Advanced Curriculum on Energy Efficient Buildings in Extreme Continental and Sunny Climate

CEBEC

WP-4: Dissemination and Exploitation

Written by: German Mongolian Institute for Resources and technology

NOVEMBER 1, 2023

Table of Contents

1. Introduction

The project's primary objective is to support the capacity of Mongolian higher education institutions in the fields of environment and engineering by harnessing knowledge and expertise from European counterparts. This initiative is of paramount significance to Mongolia, as it grapples with severe environmental pollution resulting from subpar urban planning and the absence of adequate thermal energy solutions for its continental climate. The project seeks to empower Mongolian higher education by focusing on curriculum development and staff training, with the ultimate goal of producing proficient professionals capable of mitigating pollution issues.

Upon completion, Mongolian higher education institutions should possess the capacity to educate, train, research, and innovate sustainable solutions in the realm of energy-efficient construction. This project, therefore, strives to address a critical environmental challenge while contributing to the educational and environmental advancement of Mongolia.

2. Project Overview

The project aims to address the critical issue of environmental pollution in Mongolia, primarily due to poor urban planning and a lack of thermal energy in a continental climate. It seeks to achieve this by enhancing the capabilities of Mongolian higher education institutions (HEIs) through knowledge transfer from European HEIs, focusing on the fields of environment and engineering. The ultimate goal is to contribute to the development of Mongolia by building the capacity of its HEIs to produce skilled professionals capable of addressing pollution problems.

Here are the key components of the project (1):

1. Develop/revise and enhance new Higher Education programs (Master and Bachelor)/existing courses on Energy Efficient Building and Renewable Energy.
2. Develop the relevant didactics methods, instructional documents and tools, including possibly digital teaching-learning tools/methods
3. Support faculty development and establish faculty cooperation and knowledge sharing network amongst the partner HEI's
4. Establish faculty/student exchange programs to support internationalization of the partner HEI's
5. Develop of laboratory facilities amongst the Partner universities
6. Develop training programs for engineers already working in the industry (building design, construction, and maintenance).

Therefore, this project is a collaborative effort between European and Mongolian higher education institutions to address the pressing issue of environmental pollution in Mongolia. By enhancing the capacity of Mongolian HEIs in the area of energy-efficient buildings and related environmental engineering, the project aims to contribute to the well-being of the Mongolian population and support the country's development in a sustainable and environmentally responsible manner.

3. Dissemination and Exploitation Plan

Dissemination and exploitation plan will ensure that the information will be spread to a large number of potential groups of interest as described on the detailed description of the project. At the same time, it is flexible enough to meet future demands from target groups as described below.

Work package type and ref. nr	**DISSEMINATION AND EXPLOITATION**	**4**
Title	Dissemination and Exploitation	
Related Assumptions and risks	Assumptions: Crediting of the courses, good interest and participation from students and the market in seminars or other marketing activities, effective networking with companies and associations involved. Long time sponsorship Risks: the developed courses and Master examine will not be credited or the market doesn't employ students in the expected number.	
Description	Marketing the newly developed courses will be important in order to get a high enough number of students to the courses. Keeping a laboratory living needs continuous maintenance. This costs money and time. One way of financing this is to sell or rent the facility to the industry. This creates necessary funds and also developed the know-how for the university. The laboratory can also work as a bridge between the university and industrial partners.	
Tasks	Dissemination information days shall be organized for the students, engineering associations, and large companies of the building and energy markets and for authorities to make a new education and their content well known. Advertisements shall be put in newspapers, magazines, and on the Internet about professional seminars and laboratory facilities. To keep the equipment in good condition in the long run sponsorship shall be searched for the laboratories through promotion to employment agencies, enterprises, local authorities, and ministries, soliciting their investment and sponsorship. Enterprises will be invited to give financial support in order to supply fellowship to deserving participants or to collaborate in the thesis drawing up, receiving students, and allowing energy analysis from their plants. They will be invited to use test facilities and to help maintain them. Different methods and communication tools will be used, such as meetings,	

	internet websites, newspapers, radio, local TV, brochures, and posters.			
Estimated Start Date (dd-mm- yyyy)	15-01-2021	Estimated End Date (dd-mm-yyyy)	14-12-2023	
Lead Organisation	German-Mongolian Institute for Resources and Technology (GMIT)			
Participating Organisation	All partner Universities			

Deliverables/ results/ outcomes

Expected Deliverable/Results/ Outcomes	Work Package and Outcome ref.nr	**4.1**	
	Title	Web-site	
	Type	o Teaching material o Learning material o Training material	o Event o Report x Service/ Product
	Description	Project web site is created. Information sources are added to the web-site regularly. All information on the university web-site will be in English and Mongolian.	
	Due date	14-12-2023	
	Languages	English, Mongolian	
Target groups	x Teaching staff x Students o Trainees o Administrative staff o Technical staff o Librarians o Others		

	If you selected 'Other', please identify these target groups. (Max. 250 words)		
Dissemination level	o Department/ Faculty o Institution	o Local o Regional	x National o International

