THE REGENERATIVE FUTURE

DRONE AGAINST FOREST FIRE

Thai Summit Group is a Thai manufacturing company. It is a manufacturer of automotive and motorcycle parts, electrical appliances, and agricultural machinery. The company was founded in 1977.

ChangeFusion

A Bangkok-based organization that grow social entrepreneurs for creative and sustainable change.

FabCafe
what do you fab?

A global network now serves and fosters creative technology communities in 14 locations around the world.

THE NEXT FOREST

A service provider focusing on restoring forests with biological science knowledge.

Contents

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17 MARCH	OPENHOUSE
18-21 MARCH	INSIGHT CAMP
24-26 MARCH	TECH CAMP IoT Precision Forestry
27 MARCH	EARTH SHOT

GOOGLE WORK DRIVE WITH PHOTO

Notion

In a dynamic collaboration between Juang Pattana Holding, ChangeFusion, and FabCafe Bangkok, **Regenerative Future 2025** returns for its second year–bolder and more immersive than ever. Designed to empower the next generation to tackle environmental vulnerabilities and climate change, the program builds on last year's success by shifting from foundational learning to hands-on internship experiences.

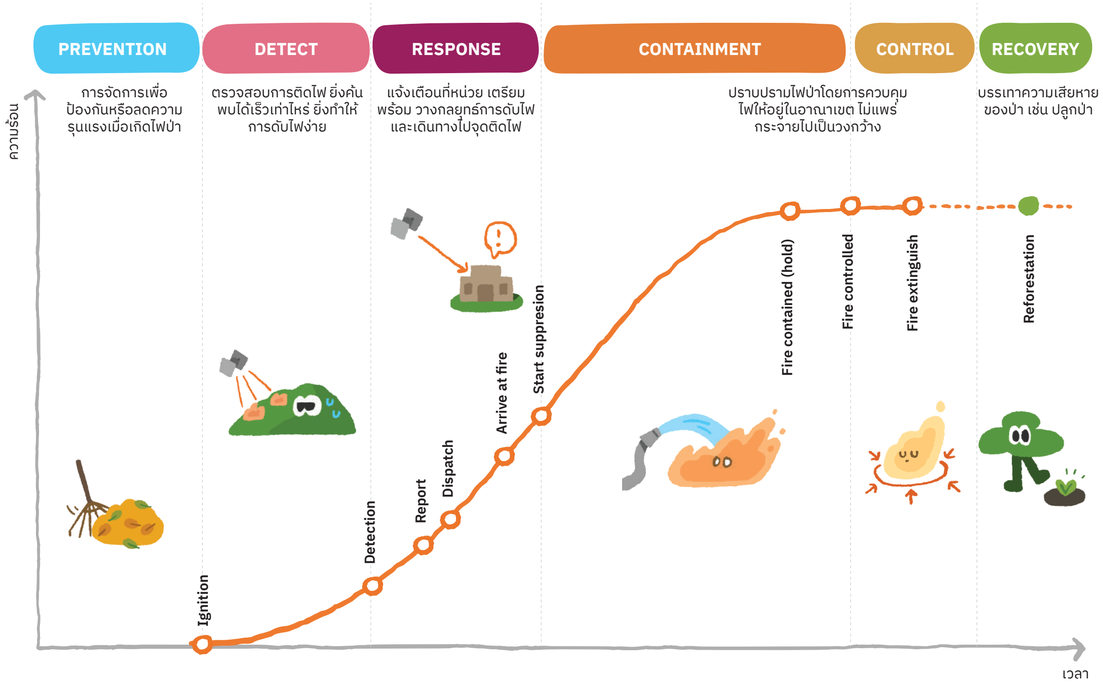
This year, **38 students**–with an average age of 17, from **12 schools across five cities**–were selected to participate: **Chiang Mai (17), Chiang Rai (5), Loei (5), Khon Kaen (7), and Bangkok (4)**. With a nearly equal gender balance of **18 female and 20 male participants**, the cohort brings a rich mix of perspectives and experiences from across Thailand.

Now in its second year, Regenerative Future 2025 shifts from theory to practice by immersing participants in hands-on internships centered around the ongoing forest fire crisis in Chiang Mai. Students investigate the issue from multiple stakeholder perspectives–including those of scientists, local communities, conservationists, and policymakers–gaining not only technical insight but also a deep appreciation for the interconnected social and ecological systems at play. This multidimensional lens encourages a richer, more empathetic approach to environmental problem-solving.

Participants choose between two cutting-edge learning pathways. In the **IoT Forest Fire Monitoring** track, students explore how Internet of Things (IoT) systems can detect and manage forest fires in real time, even in low-connectivity regions. In the **Precision Forestry with Terrestrial LiDAR** track, students use advanced 3D scanning technologies to gather and analyze forest and biodiversity data, enabling sustainable forestry practices grounded in high-resolution spatial insights.

Beyond technical knowledge, the program instills a deeper sense of purpose. Through hands-on fieldwork, collaborative labs, and interdisciplinary exploration, participants begin to see themselves not just as learners, but as contributors to meaningful change. By connecting advanced technologies with environmental stewardship, **Regenerative Future 2025** continues to set a benchmark for transformative education–one that inspires young people across Thailand to imagine and build a regenerative, equitable, and climate-resilient future.

Drone Against Forest Fire



Forest fire management often garners attention primarily for its dramatic and immediate stages of containment and control. However, to address the growing frequency and intensity of forest fires, a broader perspective is necessary. Prevention and detection are crucial elements that can significantly mitigate the impacts of fires before they grow uncontrollable. Early detection systems can dramatically reduce the spread and severity of fires, enabling more efficient resource allocation and response. Moreover, recovery processes are pivotal, often overlooked stages that ensure ecosystems and communities can rehabilitate after a fire. Effective recovery strategies not only restore these areas but also enhance their resilience against future fires.

As forest fires become more frequent and devastating, the use of technology in managing these disasters has become crucial. Internet of Things (IoT) applications and remote sensing technologies have transformed how we detect and manage fires. IoT sensors can monitor forest conditions in real time, providing critical data on humidity, temperature, and other fire-inducing variables directly to firefighting teams. Remote sensing, utilizing satellites and aerial imagery, offers comprehensive landscape surveillance, enabling quicker responses to emerging threats. Among these technologies, drones have become particularly influential. Equipped with thermal imaging and high-resolution cameras, drones offer real-time, accessible, and detailed views of fires, allowing for strategic decision-making that has proven successful in numerous instances. Notably, drones have been effectively used to map fire progression, direct firefighting efforts, and assess damage post-fire.

THE REGENERATIVE FUTURE programs are increasingly incorporating drone technology, heralding a new era of forest fire management. These programs leverage drones not only for damage assessment but also for reforestation efforts. For frontline responders, the benefits are transformative. Drones provide a safer way to evaluate and combat fires, reducing the risk to human life and increasing the effectiveness of firefighting strategies. By integrating advanced technologies such as drones, forest fire management is not only becoming more sophisticated but also more proactive, ensuring that ecosystems and communities are better protected and prepared for future challenges.

Executive Summary

The Regenerative Future project is a focused two-month intensive initiative designed to equip 38 young individuals with the necessary skills and knowledge to address environmental challenges innovatively and sustainably. This year, the spotlight is on tackling the issue of forest fires in Chiang Mai. The program aims to empower students to collect data and develop empathy-driven insights before launching their projects, with a strong emphasis on using drone technology. It features a collaborative effort between academic institutions and environmental organizations, merging local expertise with advanced technological training.

The cohort consists of 38 students–20 males and 18 females from 5 cities. These students represent 12 different schools and have an average age of 17 years.

The Regenerative Future: Implementing Constructivism in Learning

1. Insight Camp: The program begins with a Four-day Insight Camp in Chiang Mai, introducing students to the environmental, social, and economic dimensions of forest management in Northern Thailand. Organized in collaboration with Chiang Mai University, the Forest Restoration Research Unit (FORRU), the Breath Council,, local tribal leaders, and staff from Doi Suthep-Pui National Park, the camp offers a rich, place-based learning experience that blends academic insight with community knowledge.

A key focus this year is **ecological restoration**, with students learning to assess forest conditions and levels of degradation using the **FORRU framework** under the guidance of **Assoc. Prof. Dr. Stephen Elliott**. This foundation in restoration science prepares students for more advanced fieldwork.

Through expert lectures and discussions, students explore the causes of forest fires, their ecological impacts, and current mitigation strategies. Field visits to local forests and interactions with **Hmong communities and conservation volunteers** allow students to witness firsthand the role of local knowledge and grassroots action in forest protection.

By the end of the camp, students leave with a deeper understanding of the challenges and possibilities in forest conservation–ready to take on the hands-on, tech-focused phase of the program.

2. Technology Camp: The second segment of the program, known as the **Technology Camp**, is held in Chiang Mai and serves as a core component of Regenerative Future 2025. This phase is designed to equip students with practical technological skills that can be directly applied to environmental challenges, particularly those affecting local forest ecosystems. At the start of the camp, students choose between two specialized learning tracks: the **IoT Forest Monitoring Track**, which focuses on building sensor networks for real-time environmental data collection in remote forest areas, and the **Precision Forestry Track**, which centers on the use of terrestrial LiDAR and 3D scanning technologies to assess biodiversity and forest health with high spatial accuracy.

Over the course of the camp, students participate in intensive, hands-on sessions where they not only learn to operate advanced equipment but also interpret data, troubleshoot field conditions, and think critically about the implications of their findings. These real-world scenarios, including case studies from the ongoing forest fire crisis in Chiang Mai, allow students to directly apply their technical knowledge to complex, pressing issues. By the end of this segment, students gain a comprehensive understanding of how digital tools can be leveraged for early wildfire detection, forest conservation, and sustainable land management, while also developing the collaborative and problem-solving skills essential for future environmental leadership.

