

ASEAN-Korea Cultural Heritage Digital Twin Success Story

ASEAN UNESCO World Heritage Digital Content Development Project

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Siro Kim
Vice President | WIPCO Ltd.
2024. Nov. 06



WIPCO Introduction

The first domestic 3D scanning company to **conduct stable business operations with 27 years of knowledge**

Possession of **multiple top-of-the-line equipment** that meets data construction requirements

Optimal organization of specialized workforce for cultural heritage content

Optimal production and quality management techniques through multiple similar business operations



2023
2022
2021
2020
2014
2013
2011
2008

Cultural heritage original database construction project etc.

National heritage 3D original data construction



Building metaverse contents by utilizing traditional patterns

Construction of traditional pattern in form of 3D Assets

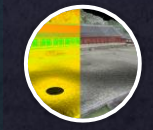
Production of 5,600 pieces of 3D content including clothing, etc.



Two other projects besides digital data construction of natural heritage

Natural Heritage – 39 cases

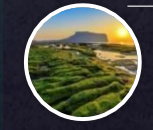
Precise records of scenic spots and natural monuments in regards of natural heritage



Integrated database construction of original records of cultural heritage in 2020

Natural Heritage

Performing precise records of Yongcheondong Cave, Jeju's columnar jointing, and many others



3D scanning of Jeju volcanic island and Sosu Seowon

Performing precise digital archiving of the mentioned locations



Cultural Heritage Digital Set 3D Database Construction Project

The start of cultural heritage archiving



Establishment of cultural heritage spatial information utilization system (GIS)

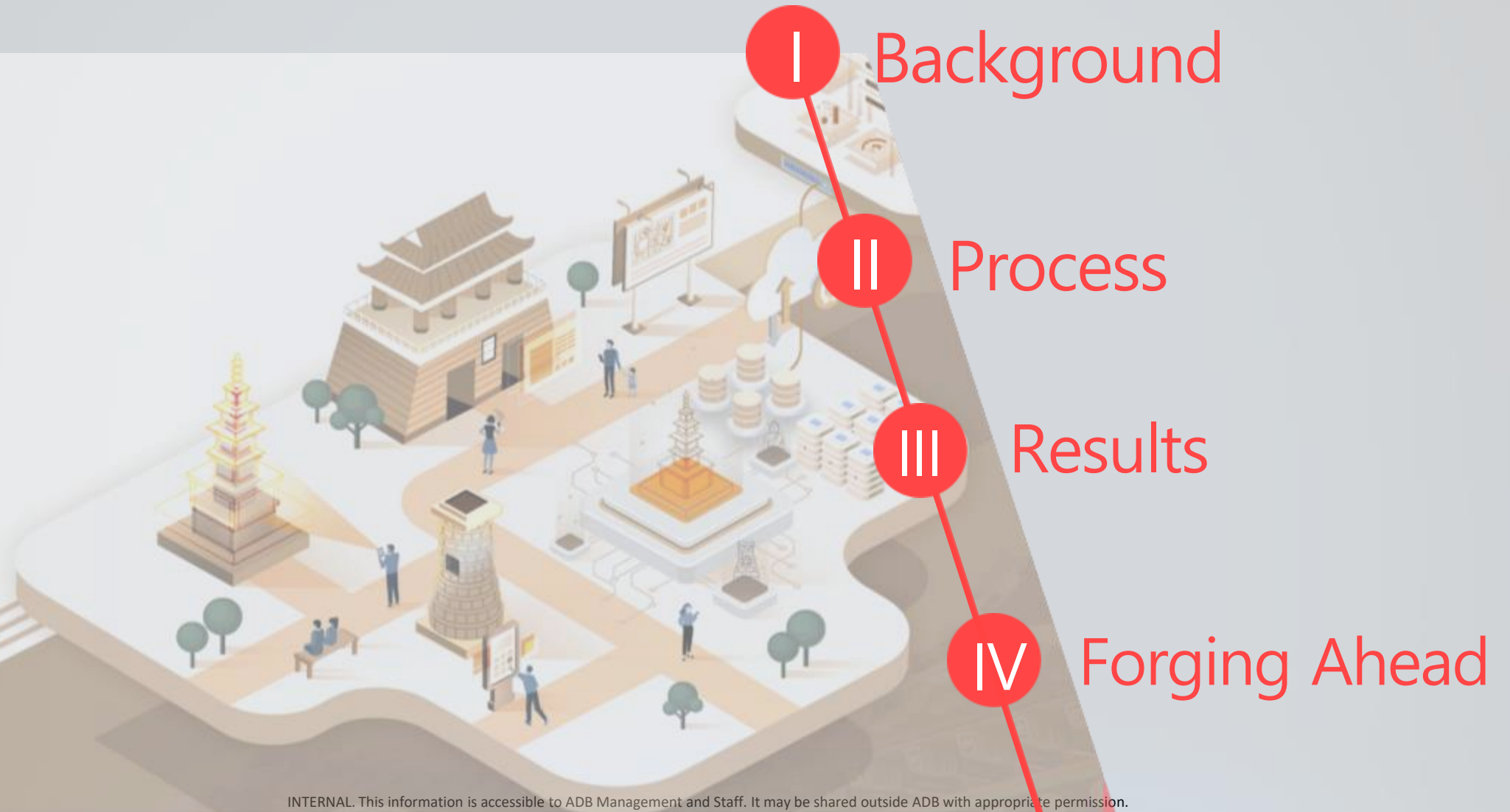
Project management and spatial information production