Expected Deliverable/Results/ Outcomes	Work Package and Outcome ref.nr	**4.2**	
	Title	Laboratory training stations	
	Type	x Teaching material x Learning material o Training material	o Event o Report o Service/ Product
	Description	To train faculty member/ staff in the use of experimental equipment, and he/ she will have a component on the use of instrumentation, the application of methods to evaluate integrated renewable energy systems and building performance, and the understanding of the methodologies.	
	Due date	14-12-2023	
	Languages	English, Mongolian	
Target groups	x Teaching staff x Students o Trainees o Administrative staff o Technical staff o Librarians		

	o Others		
	If you selected 'Other', please identify these target groups. (Max. 250 words)		
Dissemination level	o Department/ Faculty x Institution	o Local o Regional	o National o International

Expected Deliverable/Results/ Outcomes	Work Package and Outcome ref.nr	**4.3**	
	Title	Digital Learning Tools	
	Type	o Teaching material x Learning material o Training material	o Event o Report o Service/ Product
	Description	To facilitate the successful implementation of the modules and training, a series of online classes, and training offered.	
	Due date	14-02-2023	
	Languages	English, Mongolian	
Target groups	x Teaching staff x Students o Trainees o Administrative staff o Technical staff o Librarians o Others		
	If you selected 'Other', please identify these target groups. (Max. 250 words)		

Dissemination level	o Department/ Faculty x Institution	o Local o Regional	o National o International

Expected Deliverable/Results/ Outcomes	Work Package and Outcome ref.nr	**4.4**	
	Title	Dissemination information days	
	Type	o Teaching material o Learning material o Training material	x Event o Report o Service/ Product
	Description	Dissemination information days shall be organized in hybrid forms for the students, engineering associations, and stakeholders to make the new education and their content well known.	
	Due date	14-12-2023	
	Languages	English, Mongolian	
Target groups	x Teaching staff x Students o Trainees o Administrative staff o Technical staff o Librarians x Others		
	If you selected 'Other', please identify these target groups. (Max. 250 words)		

Dissemination level	o Department/ Faculty o Institution	o Local o Regional	x National o International

Expected Deliverable/Results/ Outcomes	Work Package and Outcome ref.nr	**4.5**	
	Title	Faculty/ Student Exchange Program	
	Type	x Teaching material x Learning material o Training material	o Event o Report o Service/ Product
	Description	In order to create a professional network that can collectively work together to promote Energy Efficient buildings and related technologies, we will seek an opportunity to train faculty members at European partner universities.	
	Due date	14-12-2023	
	Languages	English, Mongolian	
Target groups	x Teaching staff x Students o Trainees o Administrative staff o Technical staff o Librarians o Others		

	If you selected 'Other', please identify these target groups. (Max. 250 words)		
Dissemination level	o Department/ Faculty o Institution	o Local o Regional	o National x International

4. Dissemination and Exploitation Activities

The dissemination and exploitation activities of the project play a crucial role in ensuring that the knowledge and expertise acquired through the project are effectively shared and utilized. Here's an overview of these activities:

1. **Website Creation:** Developing a dedicated project website is an essential tool for disseminating information and updates about the project. The website can serve as a central hub for sharing project progress, resources, research findings, and contact information for project partners. It can also include a section for public access to project deliverables and outcomes.
2. **Laboratory Training Stations:** Establishing laboratory training stations is a practical approach to transferring knowledge and skills to students and professionals. These stations can provide hands-on experience and training related to energy-efficient buildings and environmental engineering, enhancing the practical aspect of the project.
3. **Digital Learning Tools:** Developing digital learning tools, such as online courses, e-books, or interactive simulations, can help disseminate project knowledge widely. These tools can be accessible to students, educators, and professionals, both within and outside of Mongolia, facilitating learning and skill development in the field of energy-efficient buildings.
4. **Dissemination Information Days:** Hosting dissemination information days or workshops can bring together stakeholders, including educators, students, industry professionals, and policymakers. These events can feature presentations, discussions, and demonstrations of the project's outcomes, sharing knowledge and fostering collaboration.
5. **Faculty/ Students exchange Program:** A faculty and student exchange program is an essential component of the project's dissemination and exploitation activities. This program involves the exchange of both educators and students between Mongolian higher education institutions and European partner institutions.
6. **Other activities:** In addition to the activities mentioned, there can be several other dissemination and exploitation activities within the project.

These activities collectively aim to maximize the impact of the project by reaching a broad audience, including students, educators, industry professionals, and the public. By creating accessible digital resources, organizing practical training, and fostering collaboration through exchange programs, the project can effectively disseminate its knowledge and contribute to the development of Mongolia's higher education sector and its capacity to address environmental challenges, particularly in the area of energy-efficient buildings.

4.1. Web-site

Objective: Establish an informative and accessible project website to centralize project information and resources, enhancing transparency and outreach.

Activities:

1. Task a project team member to create and maintain the project website.
2. Design a visually appealing and user-friendly website that includes essential components (homepage, project overview, news updates, resources, interactive tools, contact information).
3. Ensure the website supports multilingual content, particularly in Mongolian and English.
4. Regularly update the website with news articles, research findings, and educational materials.
5. Promote the website through various channels, including social media, project materials, and academic networks.

The implementation of a comprehensive dissemination and exploitation plan is vital for effectively sharing information and maximizing the impact of the project. The creation of a website (https://www.gmit.edu.mn/eng/p/55) serves as a cornerstone in this strategy, providing a centralized platform for stakeholders to access key resources, updates, and research findings.