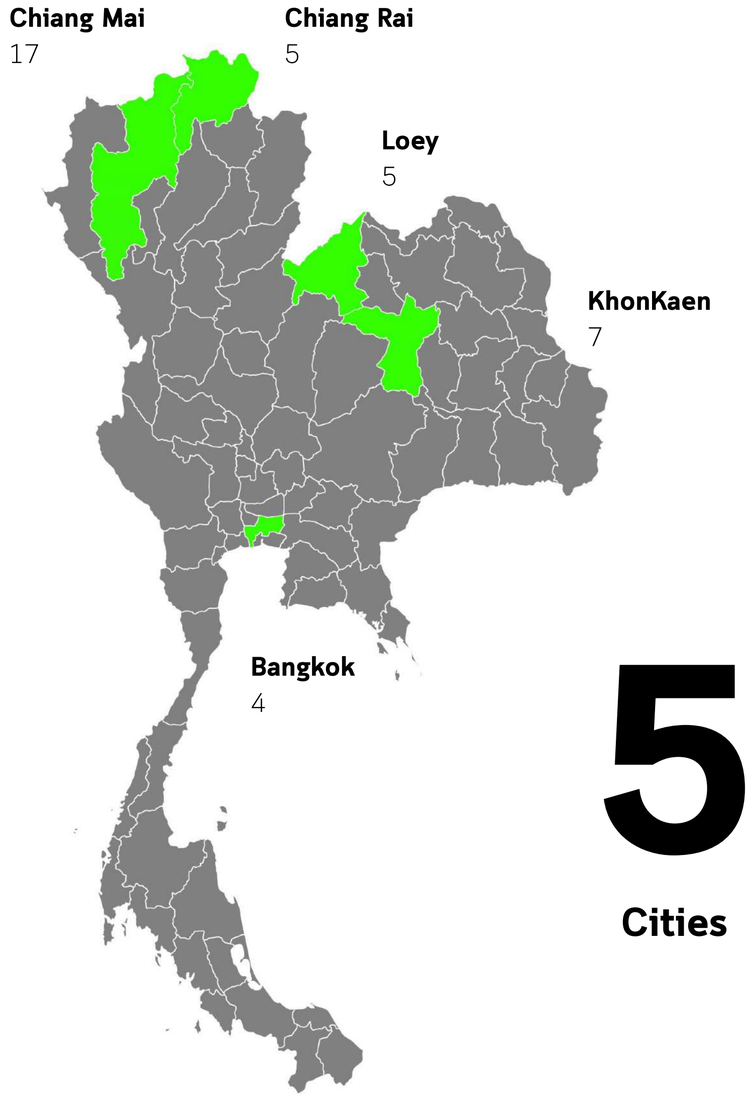
Participant Data

38

Participants

12

Schools



18 **20**

17

Average Age

Teacher excluded

5

Cities

More Detail Data here: https://bit.ly/4jcjddK


ธรรมชาติบันดาลใจ
MOTHER NATURE
THE REGENERATIVE FUTURE


THE REGENERATIVE FUTURE


WILDFIRE

Day 1

Forest Assessment
FORRU

Community Forest
สภาลมหายใจ

Day 2

ชุมชนแม่สาใหม่
FORRU

Day 3

AudioMoth
The Next Forest

Remote Sensing

IoT and Drone for Forest Monitoring
CMU

Day 4

Forest Bathing
The Next Forest

อุทยานแห่งชาติดอยสุเทพ-ปุย

หมู่บ้านดอยปุย

CIVIC Engagement Method

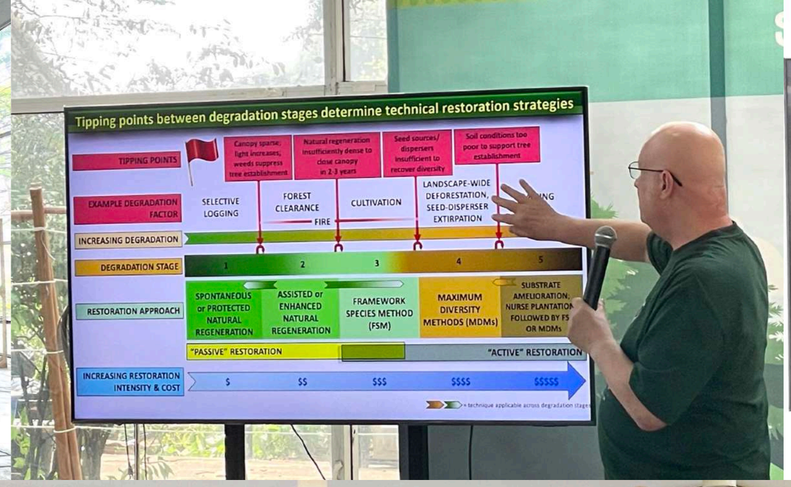
The program is structured into three main sections: Insights, Technology, and LAB Leader. Each part is designed to deepen students' understanding and engagement with forest fire management through a practical and immersive approach.

Insights Section This segment is a Four-day camp in Chiang Mai, designed to introduce students to the complexities of forest fire situations in the region. The camp features seven key insights, each provided by different stakeholders to offer a comprehensive perspective:

Download the Handbook

1. **FORRU Forest Restoration & Assessment**: Led by the Forest Restoration Research Unit (FORRU), students learn the ecological value of forests and are introduced to methods for assessing forest conditions prior to restoration. This foundational knowledge helps them understand how science guides long-term ecosystem recovery
2. **Community Forest Dynamics**: Breath Council imparts knowledge on the importance of community-managed forests and explores the human elements intertwined with these natural resources.
3. **Mae Sa Noi Hmong Community & Biodiversity Learning**: In collaboration with The Next Forest, this session emphasizes forest biodiversity and practical strategies for sustainable forest care. A field trip to the Hmong village of Mae Sa Noi allows students to witness firsthand how Indigenous knowledge and local stewardship contribute to effective forest management.
4. **Open-Source Technology**: **AudioMoth**: Students are introduced to **AudioMoth**, a low-cost, open-source acoustic monitoring device used to collect biodiversity data through sound–helping researchers understand wildlife activity in remote forests.
5. **Remote Sensing for Forest Monitoring**: This session introduces students to satellite-based remote sensing, showcasing how large-scale data is used to monitor forest cover, detect fires, and analyze land use changes over time.
6. **IoT & Drone Applications for Forest Monitoring**: Students explore the development of accessible, low-cost technologies–such as drones and IoT sensors–for real-time forest monitoring. They also examine the challenges and design considerations in deploying these tools in the field.
7. **Forest Bathing (Shinrin-yoku)**
   A guided experience in forest bathing allows students to connect emotionally and physically with nature, cultivating mindfulness and a deeper appreciation of the forest environment.
8. **Stakeholder Collaboration at Doi Suthep-Pui National Park**
   Through visits to Doi Suthep-Pui National Park and Doi Pui village, students gain insight into the coordination required among stakeholders–including park officials, local communities, and the media–to manage and protect forest landscapes effectively.
9. **Civic Engagement Workshop**
   Students reflect on their personal passions and experiences, then begin to envision how they can contribute to forest solutions in their own communities. This workshop uses civic design tools to help students connect individual purpose with collective action.


THE REGENERATIVE FUTURE


Tipping points between degradation stages determine technical restoration strategies
TIPPING POINTS
Canopy sparse; light increases; weeds suppress tree establishment
Natural regeneration insufficiently dense to close canopy in 2–3 years
Seed sources/ dispersers insufficient to recover diversity
Soil conditions too poor to support tree establishment
EXAMPLE DEGRADATION FACTOR
SELECTIVE LOGGING
FOREST CLEARANCE
FIRE
CULTIVATION
LANDSCAPE-WIDE DEFORESTATION, SEED DISPERSER EXTIRPATION
INCREASING DEGRADATION
DEGRADATION STAGE
1
2
3
4
5
RESTORATION APPROACH
SPONTANEOUS or PROTECTED NATURAL REGENERATION
ASSISTED or ENHANCED NATURAL REGENERATION
FRAMEWORK SPECIES METHOD (FSM)
MAXIMUM DIVERSITY METHODS (MDMs)
SUBSTRATE AMELIORATION, NURSE PLANTATION FOLLOWED BY FS OR MDMs
"PASSIVE" RESTORATION
"ACTIVE" RESTORATION
INCREASING RESTORATION INTENSITY & COST
$
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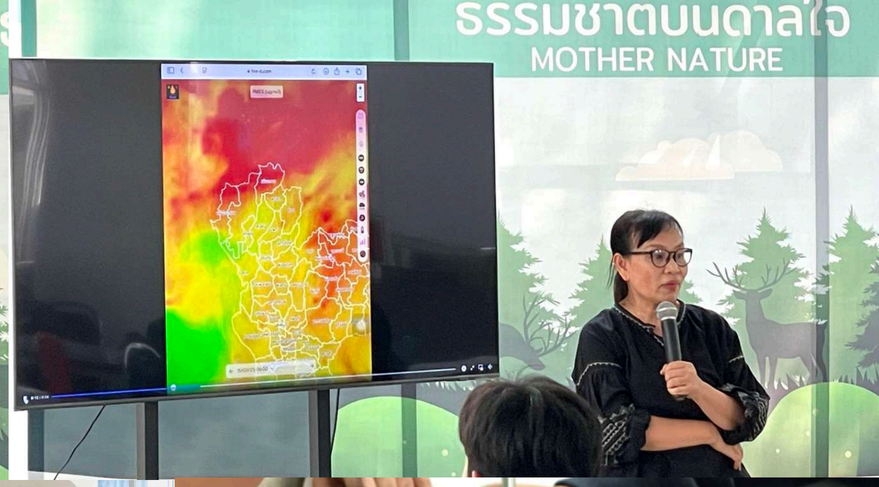
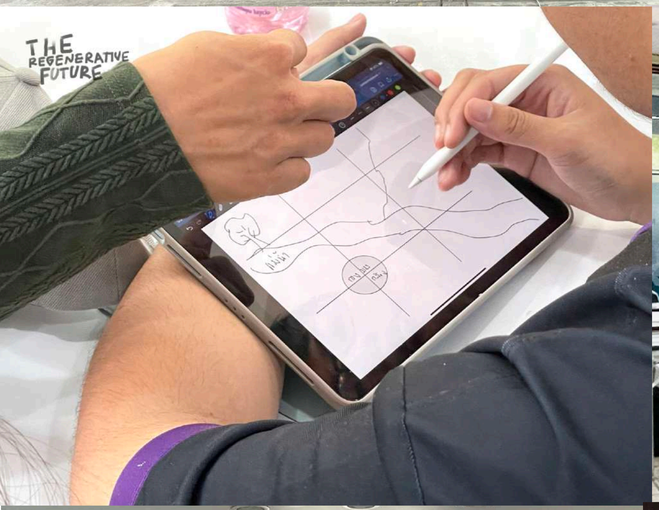
+ technique applicable across degradation stages


ธรรมชาติบนดาลใจ
MOTHER NATURE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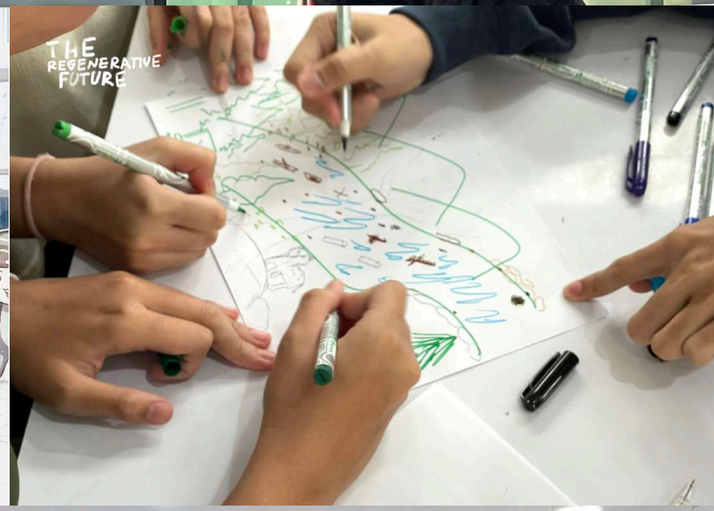
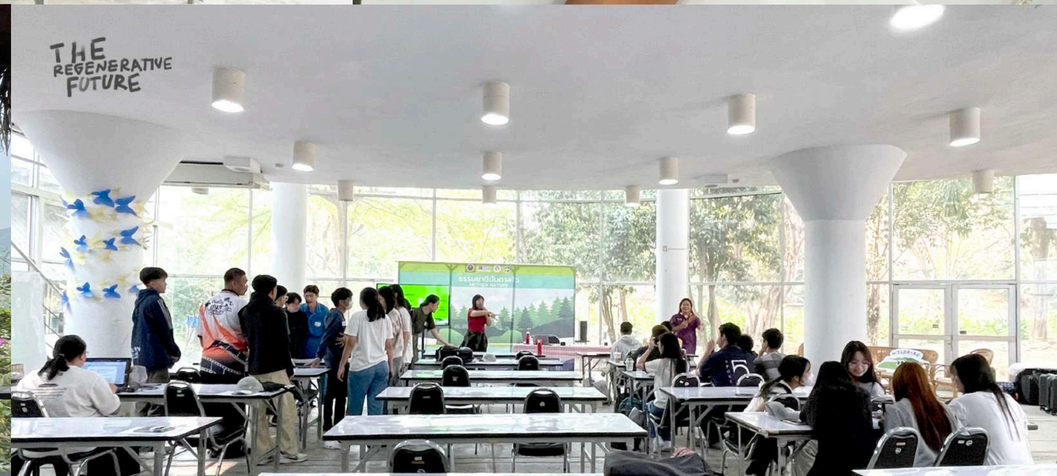