Accident that leads to the destruction of Sungnyemun (Namdaemun)

Due to 3D Scanning work that is done before the accident, restoration of Sungnyemun's structure is made possible using BIM

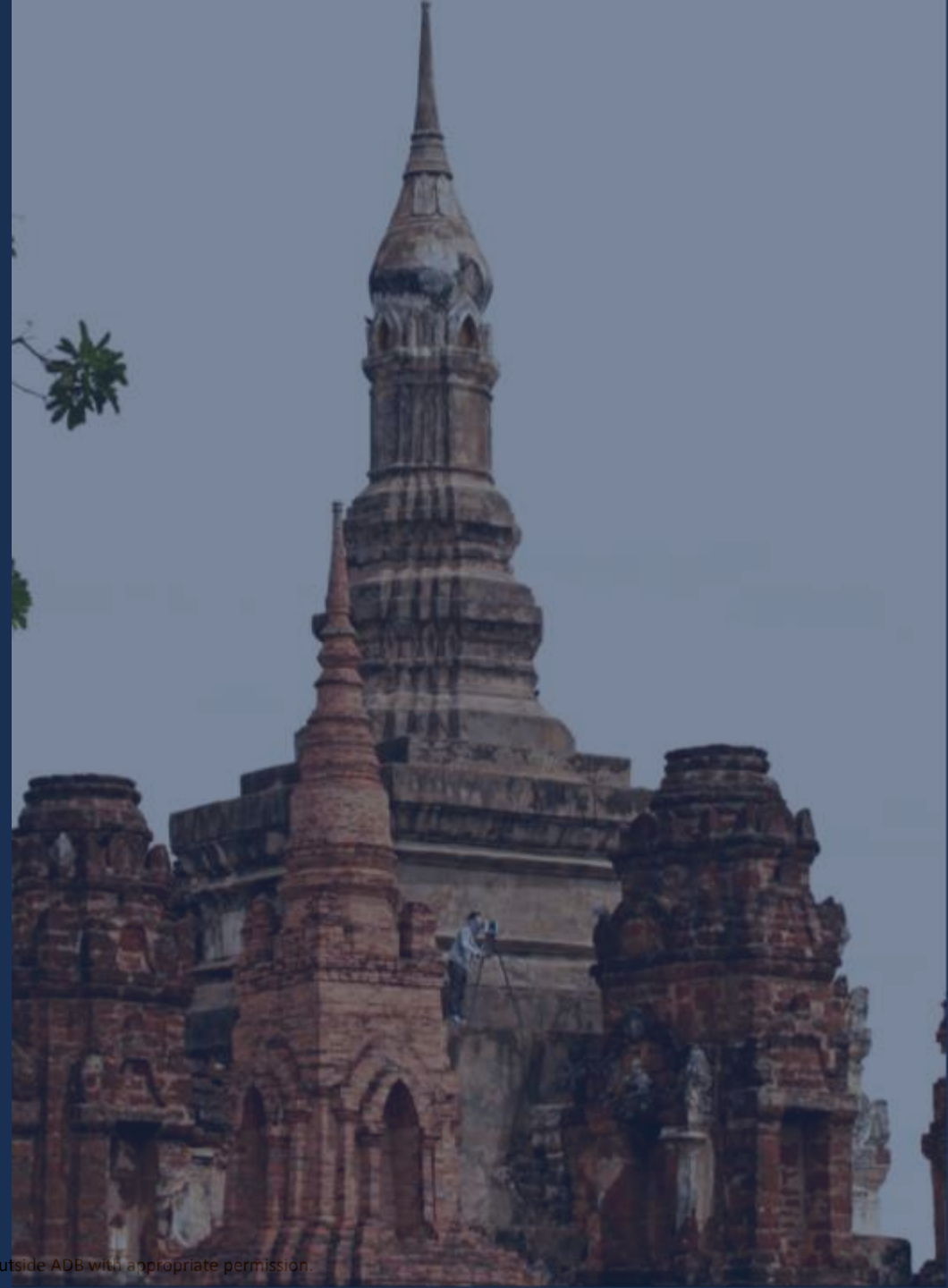
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01 Korea's Public Diplomacy