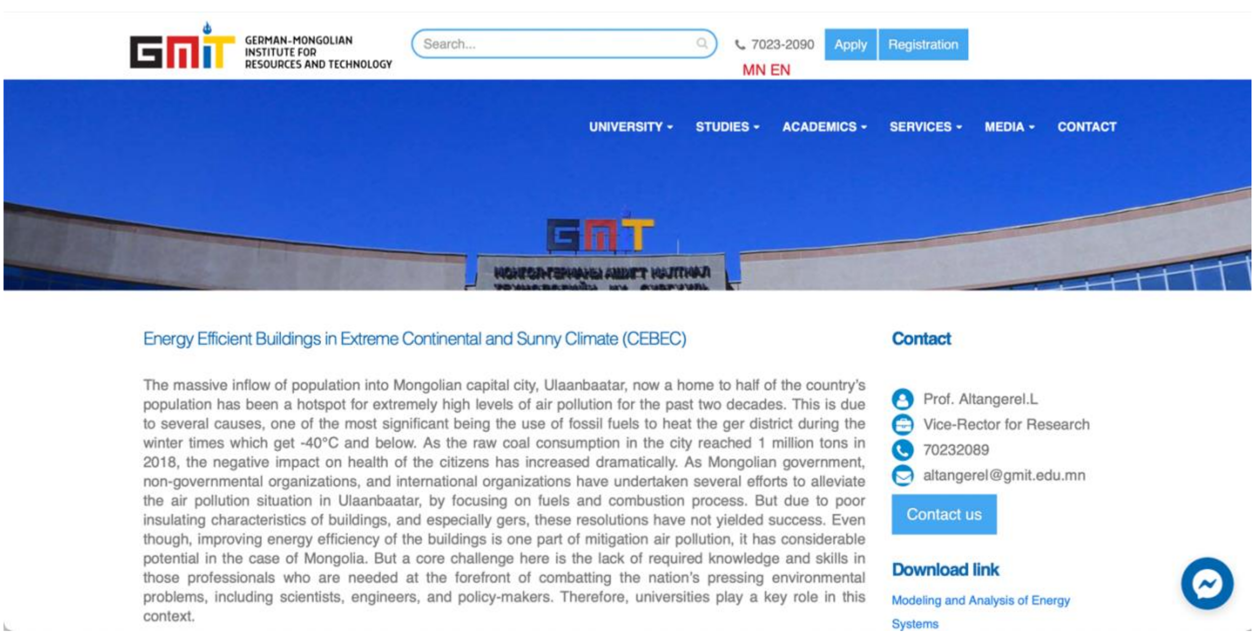


Fig-1: Web-site at GMIT

Additionally, the establishment of a dedicated Facebook page further enhances outreach by tapping into a broader audience and facilitating regular updates.

Fig-2: *Facebook page at GMIT*

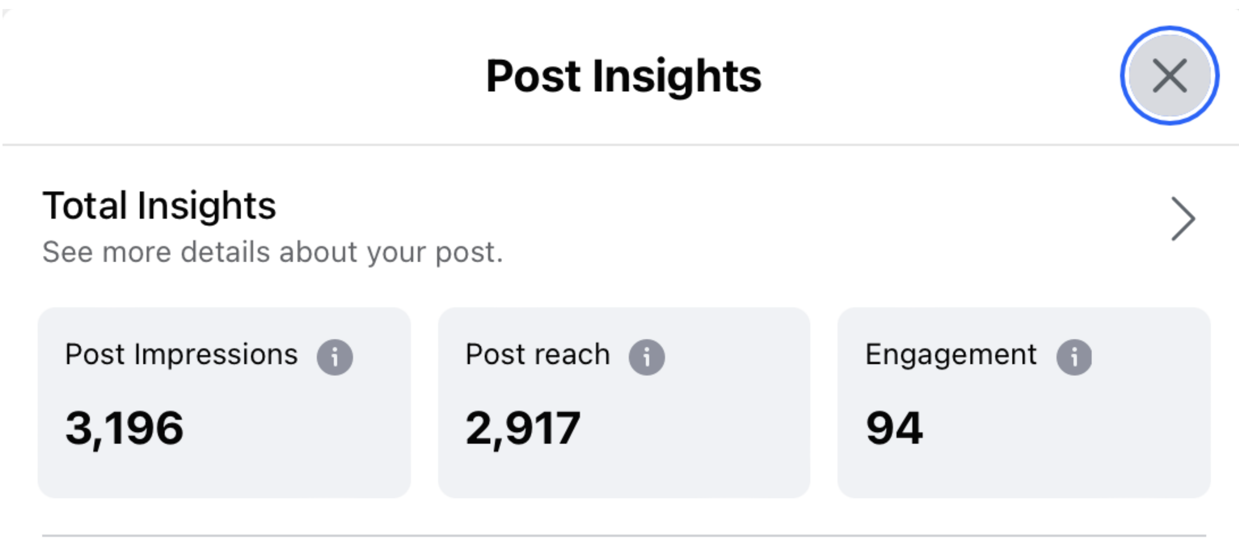


Fig-3: *Insights on Facebook page at GMIT*

Through these channels, we aimed to foster a dynamic and interactive online presence, engaging with our target audience and ensuring the timely distribution of relevant content. By combining the accessibility of a website with the widespread reach of social media, we are well-positioned to disseminate information efficiently and promote the widespread exploitation of our research outcomes.