THE REGENERATIVE FUTURE


THE REGENERATIVE FUTURE


THE REGENERATIVE FUTURE


THE REGENERATIVE FUTURE












ธรรมชาติบันดาลใจ
MOTHER NATURE


ธรรมชาติบันดาลใจ
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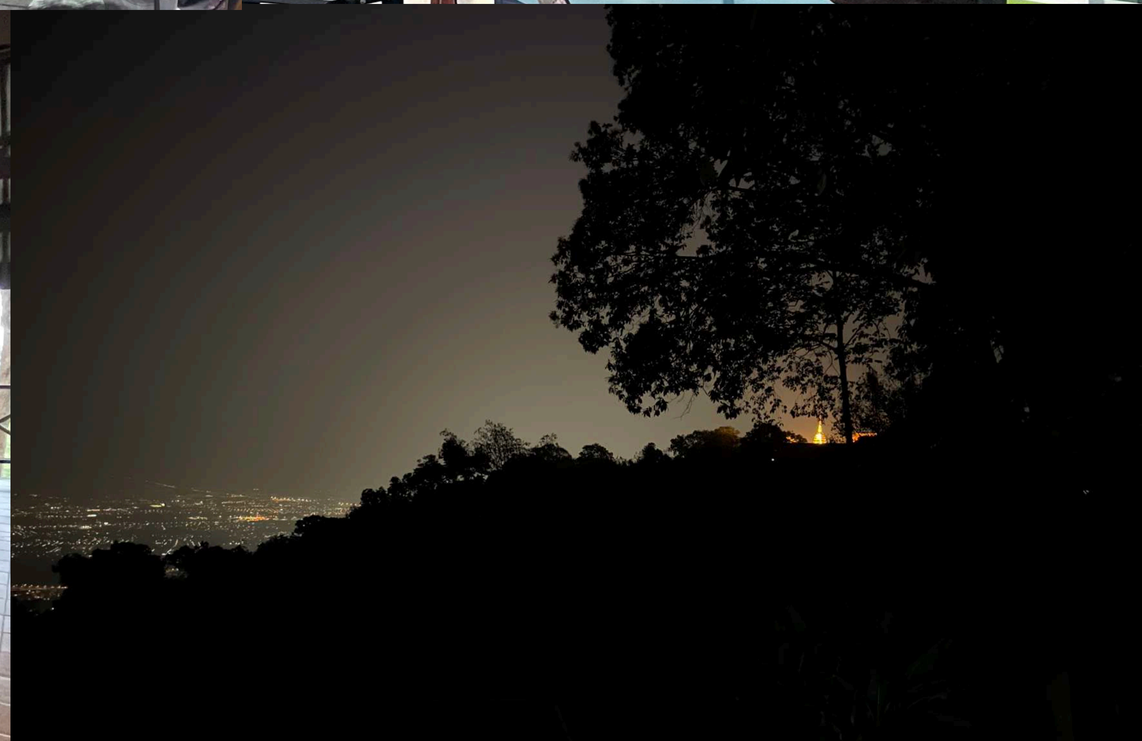



MAKE
MONEY
NOT
FRIENDS





Challenges and Feedback

This year's **Insight Camp** was a great success, receiving a **perfect score of 5 out of 5** from all participants who completed the evaluation. Several improvements were implemented based on feedback from the previous year, resulting in a more engaging and effective learning experience.

Firstly, **ice-breaking and team-building activities** were added at the beginning of the program. These helped students get to know one another, build trust, and collaborate more smoothly throughout the camp. Secondly, the program was extended from **three to four days**, addressing last year's concern that the content was too dense. The additional day allowed for a more relaxed pace, giving students more time to absorb information, reflect, and participate meaningfully.

Another key improvement was the introduction of a **more interactive learning format**. Tools such as **Typeform** and **Mentimeter** were used to facilitate real-time feedback and visualization of student ideas directly from their mobile devices. This shift helped enhance engagement, encourage critical thinking, and bridge the gap between theory and practice. For lecture sessions, the use of **Fireflies AI Notetaker** allowed students to better understand and retain key points, with added support for translation and summarization–making complex content more accessible.

However, some challenges remain. Feedback from schools noted that the **Insight Camp's schedule overlapped with summer sessions**–a critical period for upper secondary students preparing for university entrance exams. As a result, students from highly competitive academic tracks were less available to participate. Most of the participants this year were from Highschool 4-5 or Highschool 6 students who had already secured university admission through early decision programs.

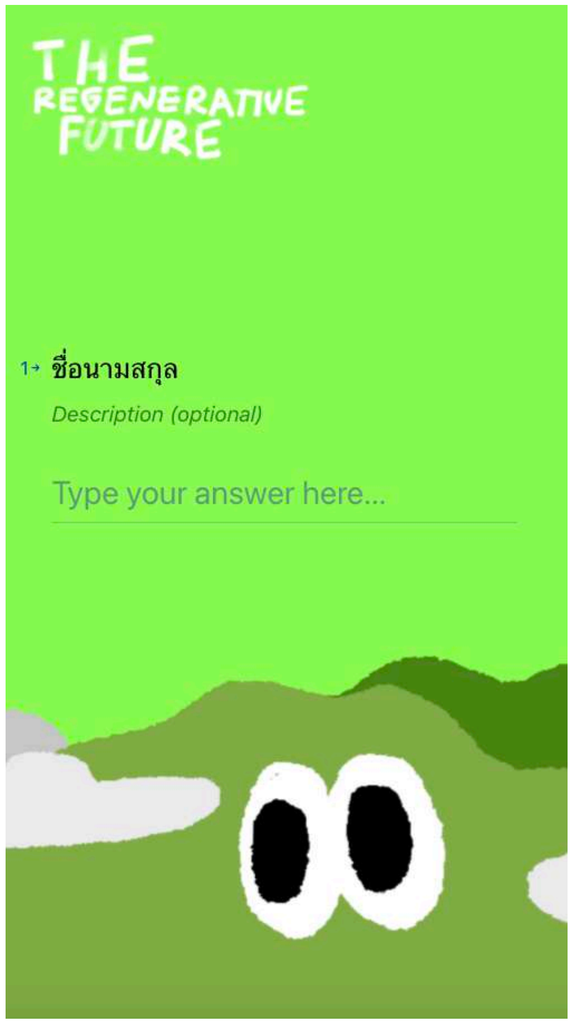
In terms of **student recruitment**, direct communication with schools was not always effective due to internal paperwork processes and lack of follow-up. In some cases, invitations were overlooked. A recommended approach for future editions is to **reach out directly to alumni or specific teachers** who are familiar with the program. Teachers who are informed about the initiative have consistently expressed strong support and are willing to help nominate and encourage students to join.

While the overall feedback for the Insight Camp was overwhelmingly positive, several areas for improvement were noted by both students and staff. A key suggestion centered on **accommodation and food arrangements**, with recommendations to ensure greater comfort and consistency in quality.

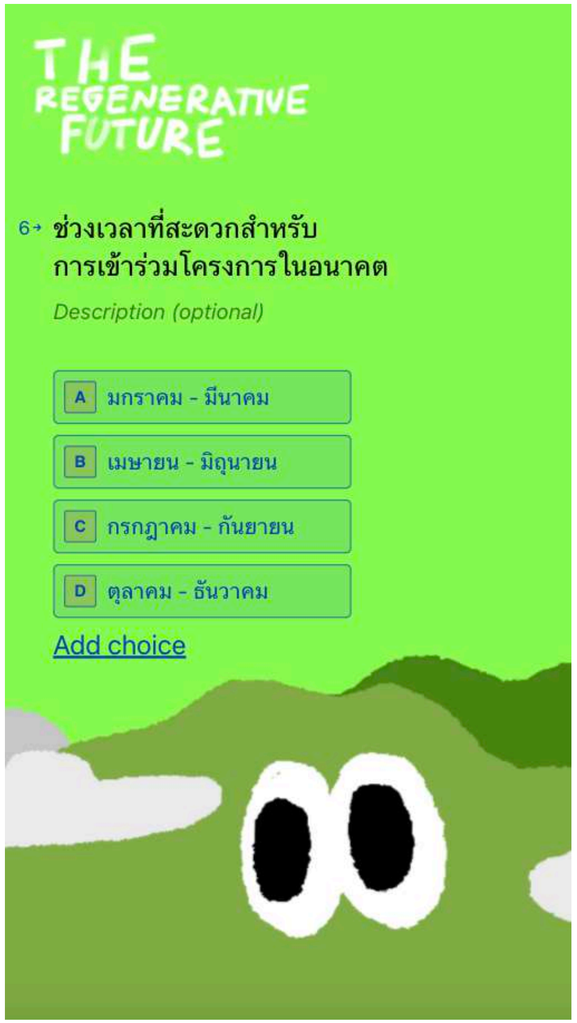
Participants also expressed a desire for **more recreational activities** to help balance the intensive academic content and foster stronger social connections. These moments of relaxation and fun are seen as essential for maintaining energy and enthusiasm throughout the camp.

Additionally, there were calls for a **more precise and stable schedule**. While flexibility is sometimes necessary, last-minute changes–often due to student fatigue or speaker availability–created some confusion. A clearer, more predictable program timeline would help participants better manage their energy and expectations, leading to a smoother overall experience.

Typeform Mentimeter

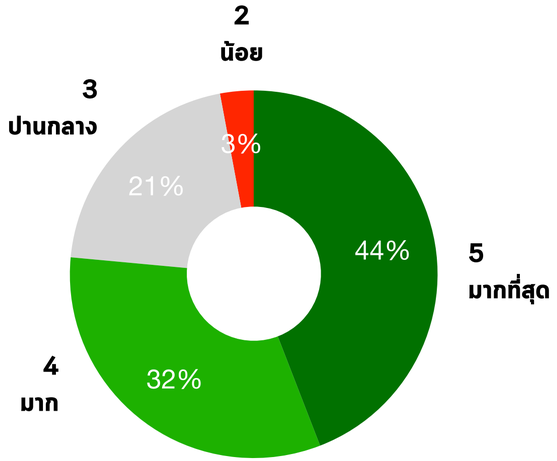

THE REGENERATIVE FUTURE
1→ ชื่อนามสกุล
Description (optional)
Type your answer here...


THE REGENERATIVE FUTURE
3→ ระดับความเข้าใจเกี่ยวกับการนำ
เทคโนโลยีเข้ามาใช้
เพื่อช่วยบริหารจัดการปัญหาไฟป่า
5 ความเข้าใจมากที่สุด
1
2
3
4
5


THE REGENERATIVE FUTURE
6→ ช่วงเวลาที่สะดวกสำหรับ
การเข้าร่วมโครงการในอนาคต
Description (optional)
A มกราคม - มีนาคม
B เมษายน - มิถุนายน
C กรกฎาคม - กันยายน
D ตุลาคม - ธันวาคม
Add choice

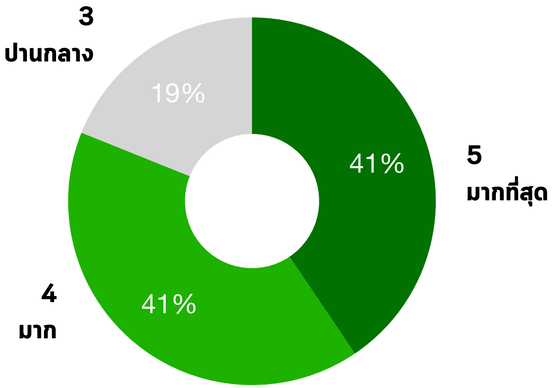
หมวดที่ 1: ความรู้ความเข้าใจ

ปัญหาไฟป่า และกลยุทธ์การจัดการฟื้นฟูป่า
รองศาสตราจารย์
Dr. Stephen Elliott

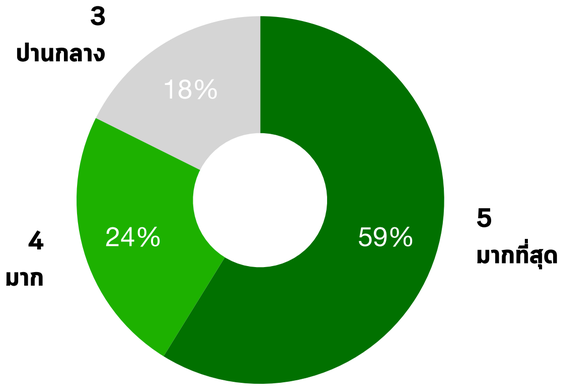


Score (1 = least, 5 = most)

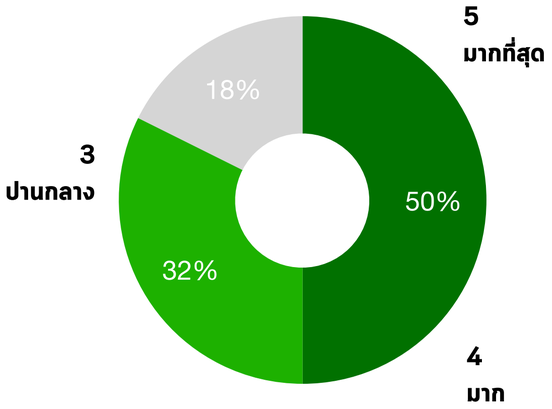
ปัญหาไฟป่า และกลยุทธ์การจัดการไฟป่า
สภาลมหายใจ



