarding the upcoming project phases.

Visit a shrimp farming company that applies modern technology to listen to the advantages and disadvantages of shrimp farmers when using new equipment and tools.

In the collaborative work map of the REAS-SEA project, there are three institutions such as: PTIT, NIPICT and IICT are responsible for embedded controlling software and field tests as shown in Fig. 01,02. Therefore, this should be necessary for NIPICT and IICT to join in this field test trip.
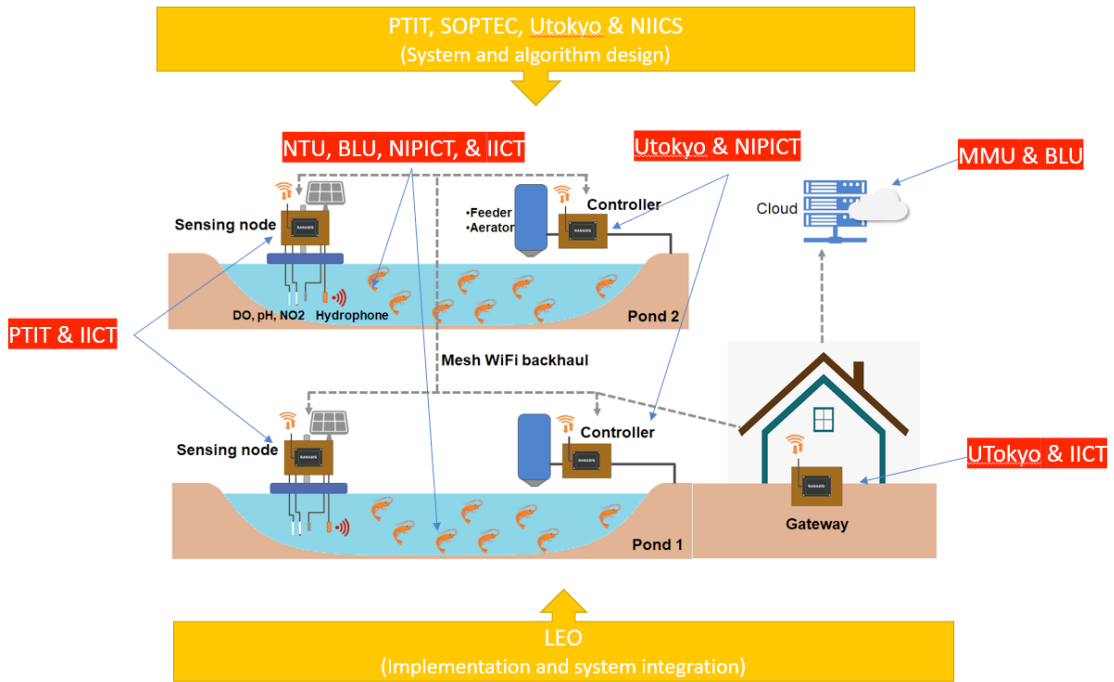
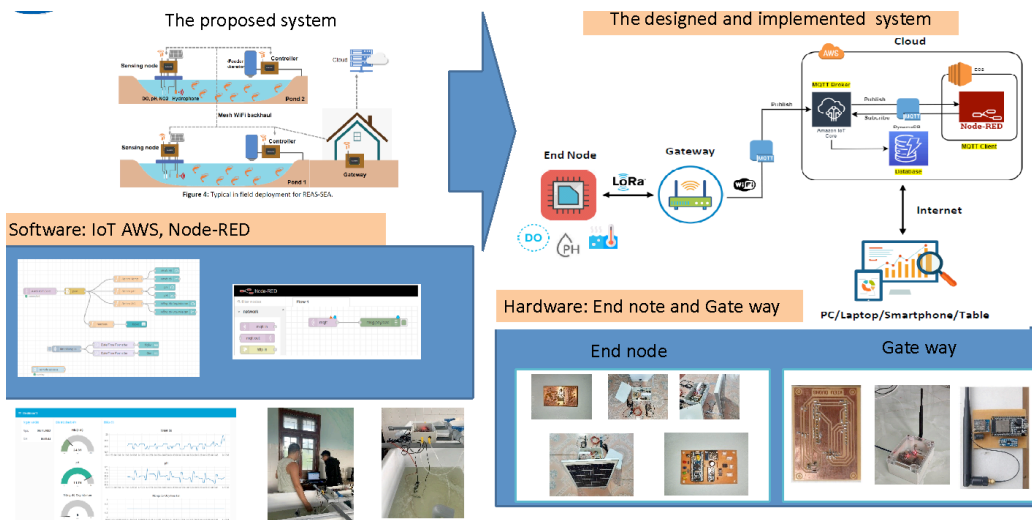Figure 01: Leveraged Resources and Participants