Please click the following links to visit a website developed by MUST: http://www.scea.edu.mn/mn/page/709 and http://www.scea.edu.mn/mn/page/716

Fig-4: *Web-site at MUST*

In the ever-evolving landscape of digital communication, the synergy between a website and social media platforms amplifies our ability to connect with diverse audiences, foster collaboration, and contribute to the broader discourse in our field. As we continue to adapt and innovate in our dissemination efforts, the integration of these online tools will remain crucial in maximizing the visibility and impact of our work.

4.2. Laboratory training stations

Objective: Establish practical training facilities to transfer knowledge and skills in the field of energy-efficient buildings and environmental engineering.

Activities:

1. Identify suitable locations and secure the necessary infrastructure and equipment for the laboratory training stations.
2. Develop comprehensive training curricula and materials for hands-on learning.
3. Train qualified instructors who can provide practical training to students and professionals.
4. Organize regular training sessions, workshops, and demonstrations.
5. Encourage participation from universities, industry partners, and relevant stakeholders.

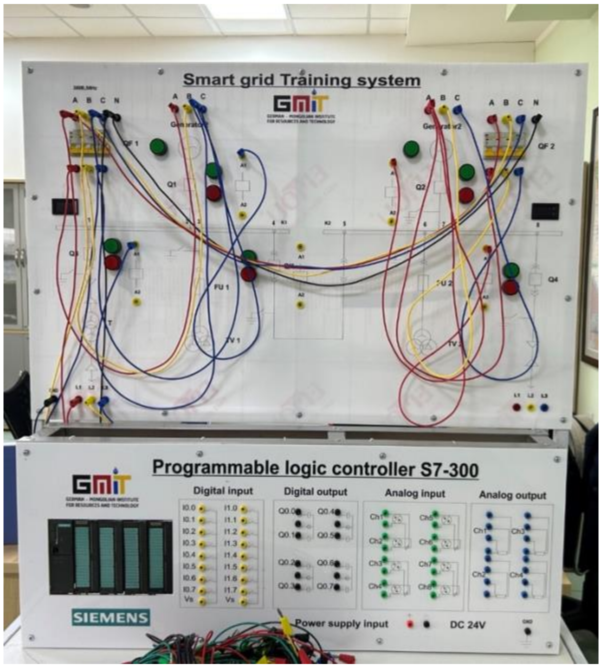
<u>**GMIT**</u>

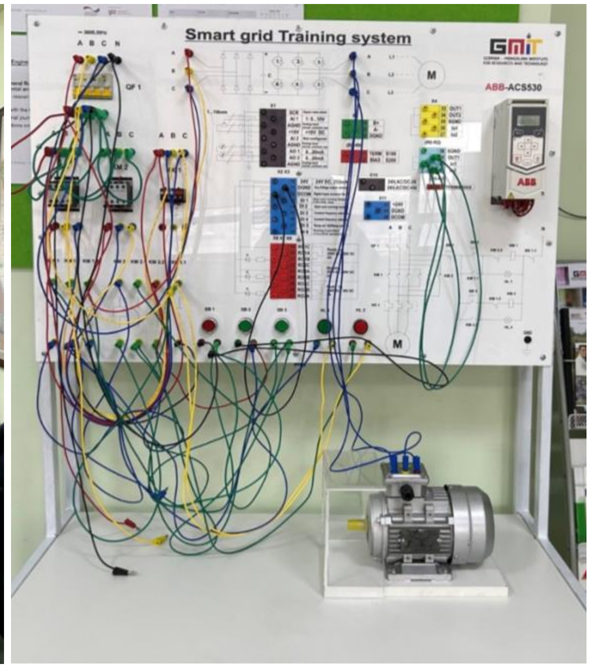
1. **Solar and Wind Training Equipment**

This training system simulate demo wind and solar generate electricity process, enable students to learn wind and solar generate electricity. Wind driven generator is driven by fan, solar energy panel is driven by high work power metal halide. This trainer cultivate students hand on ability, its suitable for engineering university, and training institute, technical schools.

2. **Smart grid training system**

Using the power transmission and distribution trainer kit, and absolute power transmission and distribution system can be assembled. From transformers with tap switches to power circuit breakers and 415V transmission line models, including line terminations with surge impedance. Various experiments can be performed on the transmission and distribution system, including no-load operation of natural loads, asymmetric and asymmetric short circuits, parallel and series compensation of transmission lines, and neutral point connection. It is suitable for teaching and skill training assessment of related majors in higher vocational schools, colleges, secondary vocational schools and technical schools.





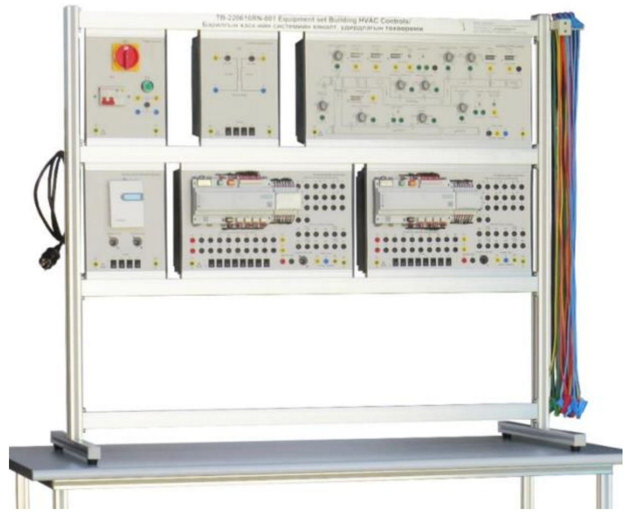
<u>MUST</u>

1. **Heat Pump Trainer**

This training device is used to study refrigeration compression cycle and evaporation system. The compressor drives the refrigerant to carry out the refrigeration cycle, introduces the operation mode of the refrigeration circuit to the students systematically, masters the principle of the refrigeration circuit and the operation mode of the compressor, and displays the system, so that the students can clearly understand the principle in the teaching process. Master the refrigeration principle and piping connection principle of the refrigeration circuit.