การนำเทคโนโลยี Remote Sensing เข้ามาใช้เพื่อช่วยบริหารจัดการปัญหาไฟป่า
พี่หมง



การนำเทคโนโลยี IoT และ Drone เข้ามาใช้ เพื่อช่วยบริหารจัดการปัญหาไฟป่า
ผู้ช่วยศาสตราจารย์
ดร.กำพล วรดิษฐ์



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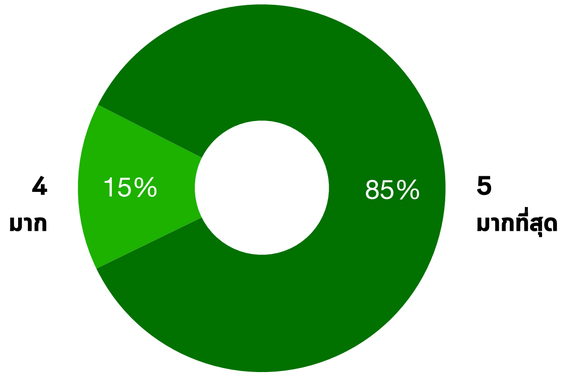
แบบสอบถามจากจำนวน 34 คน จาก 38 คน

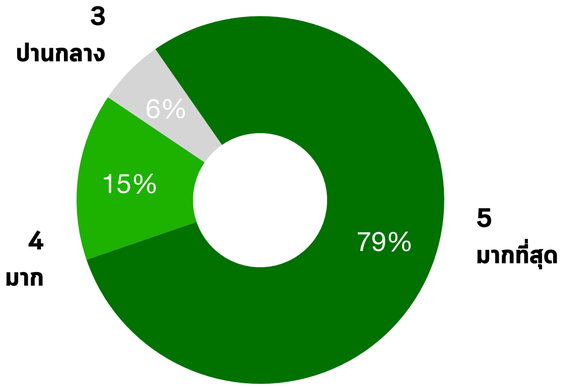
หมวดที่ 1: ความรู้ความเข้าใจ

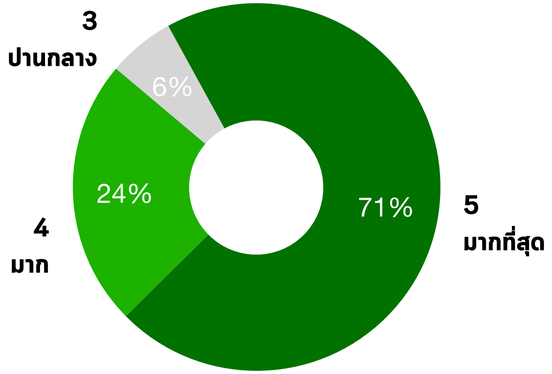
Score (1 = least, 5 = most)

การบริหารจัดการปัญหาไฟป่า
อุทยานแห่งชาติดอยสุเทพ-ปุย



การบริหารจัดการปัญหาไฟป่า
ม้ง แม่สาน้อย





การบริหารจัดการปัญหาไฟป่า
ม้ง ดอยปุย

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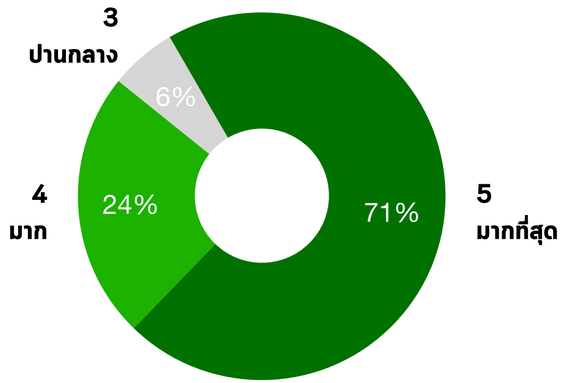
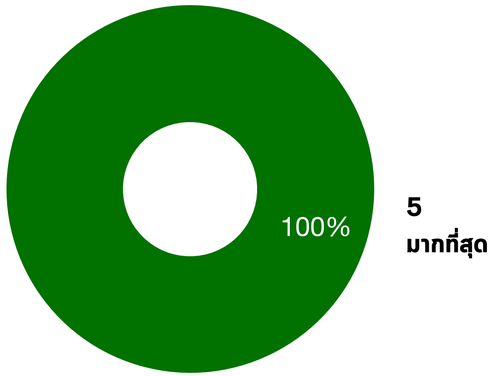
แบบสอบถามจากจำนวน 34 คน จาก 38 คน

หมวดที่ 2: ความพึงพอใจ

ระดับความสะดวกสบายในการเดินทาง

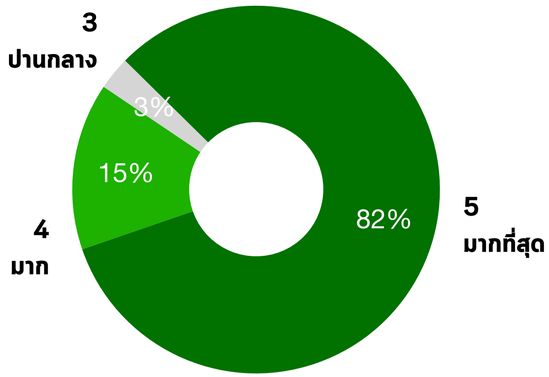


ความประทับใจโดยรวมต่อโครงการ



Score (1 = least, 5 = most)

ความเหมาะสมของสถานที่จัดงาน



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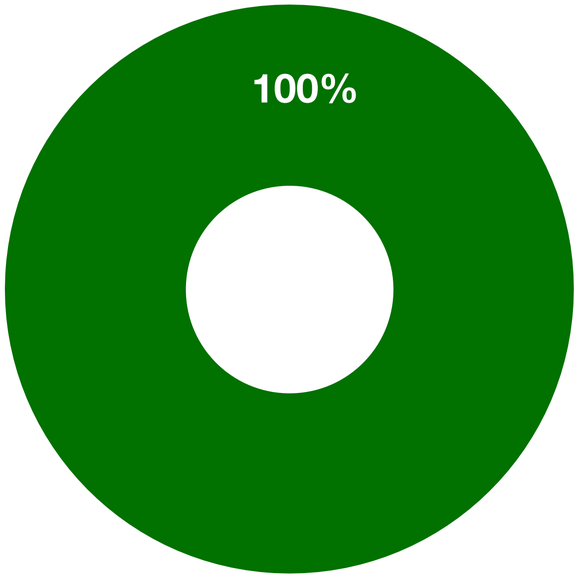
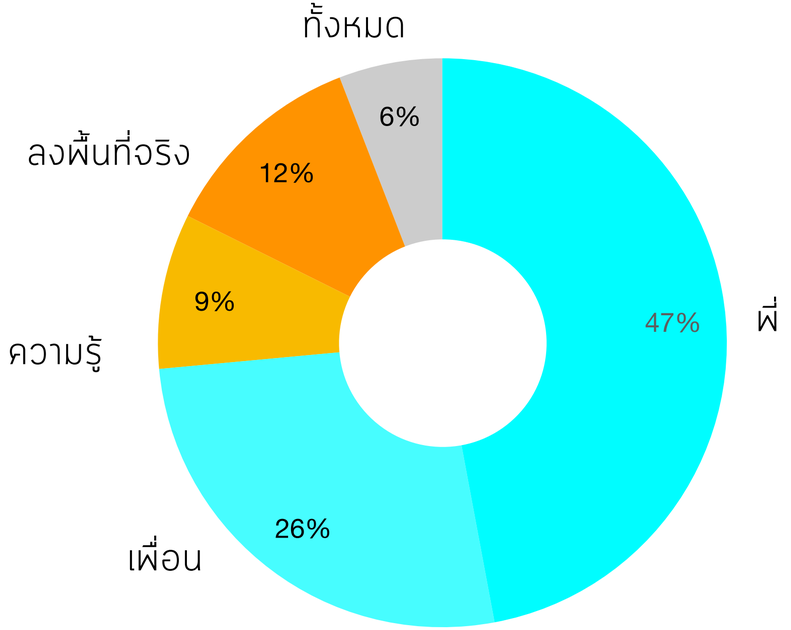
แบบสอบถามจากจำนวน 34 คน จาก 38 คน

หมวดที่ 2: ความพึงพอใจ



5
มากที่สุด

ความประทับใจโดยรวมต่อโครงการ



ปัจจัยที่ส่งผลต่อความประทับใจโดยรวมต่อโครงการ

Positive

ดีอยู่แล้ว
จัดต่อไป
เพิ่มกิจกรรมนันทนาการ
เพิ่มจังหวัดเข้าร่วม
อยากให้มาจัดที่เชียงรายบ้าง
เทคโนโลยีใหม่ๆ
เพิ่มการลงมือปฏิบัติจริง