- Public Diplomacy - what is it?
Public diplomacy is any effort by a **government** to promote its interests abroad by **communicating with foreign publics**.
- Korea's strategy
Raise profile and **strengthen influence abroad** by **sharing benefits** of Korea's cutting edge **technology** and **promoting** popular and traditional **Korean culture**.
- The New Southern Policy (2017-)
Centering the **ASEAN** region in Korea's public diplomacy overtures.



GOALS



02 Why ASEAN?



Fast growing markets

GDP: \$3.173 trillion

ROK-ASEAN trade: \$172.6 billion

Increase in mutual trade despite COVID-19 pandemic.



2019 ASEAN-ROK Commemorative Summit



Young and dynamic region

Total population: **640 million**

Median age of **30**

Countries with young median age have the **greatest growth potential.**



ASEAN-ROK Plan of Action 2021-2025

Raise awareness of cultural heritage in ASEAN and ROK

Support heritage conservation throughout region Bridge digital divide by **capacity building** and **sharing benefits of digital innovation**

03 The New Southern Policy (2017~)

Korea's core diplomatic initiative rooted in a 3P principle (People, Prosperity and Peace) and targeting the 10 countries of ASEAN and India

Vision

A people-centered community of peace and prosperity

Goal

A community of shared prosperity where ASEAN countries thrive together through mutually beneficial economic cooperation

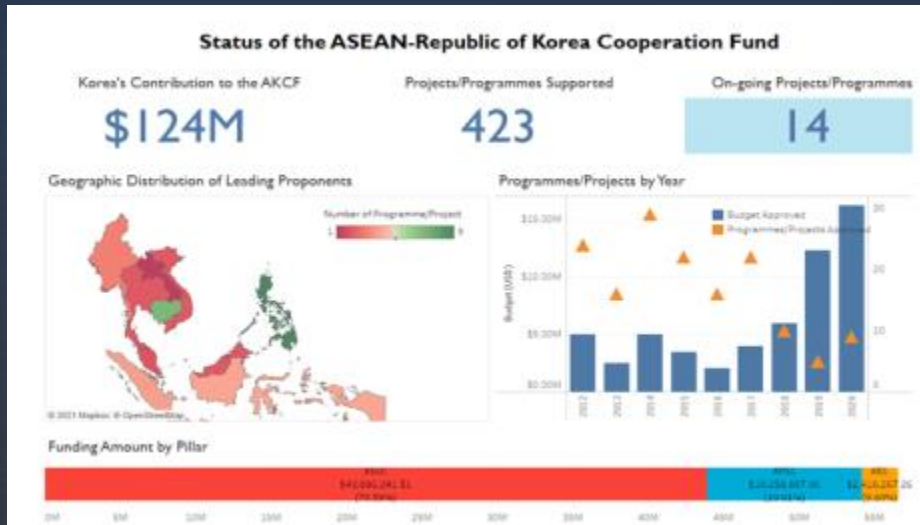


Increased mutual recognition and understanding through people-to-people exchanges
15,000,000 mutual visitors in 2020

Establishment of a stable peace throughout east Asia

04 The ASEAN-Korea Cooperation Fund

The **ASEAN-Korea Cooperation Fund** (AKCF) was launched in 1990 to strengthen ASEAN-ROK relations. It has supported more than 400 projects, including **technology transfer**, economic development, human resource development, and people-to-people exchanges.