2. **Equipment set building HVAC Controls**

This product introduces students to the fundamentals of heating, ventilation, and air conditioning (HVAC). It covers the components used in HVAC systems and teaches the skills needed to work in the HVAC field. Throughout the activity, students will gain practical knowledge on how to install, maintain, and troubleshoot HVAC systems. They are familiar with various HVAC systems. The devices in this range are designed for complete modularity. It can be used to implement many types of HVAC systems and circuits. The device uses residential, industrial and commercial equipment.



3. **Hybrid Renewable Energy Trainer**

The Renewable Energy Training Set is for experimental purposes solar, wind and hydrogen based electricity production. The experimental set is designed according to the curriculum of all institutions requiring technical education can be listed as technical universities, technical high schools and any institution requiring technical education.

<u>MULS</u>

Laboratory of Heating Supply and Energy Efficiency

The laboratory, with a primary focus on indoor air quality and comfort levels, is equipped with cutting-edge technology, including Teledyne FLIR's powerful thermal imaging camera. This advanced tool proves invaluable for searching and detecting electrical and mechanical problems, as well as construction defects. Therefore, students not only engage in simulating wind and solar electricity generation processes but also gain hands-on experience utilizing state-of-the-art equipment for precise problem identification. The wind-driven generator, powered by a fan, and the solar energy panel, driven by high-powered metal halide, enhance the learning experience. This comprehensive approach cultivates students' practical skills, making the laboratory an ideal fit for engineering universities, training institutes, and technical schools.

To conclude, the implementation of lab stations dedicated to energy efficiency and renewable energy has proven to be an effective strategy for disseminating knowledge and promoting hands-on learning experiences. The primary indicator of success, namely the number of students who visited and actively engaged in experiments, serves as a tangible measure of the initiative's impact.

Throughout the duration of the project, we observed a significant increase in student participation, reflecting a heightened interest in the subjects of energy efficiency and renewable energy. The lab stations not only provided a platform for theoretical understanding but also offered a practical and interactive environment for students to apply their knowledge through experiments.

This increased engagement underscores the success of our dissemination and exploitation plan, as it successfully attracted and retained the attention of the target audience. The positive correlation between the availability of these lab stations and the enthusiasm of students for exploring energy-related concepts is a promising sign for the long-term impact of our efforts.

Moreover, the hands-on nature of the experiments facilitated a deeper understanding of the practical applications of energy efficiency and renewable energy technologies. As students actively participated in the experiments, they not only absorbed theoretical knowledge but also honed crucial practical skills that are essential for future endeavors in the field.

In essence, the number of students who visited and engaged in experiments serves as a quantitative testament to the success of our dissemination strategy. The positive outcomes observed in terms of increased interest, participation, and practical learning experiences affirm the effectiveness of our approach in fostering a culture of energy awareness and sustainability within the academic community

4.3. Develop digital learning tools

Objective: Develop digital resources to facilitate online learning and knowledge transfer.

Activities:

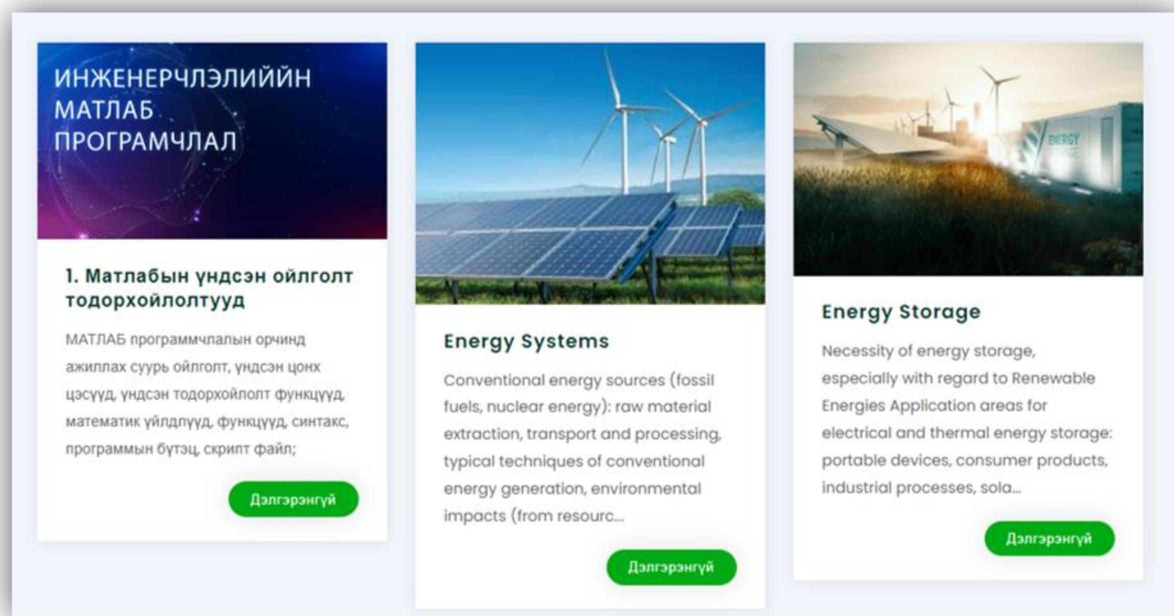
1. Create a suite of digital learning tools, including online courses, e-materials, and interactive simulations.
2. Ensure that these tools are accessible through the project website and other online platforms.
3. Conduct user testing and gather feedback to improve the effectiveness of these resources.
4. Promote digital tools through academic networks, online education platforms, and partner institutions.
5. Monitor user engagement and adapt digital tools based on user feedback.