Negative

กำหนดการแม่นยำ

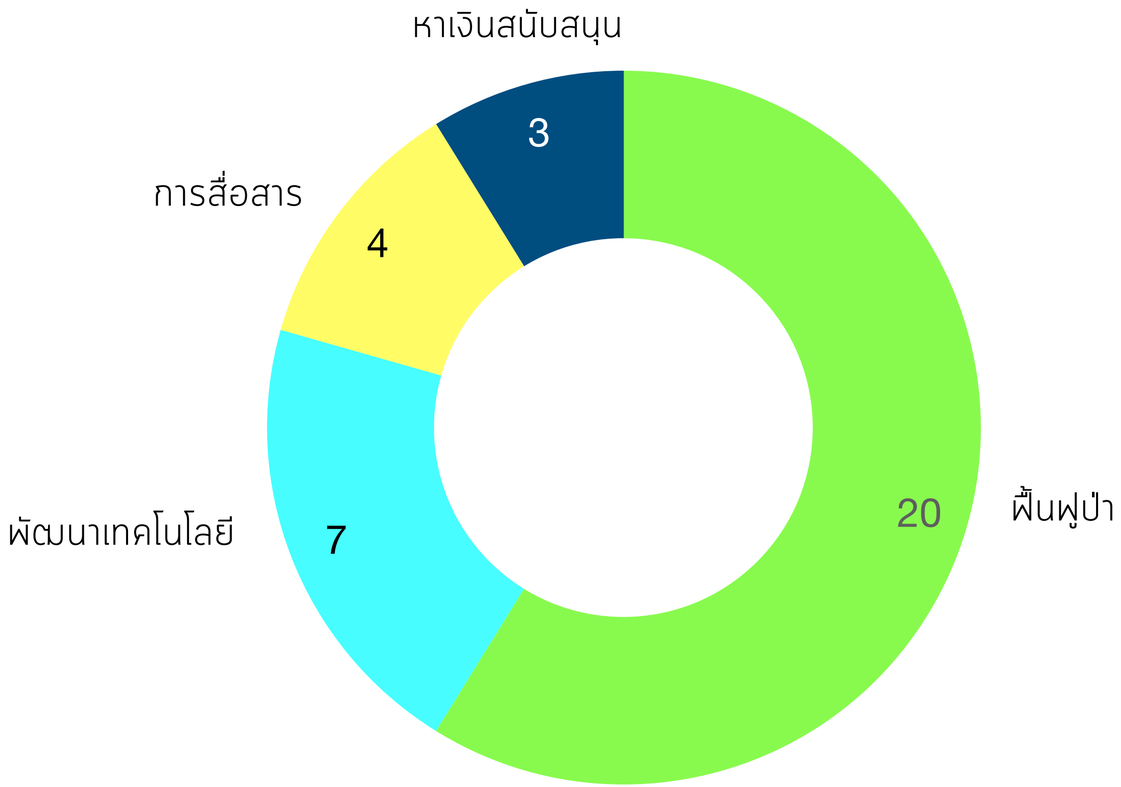
เพิ่มคุณภาพสถานที่จัด
มีปลั๊กเพียงพอ

เพิ่มคุณภาพที่พัก

ข้อเสนอแนะในการจัดค่ายครั้งต่อไป

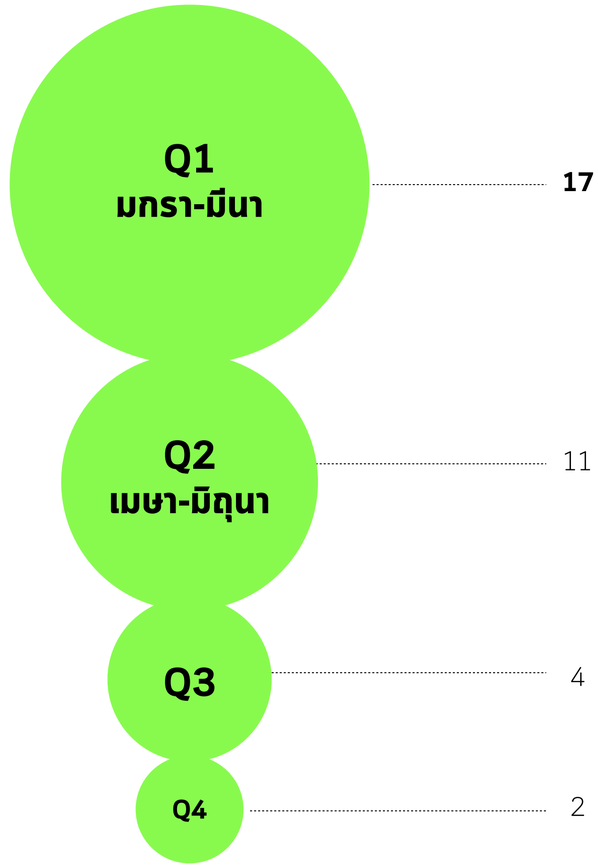
Download INSIGHT EVALUATION

หมวดที่ 2: ความพึงพอใจ



ในอนาคต คุณอยากมีส่วนร่วมในการแก้ปัญหาไฟป่าด้านไหน

แบบสอบถามจากจำนวน 34 คน จาก 38 คน



ช่วงเวลาที่สะดวกสำหรับการเข้าร่วมโครงการในอนาคต

แบบสอบถามจากจำนวน 34 คน จาก 38 คน

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The Technology Camp, the second segment of our educational program, is an intensive 3-day workshop designed to bridge technological innovation with local community needs. Hosted in Chiang Mai, the camp empowers students to apply emerging technologies in real-world contexts, guided by challenges and requests sourced directly from the communities that will ultimately benefit from the solutions.

The camp is divided into two specialized tracks. The first is **the Internet of Things (IoT)** track, held in Pong Yaeng, Mae Rim District, where 13 students explore how sensors, microcontrollers, and data networks can be used to address local environmental and agricultural challenges.

The second track focuses on **3D Scan Precision Forestry** and takes place in Pang Yang, Hang Dong District. Here, 15 students learn how to use 3D scanning technologies, including LiDAR and photogrammetry, to collect and interpret forest data with high accuracy.

Beyond technical training, the Technology Camp serves as a preparatory phase to identify and equip students who will continue on as Forest Lab Interns in the next stage of the program. These interns will take on a more active role in implementing and testing their solutions within the communities, working closely with local stakeholders to refine and deploy technologies that can make a lasting impact.

The 3-day **IoT workshop** began with an introduction to the fundamental concepts of the Internet of Things, helping students understand how connected devices can collect, exchange, and respond to data. Participants visited the community of Pong Yaeng to observe existing uses of IoT technology in the local context. This field visit provided valuable insight into how remote communities utilize technology despite limited connectivity. Following the visit, students explored the topic of IoT applications in areas with poor or no network signals, discussing solutions for data transmission and offline data storage.

The workshop then moved into a hands-on session focused on data logging and data analysis from IoT devices. Students learned how to collect environmental data from sensors, particularly focusing on detecting PM2.5 levels and identifying the presence of smoke in the air. They applied real-time notification techniques by building a system that sends alerts via email or SMS. This interactive session allowed students to experience the full cycle of designing, building, and testing an IoT-based early warning system relevant to the environmental needs of the community.

Read More and Download IoT Workshop

The **Precision Forestry workshop** immersing students in the use of 3D scanning and drone technology to study forest biodiversity. The first day began with an introduction to drone and 3D scan technology. Students received hands-on training in flying drones, developing the skills needed to safely and effectively operate unmanned aerial vehicles in the field.

On the second day, the students traveled to the forest area in Pang Yang, where they applied their drone piloting skills to collect data from the landscape. The goal was to gather high-resolution images and spatial data that could later be used to analyze forest structure and biodiversity. The third day focused on data processing and analysis. Students were introduced to software tools such as CloudCompare and QGIS, which allowed them to process point clouds and visualize the terrain and vegetation data they had captured. Through these tools, they learned how to interpret 3D models and multispectral imagery to identify different plant species, canopy structures, and indicators of biodiversity.

Read More Precision Forestry Workshop

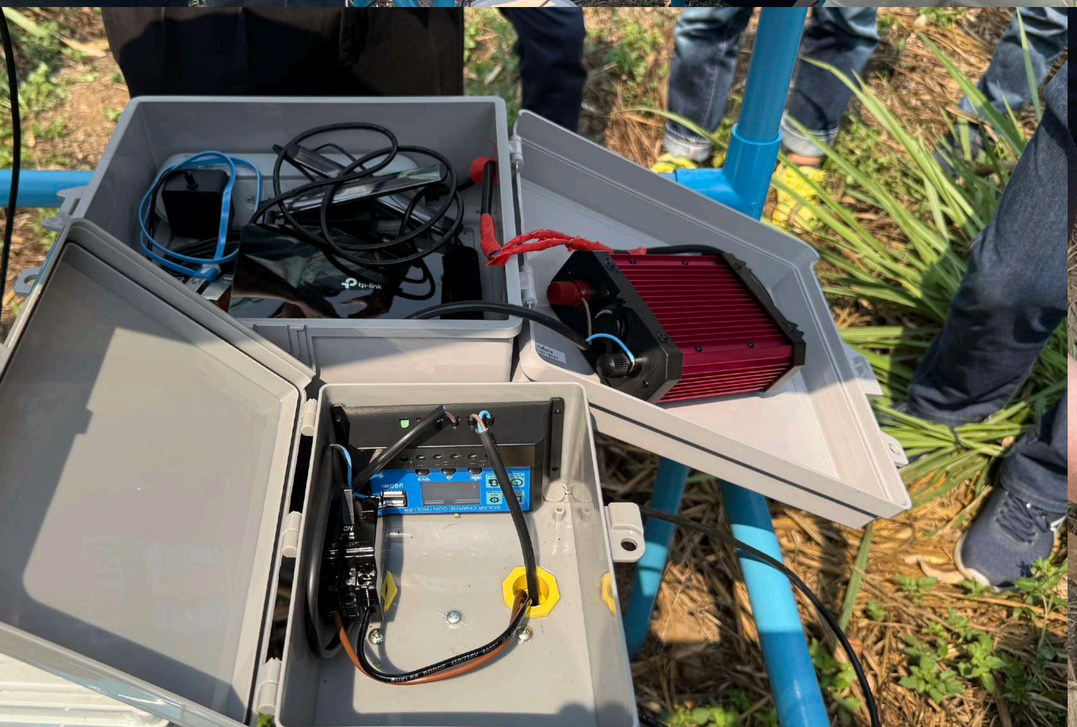
IoT

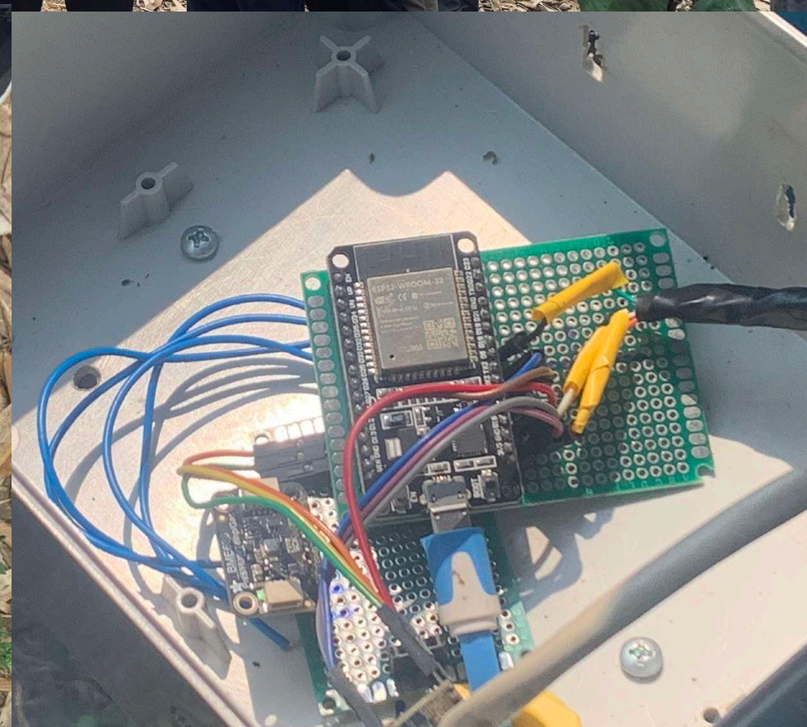
Ban Pong Yaeng, Mae Rim District, Chiang Mai Province

Ban Pong Yaeng is located in Pong Yaeng Subdistrict, Mae Rim District, Chiang Mai Province. The area is characterized by mountainous terrain and forested hills, which are typical of Chiang Mai's natural landscape. These mountainous and woodland areas are particularly vulnerable to forest fires, especially during the dry season when the weather is hot and humidity is low.

Forest fire issues in Chiang Mai have garnered significant public attention. Ethnic communities living in the area have actively collaborated to campaign against and prevent forest burning, aiming to protect the environment and reduce the risk of wildfires. These efforts are part of broader initiatives to monitor and prevent forest fires in the mountainous and wooded regions of Chiang Mai.

Download โป่งแยง



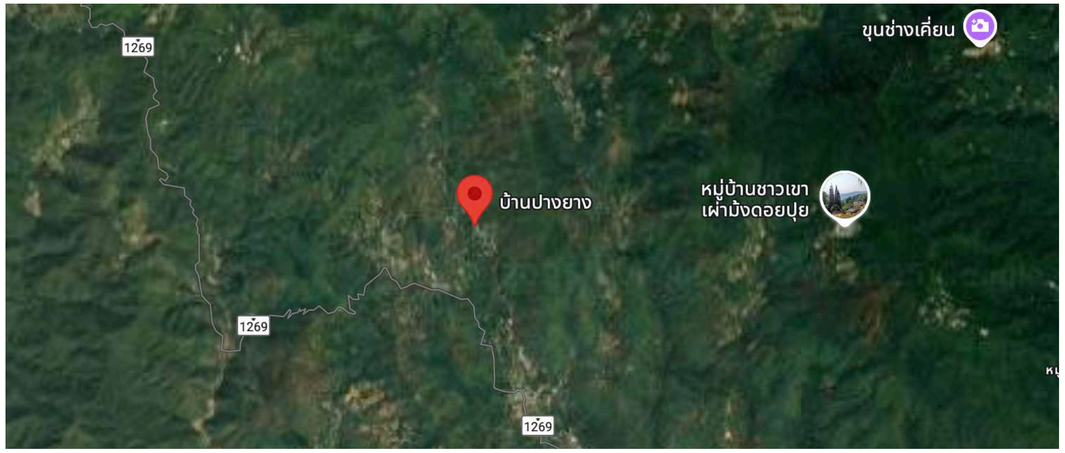


Precision Forestry

Ban Pang Yang, Hang Dong District, Chiang Mai Province

Ban Pang Yang, located in Ban Pong Subdistrict, Hang Dong District, Chiang Mai Province, is home to a population of 210 people, the majority of whom are women and elderly residents. The area has been continuously affected by forest fires. In April 2023, a wildfire broke out near Ban Pong, close to Ban Pang Yang, prompting emergency response teams to act swiftly in order to prevent the fire from spreading further. Additionally, during the same month, officials from Doi Suthep-Pui National Park, along with other relevant agencies, worked to contain another wildfire that had reached Doi Suthep, aiming to avoid a repeat of the devastating fire event in 2020.