Ongoing Programmes/Projects

Full Title	Year of Approval	Approved Amount	Main Proponent	Link
9th ASEAN-Korea Frontier Forum: ASEAN-Korea Youth Community Initiative	2019	\$1,179,362	Asia Exchange Association	http://www.aseanrokfund.com/our-partners/
ASEAN - Korea Music Festival	2019	\$2,436,261	Korea Broadcasting System (KBS)	http://www.aseanrokfund.com/our-works/a
ASEAN-ROK Technical and Vocational Education and Training for ASEAN Mobility (TEATS)	2019	\$6,924,471	Korea Research Institute for Vocational Education and Training (KRIVET); Human Resources Develop...	https://www.aseanrokfund.com/our-works/
Development of ASEAN Open Data Dictionary and Performance Index for ASEAN Connectivity	2020	\$650,508	National Information Society Agency	https://www.aseanrokfund.com/our-works/
Development of Digital Heritage Contents with UNESCO World Heritage of ASEAN Year 2-1	2019	\$1,527,045	Heritage Digital Archive Center	https://www.aseanrokfund.com/our-works/
Disaster Risk Management Capacity Building Project for APS	2020	\$4,744,045	National Civil Defense and Disaster Management Training Institute (NDTI)	https://www.aseanrokfund.com/our-works/



Collaborate

Bridge people to collaborate for the realization of ASEAN-Korea community.



Communicate

Communicate knowledge and expertise for the prosperity of people in ASEAN and Korea



Coexist

Facilitate the identities of ASEAN and Korea to coexist peacefully.

05 Project Brief

ASEAN UNESCO World Heritage Digital Content Development Project

Aims

Develop content for VR Room in Busan's **ASEAN Culture House**
Develop content based upon **major UNESCO World Heritage Sites** in all 10 ASEAN countries
Strengthen ROK-ASEAN relations by **sharing digital archiving methods and technologies**
Establish cooperation network for exchange and utilisation of cultural heritage digital archive material

Period

Phase I : July 2017 ~ November 2017
Phase II : June 2019 ~ December 2021

Funding and oversight

ASEAN-ROK Cooperation Fund | ASEAN Secretariat Office

06 Heritage Digital Archive Center



Established: 15th March, 2012

Non-profit organization recognised
by Cultural Heritage Administration



Purpose

**“to research, optimise and systematise digital methods
for the archiving and preservation of cultural heritage”**



Recent Projects

Cultural Heritage Digital Content Archiving Service (2016-2018)

ASEAN UNESCO World Heritage Digital Content Development Project (2017-)

Establishment of Cultural Heritage 3D Database (2018)

Cultural Heritage Digital Content Production Service (2018)

3D Precision Scanning Service: National Museum of Korea Relics (2018)

3D Precision Scanning Service: Gyeongcheonsa Pagoda (2018)



07 Project Scope

Where?

10 AMS' Major UNESCO World Heritage Sites

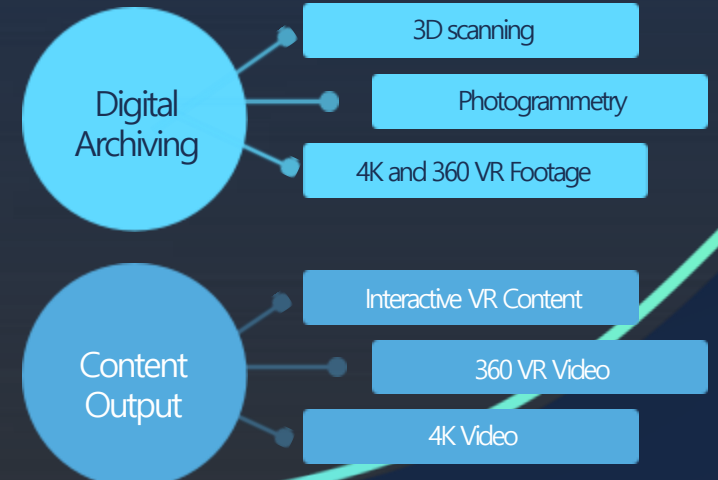
When?