Figure 02: System design and testing

III. Schedule:

Date: September 14 – 15, 2023
Venue: Nha Trang University (NTU), 02 NguyenDinh Chieu street, Vinh Tho ward, Nha Trang city, Khanh Hoa province, Vietnam

Address of field test site:

- NTU aquaculture laboratory at Cam Ranh city, My Thanh ward, Cam Thinh Dong district, Cam Ranh city, Khanh Hoa, Vietnam (about 45 km from Nha Trang University.
- Hai Duong Ninh Thuan fisheries company limited, An Hai ward, Ninh Phuoc district, Ninh Thuan province, Vietnam (about 100 km from Nha Trang University).

Date and time	Activities	Participant
Day 1: 14/9/2023, F2F Seminar		
8.30 - 10.00	- F2F Seminar for project review - System and algorithm design, Controllers design and testing, Gateway design and testing	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU) Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT) Nguyen Ngoc Mai Khanh (U-Tokyo)- join online via Zoom Foo Yee Loo (MMU)- join online via Zoom
10.00 - 10.30	**Break**	
10.30 - 12.30	- F2F Seminar for project review(continue) - Discuss on results of experiments test indoor and outdoor - Data analysis - System optimization	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU) Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT) Nguyen Ngoc Mai Khanh

		(U-Tokyo)- join online via Zoom Foo Yee Loo- (MMU)- join online via Zoom
12.00 - 13.30	**Lunch**	

Day 2: 15/9/2023, Field Test Trip & Next Plan Discussion

8.30- 9.30	- Meeting for review of field test trip, discuss about system at NTU aquaculture laboratory, Cam Ranh city - Perform experiments and discuss together	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU) Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT)
9.30 - 10.00	**Break**	
10.00 - 12.00	- Perform experiments and discuss together - Next plan discussion	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU) Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT)
12.00 - 13.00	**Lunch**	
13.00 - 15.30	Visit a shrimp farming company that applies modern technology to listen to the advantages and disadvantages of shrimp farmers when using new equipment and tools.	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU) Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT)
15:30 - 16:00	**Break**	
16:00 – 18:30	- Back to NTU - Summarize all activities and discuss, design next plan of	Nguyen Tan Sy (NTU) Tran Thi My Hanh (NTU); Ngo Van Manh (NTU)

	project	Nguyen Thi Bich Yen (Soitec) Padapxay Sayakhot (IICT) Phuangkeo Keophengthong (IICT) Chhuon Sopheakmanith (CADT) Kann Bonpagna (CADT) Nguyen Ngoc Mai Khanh (U-Tokyo)- join online via Zoom Foo Yee Loo (MMU)- join online via Zoom

IV. Participants:

No.	Name	Organization
1	Dr. Padapxay Sayakhot	Institute of Information and Communication Technology (IICT), Laos
2	Mr. Phuangkeo Keophengthong	Institute of Information and Communication Technology (IICT), Laos
3	Dr. Tran Thi My Hanh	Nha Trang University (NTU), Vietnam
4	Dr Nguyen Tan Sy	Nha Trang University (NTU), Vietnam
5	Dr. Ngo Van Manh	Nha Trang University (NTU), Vietnam
6	Ms. Nguyen Thi Bich Yen	Soitec, Singapore
7	Dr Chhuon Sopheakmanith	Cambodia Academy of Digital Technology (CADT), Cambodia
8	Dr. Kann Bonpagna	Cambodia Academy of Digital Technology (CADT), Cambodia
9	Dr. Nguyen Ngoc Mai Khanh	The University of Tokyo, Japan (U-Tokyo), Japan - join online via Zoom
10	Dr. Foo Yee Loo	Multimedia University (MMU), Malaysia- join online via Zoom

V. Summary of the activities corresponding to the objectives

Day 1: 14/9/2023, F2F Meeting

In this meeting, Dr. Tran Thi My Hanh presented an overview and current progress of the project. In addition, the aquaculture lab director has also explained the process of materials and data collection process. They use equipment in the shrimp farm include sensors to monitor water quality parameters such as temperature, salinity, and dissolved oxygen, as well as actuators to control equipment such as aerators, feeders, and pumps. The sensors and actuators should be installed in strategic locations throughout the farm, such as in the intake and outflow canals, in the shrimp ponds, and in the

feed storage area. The equipment should be connected to a central control unit, which can be a computer, and they use smartphone to control it. There are a number of different states of shrimps' activities recorded in the experiment such as being hungry, eating, and full.