In an effort to restore the damaged forest, the Ban Pang Yang community has partnered with various organizations to replant trees in the affected area. In July 2023, they launched the “Mai Yuen Ton, Pa Yang Yuen” (“Everlasting Trees, Enduring Forest”) initiative, aimed at rehabilitating the forest ecosystem damaged by the fires



Download ปางยาง


MAVIC 3E


TO BE
ACADEMY


Executing flight task
sunnysky

The final lecture was delivered by Assoc. Prof. Dr. Steve Elliott, a renowned forest ecologist and co-founder of the Forest Restoration Research Unit (FORRU) at Chiang Mai University. With over three decades of experience in ecological restoration, Dr. Elliott has pioneered practical frameworks for regenerating tropical forests and has been instrumental in shaping community-based conservation practices across Southeast Asia. His work focuses on translating scientific research into real-world action that benefits both biodiversity and local communities.

In his concluding session, Dr. Elliott prepared the new generation to think beyond traditional conservation by introducing seven key technologies that could accelerate forest restoration in the face of climate change and human-driven degradation. He began by recapping his earlier lecture on the FORRU Framework and the Species Selection Method using the RSA–**Rapid Site Assessment**–model. He emphasized that before jumping to solutions, it is crucial to first understand and assess the specific ecological conditions of a site. Restoration, he reminded the audience, must be rooted in deep understanding, not assumptions.

He then outlined a vision of how forest science and emerging technology can work hand-in-hand:

Drone seeding enables rapid reforestation over vast and difficult terrain, using unmanned aerial vehicles to drop native seeds precisely where they are needed. This approach significantly reduces the time, cost, and labor involved in traditional planting methods.

Allelopathy, or the use of plants' natural chemical defenses, offers a more intelligent and ecological alternative to herbicides. By identifying species that naturally suppress weeds, we can support safer, more efficient restoration while maintaining soil and ecosystem health.

AI for automatic species recognition uses computer vision and machine learning to instantly identify tree species through images. This technology can assist field teams in monitoring species diversity and help non-experts participate in restoration with confidence.

Integrated databases for species selection and species/site matching bring together ecological, botanical, and climate data to guide practitioners in choosing the most suitable native species for a specific location. This increases the chance of survival and leads to more resilient ecosystems.

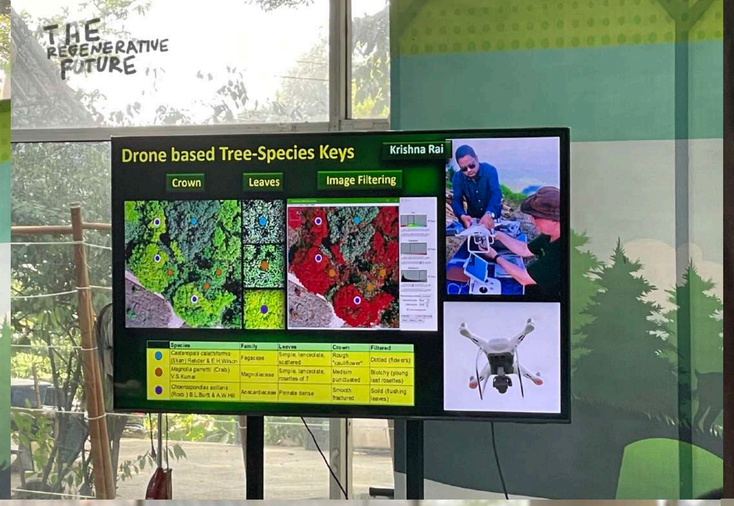
Wildlife monitoring technology is being refined with acoustic sensors, automated camera traps, and other tools that track animal presence in restored forests. These methods give critical insight into the return of biodiversity and help gauge the success of restoration over time.

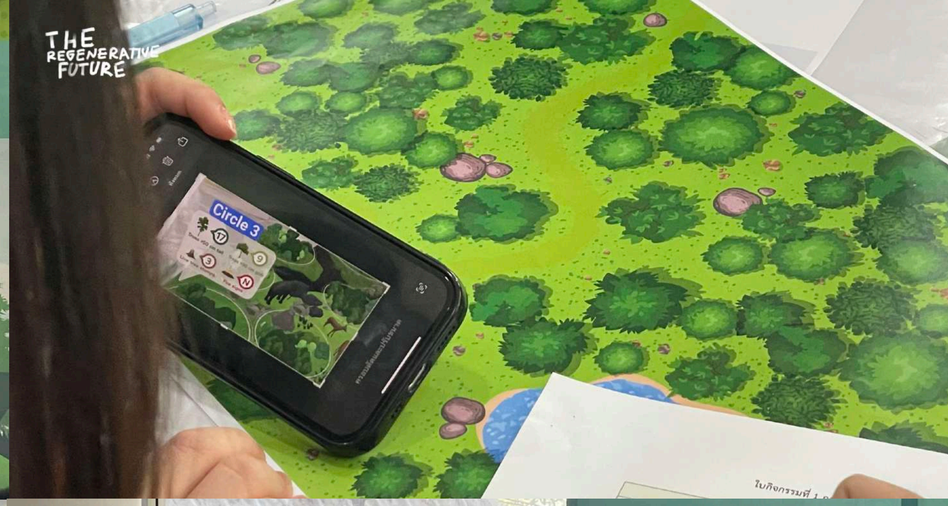
Automated assessment of degradation and restoration, through drone imaging, remote sensing, and AI analysis, allows for real-time tracking of forest health. One particularly exciting idea highlighted by Dr. Elliott was the use of **auto-recharging magnetic stations for drones**, enabling drones to operate continuously in remote areas without manual battery swaps.

In closing, Dr. Elliott offered a powerful and personal reflection. He recalled how, thirty years ago, many believed large-scale forest restoration simply couldn't be done. At the time, there was no clear roadmap, no proven system to bring degraded landscapes back to life. But today, through years of persistence, collaboration, and scientific progress, a complete toolbox of restoration technology already exists. The missing piece, he said, is people–people who know how to put it all together and carry it forward.

So he passed his knowledge to the next generation: "The technology is already here–but we need people who can connect the dots and make it work. So I give this to you–this generation–because it's your world, and your future. Use your tools. Use your power. And help save the planet you live in."

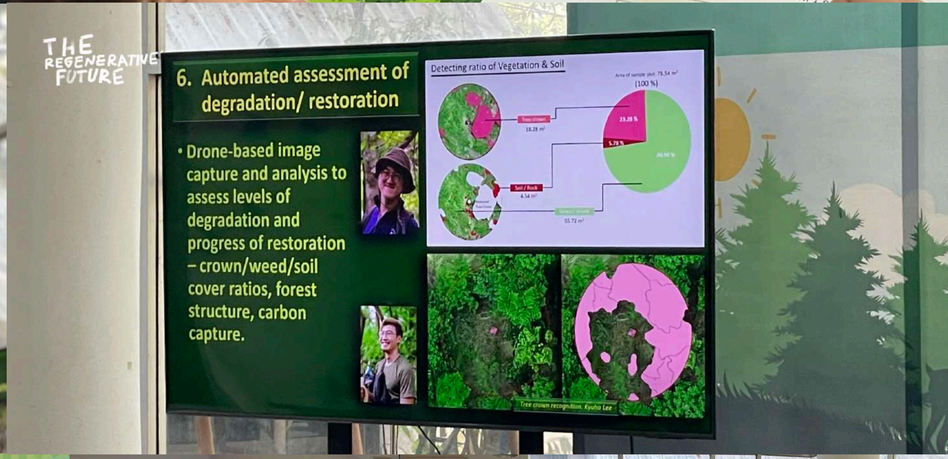

ธรรมชาติบันดาลใจ
MOTHER NATURE
Forest Ecosystem Restoration
Directing and accelerating ecological succession towards an indigenous reference forest ecosystem of the maximum biomass, structural complexity, biodiversity and ecological functioning that are self-sustainable within climatic and soil limitations.

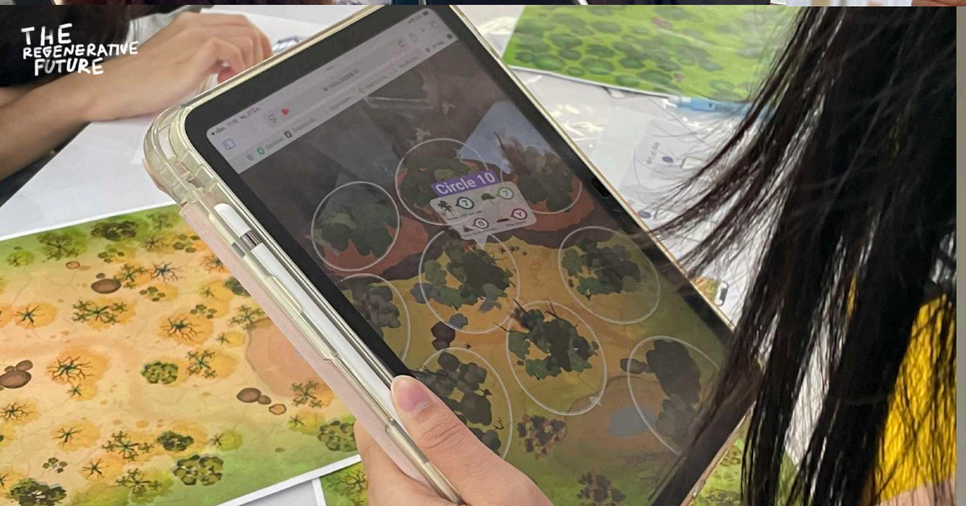

THE REGENERATIVE FUTURE
Drone based Tree-Species Keys
Krishna Rai
Crown
Leaves
Image Filtering

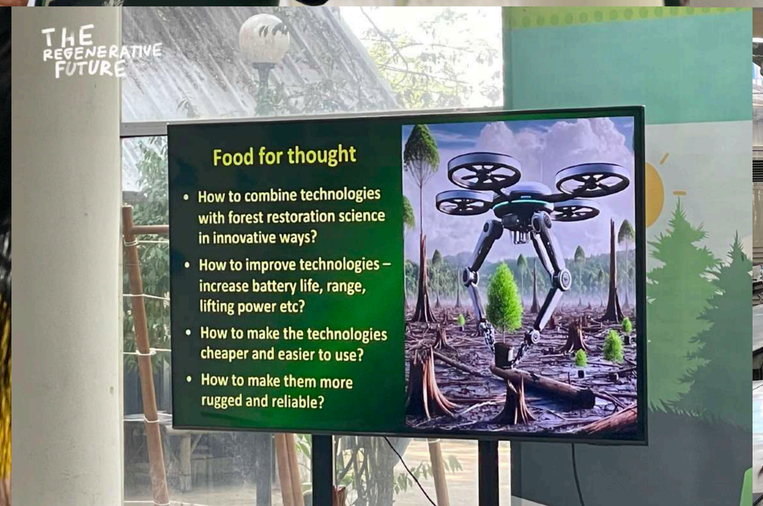

THE REGENERATIVE FUTURE
Circle 3


THE REGENERATIVE FUTURE
ธรรมชาติบันดาลใจ
MOTHER NATURE


THE REGENERATIVE FUTURE


THE REGENERATIVE FUTURE
6. Automated assessment of degradation/ restoration
• Drone-based image capture and analysis to assess levels of degradation and progress of restoration – crown/weed/soil cover ratios, forest structure, carbon capture.
Detecting ratio of Vegetation & Soil


THE REGENERATIVE FUTURE
Circle 10


THE REGENERATIVE FUTURE
Food for thought
• How to combine technologies with forest restoration science in innovative ways?
• How to improve technologies – increase battery life, range, lifting power etc?
• How to make the technologies cheaper and easier to use?
• How to make them more rugged and reliable?


THE REGENERATIVE FUTURE
Drones as monitoring

As part of the concluding session of The Regenerative Future Program 2025, students participated in a final presentation aimed at reinforcing cross-disciplinary understanding and communication. Each group–**IoT** and **3D Scan**–was tasked with presenting what they had learned during the tech camp and explaining their technical knowledge to peers from other groups in accessible terms.

The session served two main purposes:

1. **To assess students' understanding** of their respective technical topics.
2. **To evaluate their ability to communicate their knowledge** to peers without prior technical backgrounds.
3. **To observe their readiness to collaborate in future lab-based, real-world applications**.