40 month period
2017~2021

- ▶ Digital archiving of AMS' major UNESCO World Heritage Sites
- ▶ Production of digital content based upon archived data
- ▶ Sharing of digital archive data optimized for content development



Results



08 Selected World Heritage Sites

Brunei Darussalam

Omar Ali Saifuddien Mosque



Myanmar

Historic City of Bagan



Viet Nam

Complex of Hue Monuments



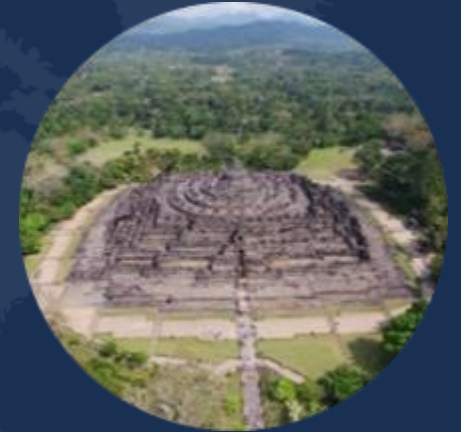
Cambodia

Angkor Wat



Indonesia

Borodudur Temple Compounds



Consultation with AMS on heritage site selection

Data collection, taking into account specific considerations of each site



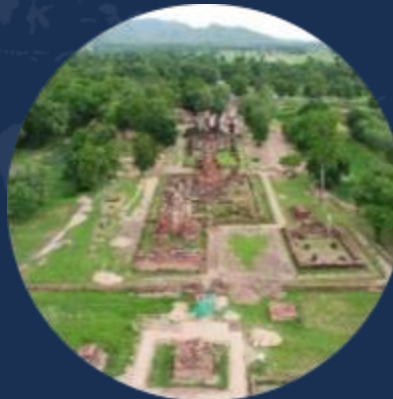
Malaysia

Historic City of Melaka



DPR Laos

Vat Phou



Thailand

Sukhothai Historical Park



Philippines

Historic City of Vigan



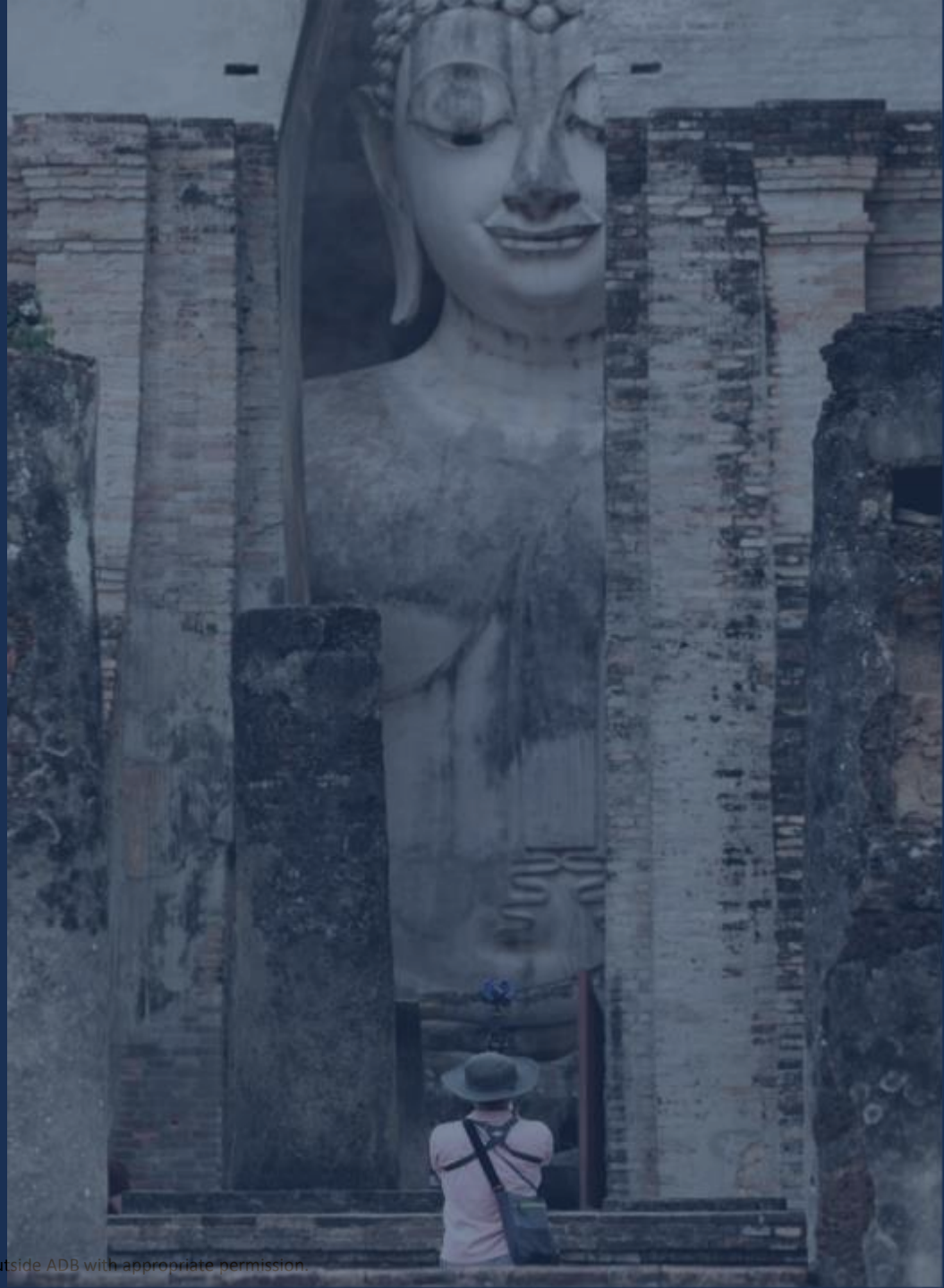
Singapore

Botanic Gardens



II. Process

- 01 Project Trajectory
- 02 Content Development Process
- 03 Data Collection
- 04 3D Scan Data: Post-Processing
- 05 Photogrammetry: Post-Processing
- 06 3D Model Development Process
- 07 Content Development Process



01 Project Trajectory

Year 1

- March 2017 Planning and preliminary preparation for project year one
- July 2017 Project contract signed
- July-August 2017 Fieldwork in Cambodia, Indonesia and Myanmar
- September 2017 Opening of ASEAN Culture House in Busan (attended by Foreign Ministers)

Year 3

- June 2019 Project contract renewed
- July-September 2019 Fieldwork in Thailand, Laos, Viet Nam, Malaysia, Brunei, Philippines
- November 2019 ASEAN-ROK Commemorative Summit, First Korea-Mekong Summit of 10 AMS)

Year 5

2018

- June 2018 Fieldwork in Singapore
- July 2018 Korea UNESCO Festival in conjunction with Singapore Botanic Gardens Heritage Festival 2018 - coincided with President Moon's official state visit

2020~21

Establishment of Korea's first database of ASEAN cultural heritage

2017

2019~20

2021. 12

Year 2

Year 4

- June 2021 Interim Project Report
- July 2021 Installation of VR equipment in Bangkok's ASEAN Culture Centre
- December 2021 Project Completion Report and presentation of content to respective AMS