The experiment was initially conducted in the laboratory. In the laboratory, a shrimp was put into a studio box which is covered by soundproof foam to block the noise from the surrounding. Then, the shrimps had been given food before its eating sound was recorded for data collection. After the shrimp finished eating, the sound of the shrimp was recorded for the full appetite state. Then the shrimps were left for some time without food so that the sound of the hunger from the shrimp was also recorded in the box accordingly. After this experiment, a number of recordings related to each state of the shrimp (being hungry, eating, and full) were saved using smartphone application with the microphone.

After a number of days, shrimps were released to the pond for further data collection process in outdoor environments. The data collection procedure for each state of the shrimps was conducted similarly to the experiment in the box. After the recording of each state of the shrimps were saved in the cloud drive, the sound recording of the outdoor experiment was used for comparison with the one in the box.

Then, Stephanie, summer internship student of the Dr. Mai Khanh, conducted a presentation about the data processing of the sound data collected from the previous experiments for both indoor and outdoor experiments. She has presented about the issue of the presence of noise in the outdoor environment. By cutting the low frequency of the sound (which is normally the noise sound), the quality of the dataset has also been reduced as there was a loss in some features of the data. As a result, she was also working on a method to filter the noise from the input data rather than removing the low frequency method. Furthermore, she has also shown an interesting thing in using deep learning such as convolutional neural networks to perform the feature selection more dynamically and efficiently without having to select the features manually by hand, which is a labor-intensive task.

Day 2: 15/9/2023, Field Test Trip & Next Plan Discussion

In the morning of 15 September 2023, we left from the Hotel at 7:15 AM to the field test shrimp farms and we started the journey by visiting an NTU aquaculture laboratory at Cam Ranh City. At the laboratory, we have seen two types of ponds: one uses the changing water regularly, and the other uses the filter stone to clean the water without changing the water. 150 shrimps per cubic meter are placed in each pond, accumulating over 35,000 shrimps in each

pond. According to the head of the laboratory, he has mentioned that the shrimps from the second pond is bigger than the first pond (48 shrimps per kilogram in the pond with mineral vs. 44 shrimps per kilogram in the pond with changing water).

Then we moved to the laboratory room where we saw the equipment used in the experiment. The equipment includes a hydrophone, an underwater camera, a feeding machine, and an experiment box covered with soundproof foam. The expert has guided us through the step-by-step process of the experiment through the demonstration so that we can understand more clearly the data collection process both in the box and in the pond.

After that, we visited the different types of tanks to check the water quality improvement experiment. In this experiment, a tank is filled with different minerals to observe the water quality in each tank for the shrimps. 154 shrimps per cubic meter were placed in each tank, with a total number of 400 shrimps per tank. The result has shown that the survival rate of the shrimps in the tank is 80% and the survival rate in a pond is 82%. We then continued to check the experiments of water quality control in a number of smaller tanks where different substances were input into the water to clean it.

We had a shrimp tasting with the shrimp cultivated from the pond. In our opinion, the shrimp tasted very delicious with no chemical and full of flavor inside it. We would say that it was one of the best shrimps we have ever had so far, until now.

After we completed a visit to the laboratory, we had a group photo before moving to the shrimp farming company. In shrimp farm, there are many lakes with specific purposes. For example, one pond contains seawater extracted from the sea. The seawater was then allowed to flow to the next pond before different substances were used in different ponds to filter the water. After that, we went to the pond with the final clean water where shrimps were placed there and provided regular feeding. This was our first time experiencing this process, and we were surprised at how clean the water was after the filtering process. After seeing the real production process at the shrimp farm, we finally understood the importance of water quality in shrimp farming and the problem that we would like to solve regarding the efficiency of the feeding process.

After that, we went back to Nha Trang University to have a meeting. Discuss the next steps of the project. Each team exchanged ideas and contributed to the project. Dr. Sy Tan Nguyen (Vice-Director of Aquaculture Institude of NTU), Dr. Mai Khanh and Dr. Foo also participated in the meeting. The Lao team also offered to help with the research of the cloud system to bring the audio files obtained from the recording on the farm and then upload them to the cloud system so that all teams can use the audio files for further analysis. However,

the details will be meeting online to discuss the details of the files together with the experts again.

VI. Others