The Precision Forestry group focused on drone operations and their applications in forest research. Students shared their experiences learning to pilot drones safely and legally, along with gaining knowledge of national drone regulations. They explained how they collected aerial data and processed it using CloudCompare software to export point cloud data, which was then further analyzed in QGIS to generate meaningful spatial visualizations. A key part of their presentation involved interpreting multispectral imagery, showcasing how different bands of light can reveal insights about forest health, such as identifying stressed vegetation or early signs of forest degradation. Their ability to link drone data with forest monitoring and conservation efforts demonstrated not just technical proficiency but also environmental awareness. (Pdf)

The IoT group explored the development of environmental monitoring systems using ESP32 microcontrollers. Their presentation covered how they built sensors that could operate in off-grid environments without internet access, making them especially useful for fieldwork in remote forest areas. They described how data gathered from these sensors was logged, transferred through local wireless networks, and automatically visualized in online platforms, allowing for efficient reporting and analysis. The group also developed a strategic concept applying their IoT system to the full cycle of forest fire management. They presented ideas covering prevention, detection, emergency response, containment, and post-fire recovery, imagining a network of smart sensors that could alert authorities in real-time and support restoration efforts. Their creative application of technology to a pressing ecological issue was a highlight of the session. (Pdf)

Gallery


THE REGENERATIVE FUTURE
MOTHER NATURE
HATE is not a family value

Challenges and Feedback

The evaluation of the Technology Camp was divided into two main components. The first was **a Learning Summary presentation**, where each group demonstrated their understanding of the workshop content and their ability to successfully complete hands-on activities. Students were required to explain their process and outcomes to peers from other groups, effectively sharing their learning. Both the IoT and 3D Scan Precision Forestry tracks performed exceptionally well in this area. Their presentations were clear, concise, and showcased a solid grasp of the concepts, making it easy for others to understand and engage with their work.

The second component was **a feedback form** completed by the participants. Overall, the Tech camp received an average rating of 4 out of 5. However, the IoT fieldwork section received slightly lower scores. This was largely due to a last-minute change in the field survey location. As a result, the organizer team was unable to conduct a proper pre-survey of the route and relied on Google Maps for navigation. This led to an unexpected challenge–Google Maps did not account for the steep elevation changes in the area, directing participants to a route that vehicles could not traverse. The team had to find an alternative path on the spot, which caused delays and affected the smoothness of the fieldwork experience.

This issue highlighted the importance of conducting a site survey in advance, especially in areas with complex terrain. With better on-ground preparation, such logistical problems can be avoided in future camps, ensuring a more seamless and productive learning experience for all participants.

One of the most memorable aspects of the Technology Camp, as reflected in participant feedback, was the strong sense of **human connection**. High scores were given for the support provided by mentors and facilitators, as well as for the friendships and team bonding that formed throughout the workshop. These interpersonal experiences left a lasting impression on the students and contributed greatly to the overall atmosphere of the camp.

The second major highlight was the **hands-on nature of the workshop.** Participants appreciated the opportunity to engage directly with the technologies they were learning about–whether it was assembling IoT circuits, flying drones, conducting fieldwork, or running real-time simulations. This practical engagement helped students better understand and apply the knowledge in meaningful ways.

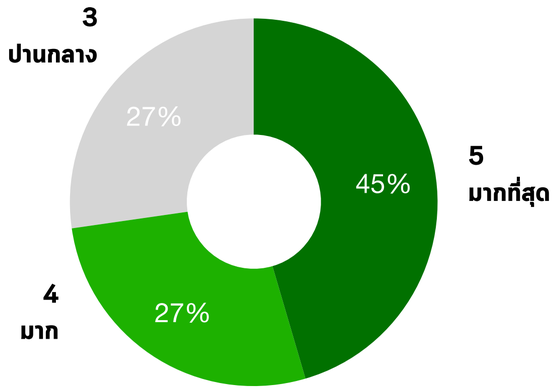
In terms of suggestions for improvement, the IoT group noted that the old projector used in their classroom affected the clarity and quality of the visuals during sessions. In contrast, the Precision Forestry group benefited from using a modern TV display, which made it easier to follow along. However, the Precision Forestry group faced challenges with the internet connection, as their simulations required high-speed internet access.

Beyond **technical facilities**, both groups expressed a strong desire for more time to develop their prototypes and refine their ideas for **real-world implementation**. This feedback will be passed on to the next phase of the program, where selected students will continue their journey as Forest Lab Leaders and have the chance to further apply their designs in real field conditions.

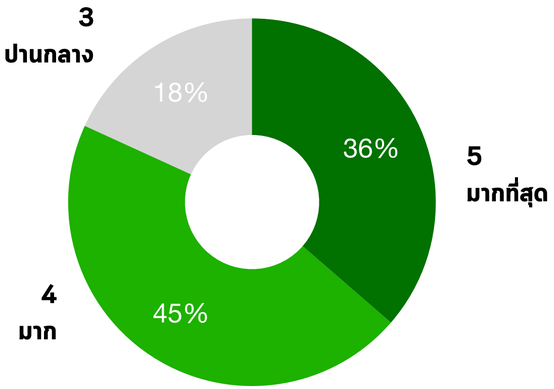
หมวดที่ 1: ความรู้ความเข้าใจ IoT

Score (1 = least, 5 = most)

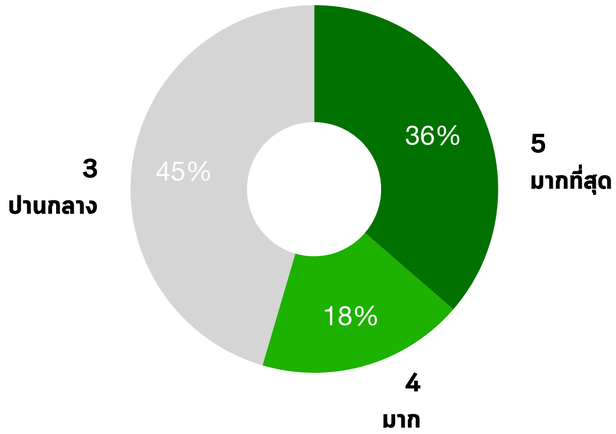
การทำงาน และองค์ประกอบของเทคโนโลยี IoT
ผู้ช่วยศาสตราจารย์
สมรรถพล ตาณพันธุ์



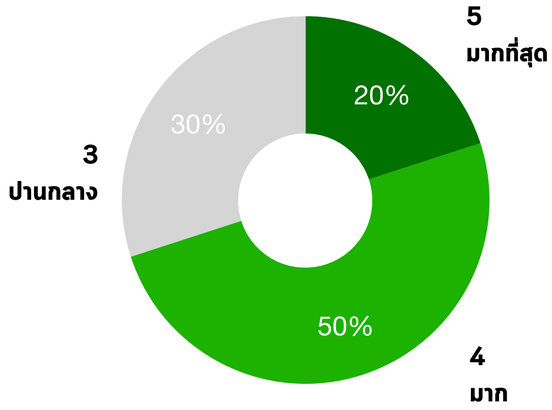
การรับส่งข้อมูลด้วย ESP32
ผู้ช่วยศาสตราจารย์
สมรรถพล ตาณพันธุ์



การเก็บข้อมูล (Data Logging) และ นำเสนอผ่านแผนภูมิรูปภาพ (Visualization)
ผู้ช่วยศาสตราจารย์
สมรรถพล ตาณพันธุ์



การใช้งาน IoT ในพื้นที่ไม่มีสัญญาณอินเตอร์เน็ต
ผู้ช่วยศาสตราจารย์
สมรรถพล ตาณพันธุ์



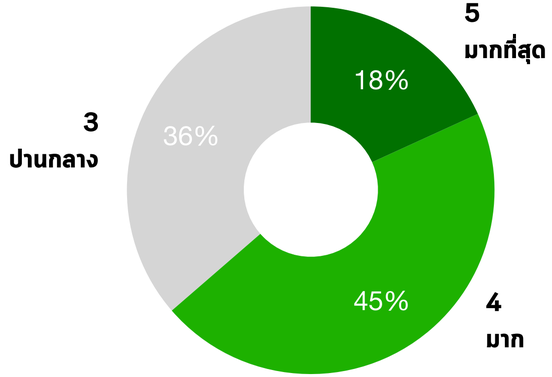
Download IoT TECH CAMP EVALUATION

แบบสอบถามจากจำนวน 11 คน จาก 13 คน

หมวดที่ 1: ความรู้ความเข้าใจ IoT

Score (1 = least, 5 = most)

การบริหารจัดการปัญหาไฟป่าด้วยเทคโนโลยีในพื้นที่
บ้านโป่งแยง



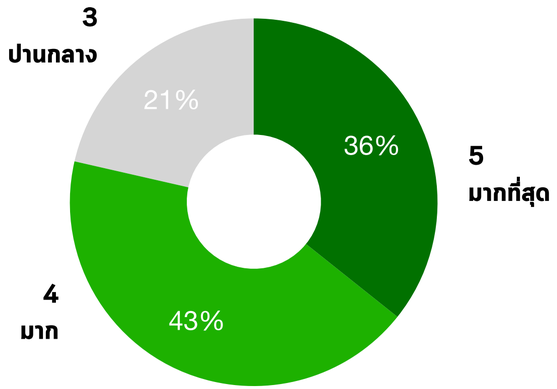
Download IoT TECH CAMP EVALUATION

แบบสอบถามจากจำนวน 11 คน จาก 13 คน

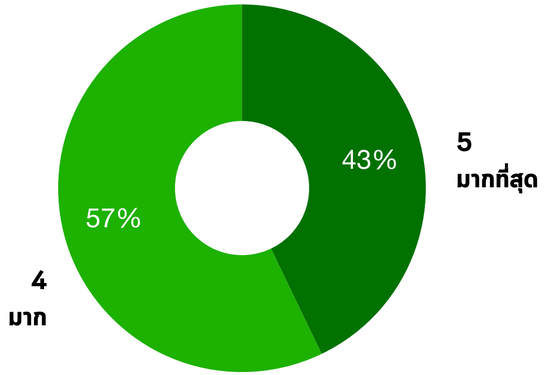
หมวดที่ 1: ความรู้ความเข้าใจ Precision Forestry

Score (1 = least, 5 = most)

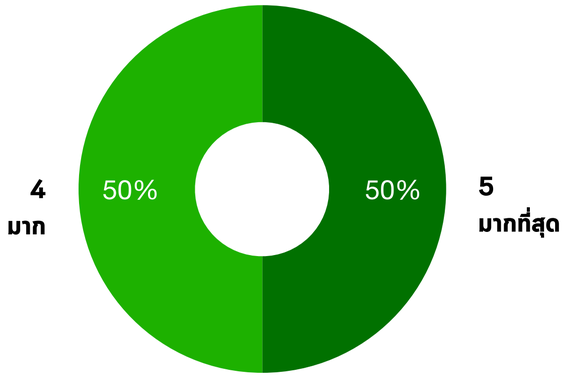
การทำงาน และองค์ประกอบของเทคโนโลยี 3D SCAN
อาจารย์ ร่มฉัตร ชูโชติ



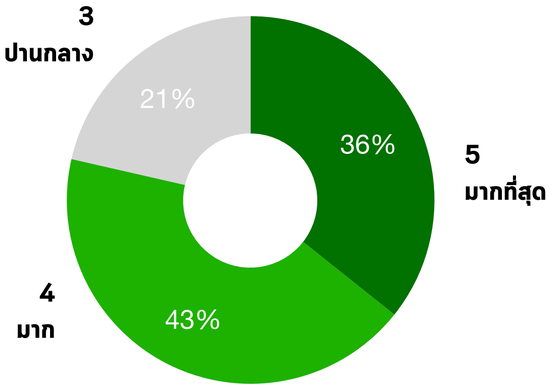
การนำเทคโนโลยี 3D SCAN และ โดรน เพื่อการศึกษาความหลากหลายทางชีวภาพ
อาจารย์ ร่มฉัตร ชูโชติ



เทคนิกการเก็บข้อมูลป่า และ ทดลองสร้างแผนที่ความหลากหลายทางชีวภาพของป่าที่ไปเก็บข้อมูลมา
อาจารย์ ร่มฉัตร ชูโชติ,
คุณ ปิยวัฒน์ แสงเงินชัย