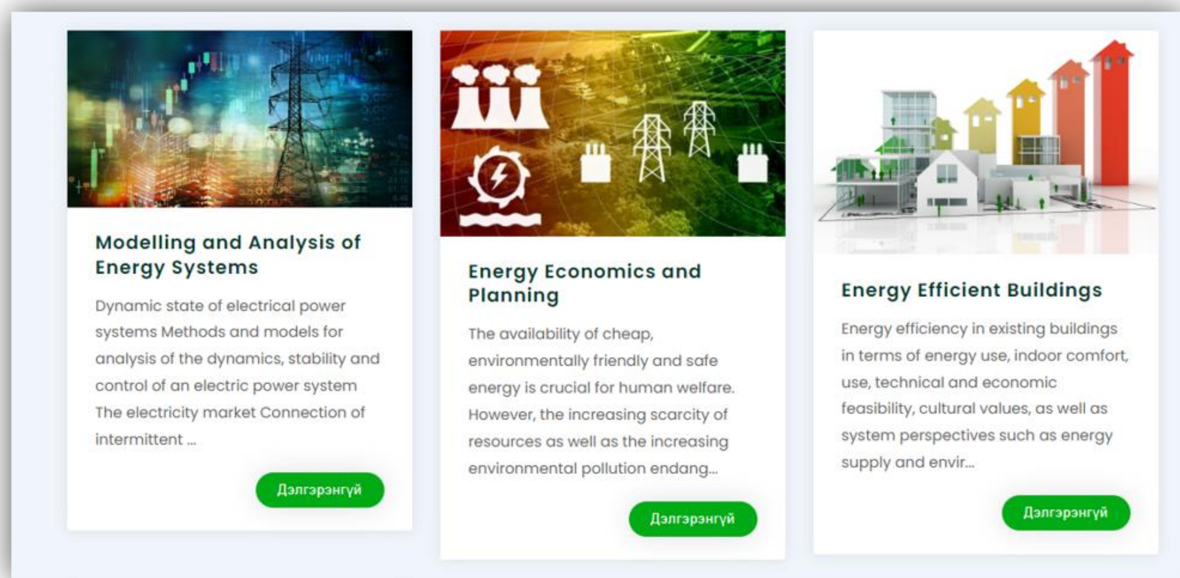
The execution of digital training courses by GMIT has proven to be a resounding success, with two well-organized and impactful sessions. The positive outcomes achieved through these initiatives underscore the effectiveness of our dissemination and exploitation plan. By seamlessly blending virtual and in-person learning experiences, we have reached a diverse audience and contributed significantly to knowledge transfer.

1. ONLINE MATLAB COURSE

The online course developed and was conducted through a dedicated website, accessible at https://matlab.gmit.mn. This platform offered participants a comprehensive learning experience, encompassing the following key components:

1. **Video Lectures**: The course featured a total of nine in-depth video lectures, providing a combined duration of 6 hours of engaging content. These lectures served as the foundation for understanding the course material.
2. **Practice Problems:** Complementing each video lecture were sets of practice problems, designed to reinforce and apply the concepts covered. These exercises allowed participants to enhance their understanding through hands-on learning.
3. **Homework Assignments:** Participants were tasked with homework assignments corresponding to each video lecture. These assignments were crafted to challenge students and encourage a deeper exploration of the course content, fostering a more robust grasp of the subject matter.
4. **User Engagement:** A noteworthy achievement of the course was the active participation of 103 users. This diverse group of individuals joined the program, contributing to a dynamic and collaborative learning environment.
5. **Video Content Consumption:** Collectively, the users dedicated a total of 283 hours to watching the video content. On average, each participant spent approximately 2.7 hours engaged in the course material. Remarkably, 47 users demonstrated a high level of commitment, having watched all the content at least once.





The success of the online course, as evidenced by the significant user participation and extensive video content consumption, underscores the effectiveness of the dedicated platform in delivering a rich and impactful learning experience.

2. MATLAB SIMULINK MODELING AND DYNAMIC MODELING DEVELOPMENT TRAINING PROGRAM

The objective was to empower engineers and technicians with the skills to write code in MATLAB, create and test dynamic models using MATLAB Simulink, handle large datasets, and develop software. The training sessions were conducted by Prof. Ariunbolor from GMIT and taught in English language.