เทคนิกการประมวลผลข้อมูลเพื่อสร้าง 3D Model
อาจารย์ ร่มฉัตร ชูโชติ,
คุณ ปิยวัฒน์ แสงเงินชัย,
คุณ ชุติกาญจน์ จันทรา



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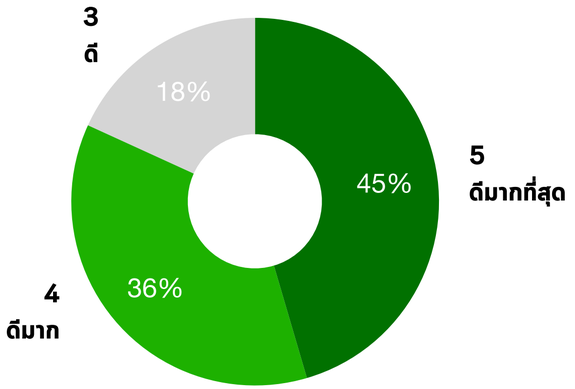
แบบสอบถามจากจำนวน 14 คน จาก 15 คน

หมวดที่ 2: ความพึงพอใจ

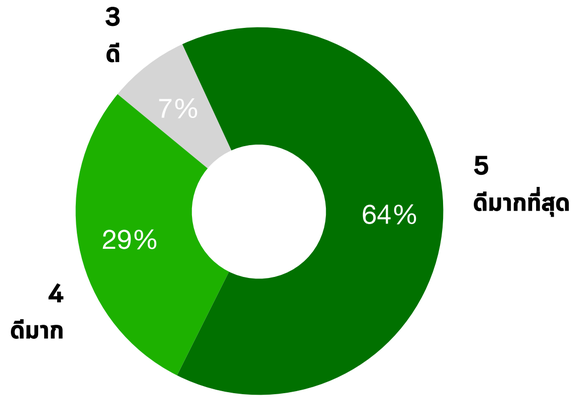
Score (1 = least, 5 = most)

ความเหมาะสมของสถานที่จัดงาน

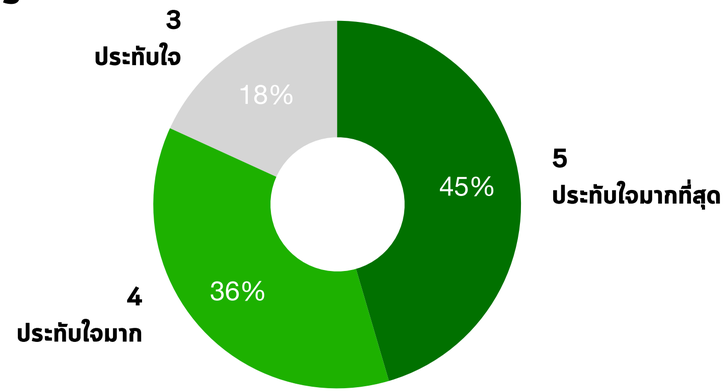
IoT

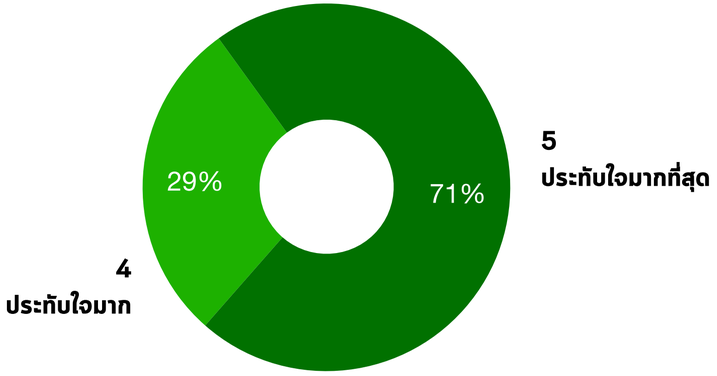


Precision Forestry



ความประทับใจโดยรวมต่อโครงการ

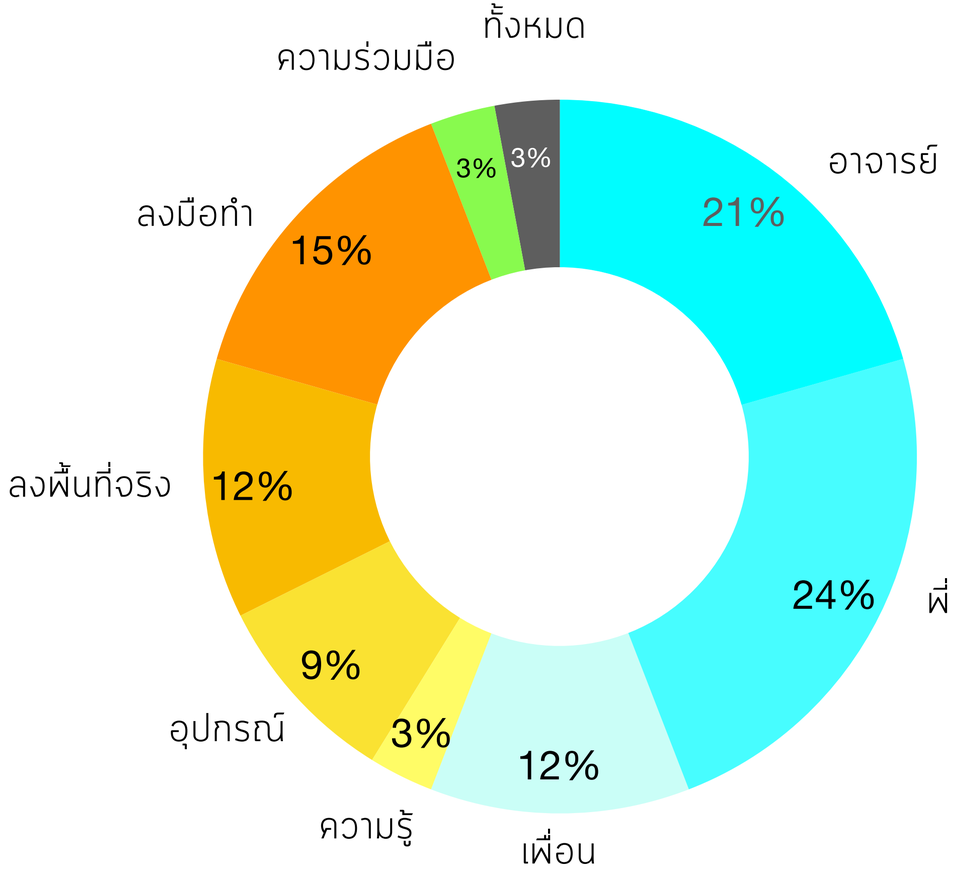




Download INSIGHT EVALUATION PRECISION FORESTRY TECH CAMP EVALUATION

แบบสอบถามจากจำนวน 26 คน จาก 28 คน

หมวดที่ 2: ความพึงพอใจ



<u>ปัจจัยที่ส่งผล</u>ต่อความประทับใจโดยรวมต่อโครงการ

Positive

ดีอยู่แล้ว

จัดต่อไป

เพิ่มกิจกรรมนันทนาการ

เพิ่มการลงมือปฏิบัติจริง

Negative

แจ้งรายละเอียดให้ชัดเจน

อยากได้ความรู้มากกว่านี้
วิธีการนำเสนอข้อมูลในการสอน

ความเสถียรของ Internet
TV แทน Projector

ข้อเสนอแนะในการจัดค่ายครั้งต่อไป

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แบบสอบถามจากจำนวน 26 คน จาก 28 คน

Section 2: People

Effective management of forest fires in Chiang Mai involves a diverse range of stakeholders, each playing crucial roles in prevention, mitigation, and recovery efforts. Understanding these stakeholders is vital for coordinated actions and effective communication during fire incidents. Here's an overview of the primary stakeholders involved in forest fire management in Chiang Mai;

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1. **Local Government Agencies**
    - **Chiang Mai Provincial Administration**: Manages overall governance and coordinates between various departments and sectors for fire prevention and control.
    - **Department of Disaster Prevention and Mitigation (DDPM)**: Responsible for planning and implementing measures to prevent and mitigate natural disasters, including forest fires.

2. **Environmental and Forestry Departments**
    - **Royal Forest Department (RFD)**: Oversees forest conservation, reforestation, and sustainable forest management, including the enforcement of fire management policies.
    - **Department of National Parks, Wildlife and Plant Conservation (DNP)**: Manages national parks and protected areas, implementing fire prevention and control strategies within these territories.
    - **Doi Suthep-Pui National Park**: Directly involved in local fire management efforts, coordinating on-the-ground activities and public education initiatives to prevent and respond to forest fires in the park area.

3. **Local Communities and Indigenous Peoples**
    - **Hmong and other hill tribes**: Often residing in or near forested areas, these communities are directly impacted by forest fires. They play a significant role in traditional and community-based fire management practices.

4. **Academic and Research Institutions**
    - **Chiang Mai University**: Engages in research and development related to forest ecology, fire management, and climate change. Often collaborates with government agencies to develop fire management strategies.
    - **Forest Restoration Research Unit (FORRU)**: Focuses on research and implementation of forest restoration projects which can include fire resilience measures.

5. **Non-Governmental Organizations (NGOs)**
    - **The Next Forest**: Focuses on sustainable forest management and restoration practices, providing expertise and resources for rehabilitating fire-affected areas.
    - **Breath Council**: Works with community forests to promote sustainable practices and improve local responses to air quality.
    - **Change Fusion**: A catalyst for social innovation, supporting initiatives that integrate community efforts with sustainable environmental solutions.

6. **Private Sector**
    - **Tourism Operators**: Have a vested interest in maintaining the natural beauty and safety of forested areas to sustain tourism.
    - **Agricultural Businesses**: Especially those that utilize or border forest lands, affected by the risk of fire damage to their crops and property.
    - **Juang Pattana Holding**: Provides funding, support and insights into large-scale manufacturing processes, showcasing advanced technologies in robotics and automation that can be applied to enhance forest fire management and response strategies.

7. **Volunteer Firefighters and Community Fire Guards**
    - Local volunteers who receive training to assist in firefighting and preventive measures, crucial for initial fire response and community-level fire management.

8. **Media**
    - Plays a critical role in disseminating information about fire risks, ongoing fires, and prevention strategies to the public.

9. **Innovative Enterprises and Collaborative Spaces**
    - **FabCafe Bangkok**: Provides technological and creative support, facilitating prototype development for fire management tools like drones and other digital fabrication solutions.

10. **Technology Providers**
    - Companies and startups that offer technological solutions like drones, satellite imagery, and remote sensing tools for forest surveillance and fire management such as DJI

By collaborating effectively, these stakeholders can enhance their response strategies and improve the overall management of forest fires in Chiang Mai, thereby protecting both the environment and the communities that depend on it

Section 3: Evaluation and Impact Assessment

To promote integrated learning in technology and analytical thinking to enhance the potential of youth to create positive changes for the environment.

Impact Goal

4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

Stakeholder	Activities	Output	Outcome
Student	Insight camp in Chiang Mai - Introduction to forest fire situations	Be able to integrate learning, data collection, and analytical thinking to create solutions through the use of technology that positively impact the environment	Cultivate 21st-century learning skills, such as creativity, critical thinking, flexibility, and adaptability.
	Technology camp - introduction to advanced technologies	Changes in perception led some students to seek fields of study that better match their interests, such as switching from a major in art to one in engineering.	A fulfilling career that suits one's interests.
Local Community	Visit the community to discuss the limitations of wildfire management and new technology	Shared situation with students and new tech for community use explored.	Exploration of using new yet relevant tech (drones, etc.) for new wildfire management planning.
Academic/ Environmental department	Exchange knowledge about wildfire situations, wildfire management, and the use of technology in wildfire management.	Shared insights with students and new tech for wildfire management explored	Opportunities to increase work effectiveness by using technology to address environmental issues, such as a plan for seeds restoration drones. .
Corporate	Supporting various activities, such as participating in field visits, as well as serving as a commentator on presentation day to provide feedback.	Executives and team members engage in learning about environmental issues and contribute to the development of youth in technology.	Long-term social responsibility by creating value for the environment and youth.


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THAI SUMMIT GROUP

JUANG PATTANA HOLDING

ChangeFusion

THE NEXT FOREST

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