A total of 15 participants were engaged in the MATLAB SIMULINK modeling and dynamic modeling development training program. Twelve individuals represented the Mongolian University of Science and Technology, while three participants were from the Mongolian University of Life Sciences. The overall duration of the training program was 56 hours.

Our commitment to providing accessible and versatile training opportunities has not only widened our organizational reach but has also fostered a culture of continuous learning within our community. The enthusiastic participation and feedback from participants serve as a testament to the relevance and quality of our courses.

As we reflect on the accomplishments of these two sessions, we look forward to building upon this success in future endeavors. The combination of online and offline modalities has allowed us to adapt to the evolving needs of our audience, ensuring a dynamic and engaging learning experience. We are poised to continue making a positive impact, leveraging the lessons learned from these sessions to refine and enhance our future training programs.

4.4. Dissemination information days

Objective: Host information days and workshops to engage stakeholders, share project updates, and discuss findings.

Activities:

1. Organize periodic dissemination information days, seminars, and workshops.
2. Invite representatives from academia, industry, government, and the public to participate.
3. Share project milestones, research findings, and best practices.
4. Encourage discussions and collaboration among participants.
5. Document and share the outcomes and insights from these events through the project website and other channels.

Mongolian partner universities made significant strides in the implementation of our dissemination and exploitation plan through the successful organization and attendance of various events. These information days served as crucial platforms to share our project outcomes, engage with stakeholders, and foster collaborative partnerships within our target communities.

1. EU Days-2023

The Delegation of the European Union to Mongolia (“the Delegation”) celebrated the richness and diversity of European culture through Europe Day on Sunday 14 May for the third consecutive year. Throughout the day, seventy booths showcased and all the projects co-funded by the European Union and its Member States in Mongolia displayed their activities for the benefitting people around Mongolia such as Europe’s unique heritage, vibrant culture, tourism and educational opportunities, and distinctive charms.

Her Excellency, Ambassador Axelle Nicaise of the European Union to Mongolia visited the tent of CEBEC project funded by Erasmus+ program and principal investigators from Mongolian side emphasized the long-term benefits of the project, such as developed curriculums for undergraduate and graduate studies, laboratories, and a significant contribution to Mongolian higher education. Therefore, during the event, we actively engaged with from elderly to young guests to showcase the merits of our project.

Attending Euro Day was an enlightening experience that allowed us to promote such projects, we can drive the transition to a more energy-efficient and environmentally friendly future. Euro Day provided an excellent platform for collaboration and networking, ensuring that the energy efficiency movement continues to gather momentum across Mongolia.

2. RESAT International Conference

“Resources and Technology” (RESAT 2023) was hosted by German-Mongolian Institute for Resources and Technology (GMIT), on June 19-20, 2023. During this prestigious event, a dedicated member of our project delivered a compelling presentation, showcasing the depth and significance of our project's goals and outcomes.

3. SDEE (Sustainable development environmental engineering)

Sustainable development environmental engineering (SDEE)-2023 was held on 23rd of April, 2023 and had about 100 participants**.** During this conference MUST representative delivered a compelling presentation, showcasing the depth and significance of our project's goals and outcomes.

4. Sustainable Building Week

Within the scope of the specific objective, short-term training for HVAC engineers, graduate students, and lecturers, was organized by the MUST from 6th November to 15th November 2023. The training was organized with the support of the Mongolian Association of Civil Engineering.

The EU partner university professors conducted the training. During the training, free software was introduced to simulate solar energy, thermal bridging, and building energy consumption.

5. Dissemination information days at each university

The organization of dissemination and information days at our partner universities has proven to be a pivotal element in the successful execution of our dissemination and exploitation plan. The active engagement and participation of a diverse audience, comprising a couple of hundred guests, underscore the effectiveness of our outreach efforts.

These events served as invaluable platforms for fostering a deeper understanding of the project scopes among attendees, including students, faculty members, and external stakeholders. The high turnout not only signifies the widespread interest in our project but also demonstrates the commitment of our partner universities to actively contribute to the project's success.

The fruitful interactions and information exchange during these days have not only enriched the knowledge base of the participants but have also laid the foundation for potential collaborations and partnerships. By opening the doors of our laboratories to such a large and diverse audience, we have successfully expanded the reach of our project and its goals.

In essence, the dissemination and information days have played a crucial role in achieving our objectives outlined in the dissemination and exploitation plan. The successful engagement of a couple of hundred guests highlights the impact of our efforts and sets a solid precedent for future outreach initiatives.

4.5. Faculty/ student exchange program

Objective: Foster international collaboration and knowledge exchange through faculty and student mobility.

Activities:

1. Establish formal agreements and partnerships with European higher education institutions for exchange programs.
2. Promote faculty and student exchange opportunities within Mongolian and European partner institutions.
3. Create clear application and selection processes for participants.
4. Facilitate orientations and support services for participants before, during, and after their exchanges.
5. Monitor and evaluate the impact of exchange programs on participants and their home institutions.

1. Faculty exchange program in Tallinn

The lecturers of Mongolian partner universities attended a 14 days training course regarding the CEBEC project and its related field of energy efficiency in buildings at Tallinn University of Technology between February 06-20, 2013. The following are the brief summary of the contents included in the course.

- MatLab simulation course
- Indoor air Quality
- Thermal comfort
- Solar and lighting design
- Ventilation
- Energy performance
- Renovation of buildings
- Two-dimensional heat flow, thermal bridges

2. Student exchange program in Lund

According to the "Advanced Curriculum on Energy Efficient Buildings in Extreme Continental and Sunny Climate" (CEBEC) project, the bachelor and master students attended a short training at Lund University in Sweden between April 24 - May 05, 2023.

The primary objective of this training dedicated to students is to impart foundational knowledge of the theoretical aspects of heat and moisture transfer in diverse materials, structures, and components of buildings. Furthermore, the course aims to utilize this knowledge towards developing energy-efficient buildings and optimizing indoor environments to achieve optimal thermal comfort. For this aim, it uses modern calculation systems and programs like System Advisory Module for calculating solar energy and for moisture calculation WUFI - In conjunction with considering the thermal characteristics of buildings and building elements, it is essential to comprehend the moisture status and the impacts of humidity. Prolonged exposure to elevated moisture conditions has the potential to cause damage to building components, and the development of mold on surfaces exposed to high moisture levels can lead to significant health complications.

4.6. Other activities

As outlined in the plan, students engaged in thesis writing and project execution focused on the critical topic of energy efficiency. This initiative not only contributed to the academic growth of the students but also fostered innovative solutions in the field of energy conservation.

The implementation of the Dissemination and Exploitation Plan has yielded commendable results as students actively undertook the task of writing theses and executing projects centered around the pivotal theme of energy efficiency. The strategic alignment of academic research with practical applications has not only enriched the educational experience for the students but has also positioned at Mongolian universities as a key contributor to the discourse on sustainable practices and innovation in the field.

Through in-depth thesis writing, students delved into critical aspects of energy efficiency, contributing valuable insights that enrich the academic community's understanding of the subject. Simultaneously, the execution of practical projects allowed students to translate theoretical knowledge into tangible solutions, fostering a hands-on approach to addressing real-world challenges.

GMIT:

1. Master thesis – 2
2. Bachelor thesis – 1. The topic “Designing an off-grid, battery-backed solar PV system for a gable roof cottage in Mongolia” and the thesis work cooperated with Clean Energy LLC – it is the first private investment company of renewable energy source of wind power plant in Mongolian Energy sector.
3. Scientific project – 3 projects submitted by students (heat loss in dormitory and energy efficiency of dormitory) and 1 submitted by lecturer to address the ventilation system of campus building.

Furthermore, the exploitation strategies have laid the groundwork for the practical application of these academic endeavors. Collaborations with industry partners, exploration of commercialization opportunities, and the formulation of policy recommendations underscore the commitment of Mongolian universities to making a meaningful impact beyond the academic realm. These efforts not only bridge the gap between theory and practice but also position the organization as a catalyst for positive change in the field of energy efficiency.

Looking ahead, we remain steadfast in its dedication to fostering a culture of innovation and sustainability. The integration of thesis writing and project execution within the Dissemination and Exploitation Plan serves as a successful model for future initiatives, demonstrating the organization's commitment to producing knowledge that transcends academic boundaries and resonates in the broader landscape of industry, policy, and societal progress.

5. Conclusion

In conclusion, the successful execution of the planned activities marks a significant milestone in our project's journey to address the critical issue of environmental pollution in Mongolia. The multifaceted approach, encompassing website creation, laboratory training stations, digital learning tools, dissemination information days, faculty/students exchange programs, and other activities, has yielded positive and impactful results.

i. The establishment of a dedicated project website stands as a testament to our commitment to transparency and effective communication. This digital platform serves as a central hub for disseminating valuable information, sharing resources, and keeping stakeholders abreast of project developments. The website has become a crucial tool in fostering collaboration and engagement among diverse audiences.

ii. The implementation of laboratory training stations has played a pivotal role in enhancing the practical skills and knowledge of faculty and students. These hands-on experiences contribute not only to the academic development of individuals but also to the overall improvement of capabilities within Mongolian higher education institutions (HEIs).

iii. The integration of digital learning tools into the educational landscape has modernized the learning experience, promoting accessibility and engagement. As a result, our efforts in this area have not only empowered educators but have also equipped students with innovative tools to navigate the challenges of environmental issues in Mongolia.
iv. Dissemination information days have proven to be effective mechanisms for raising awareness and sharing project outcomes. These events have facilitated constructive dialogue, fostering a sense of community involvement and commitment to sustainable practices.
v. The faculty/students exchange program has been instrumental in promoting cross-cultural collaboration and knowledge transfer between Mongolian and European HEIs. This program has not only enriched the academic experience of participants but has also sparked collaborative initiatives that contribute to addressing environmental challenges.
vi. In addition to the outlined activities, other initiatives undertaken as part of the project have further augmented our impact. These diverse efforts collectively contribute to a comprehensive strategy for mitigating environmental pollution in Mongolia.

As we reflect on the accomplishments of the completed activities, it is evident that the project has not only met its objectives but has also laid the foundation for sustained progress. The exchange of knowledge, the development of skills, and the collaborative spirit fostered by these activities position Mongolian HEIs at the forefront of addressing environmental challenges through enhanced education and innovation.

Looking ahead, the success of these initiatives inspires confidence in the project's continued positive impact on environmental sustainability in Mongolia. The momentum gained from these accomplishments will undoubtedly propel us forward as we strive to build a greener and more resilient future for the nation.