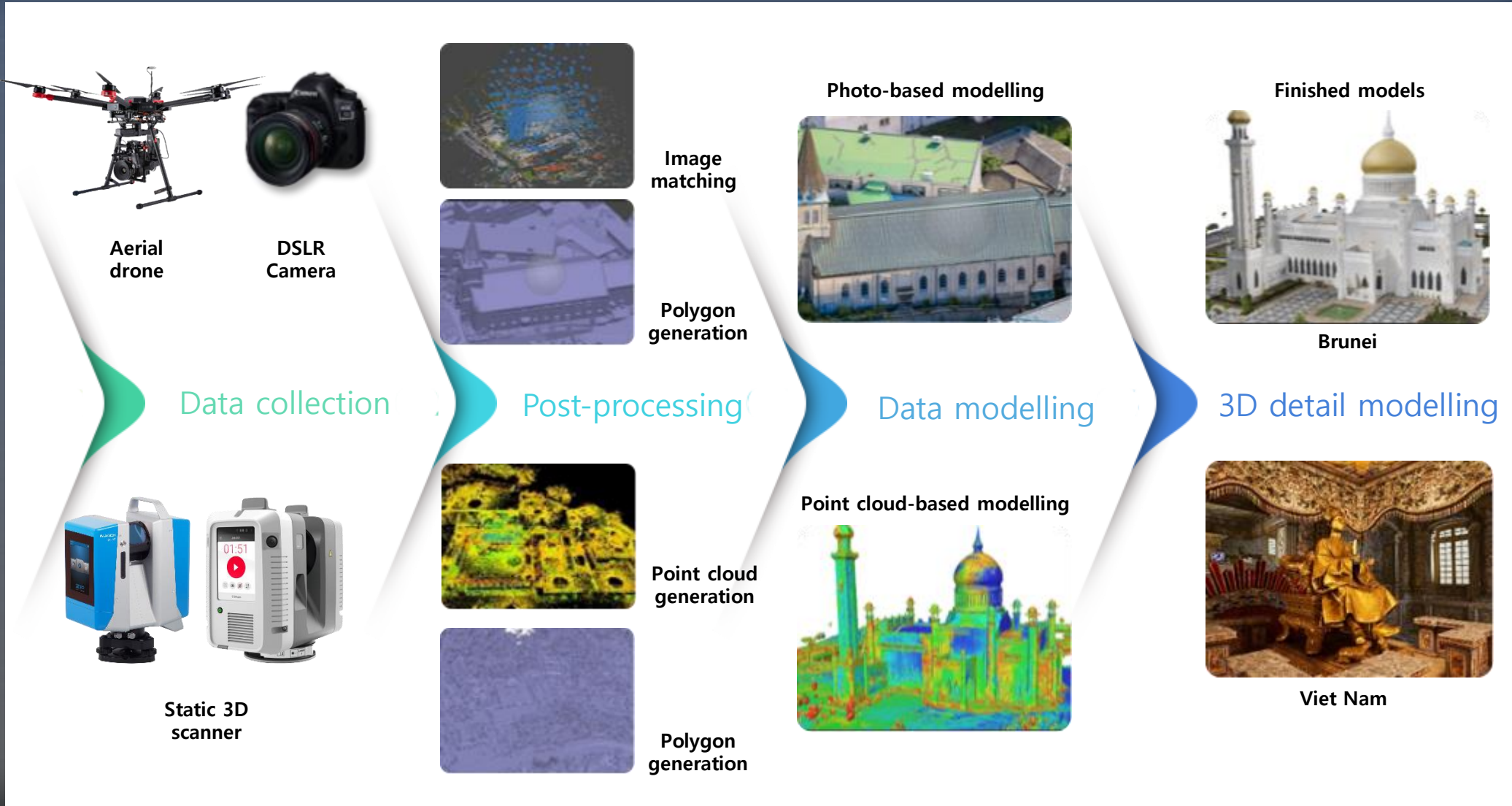
"A success story of Korean expertise in cultural heritage digitisation being mobilised in a major public diplomacy exercise."



creating realistic visuals



enhancing resolution



03 Data Collection

From July-October 2019, we captured tens of thousands of photos, thousands of laser scans, and hundreds of hours of video at UNESCO World Heritage Sites in six countries.

Thailand:
Sukhothai & Wat Mahathat

July 3-10

	3D Scanning	Photography	Video
Captured	496 Scans	10,627 Photos	> 40 hours
Equipment	RTC	Drone (8291) DSLR (2336)	
Resolution	< 2mm	> 5464 x 3640	



Laos:
Vat Phou

July 25-30

	3D Scanning	Photography	Video
Captured	375 Scans	15,820 Photos	> 24 hours
Equipment	RTC (292) Z & F (83)	Drone (8244) DSLR (7576)	
Resolution	< 2mm	> 5464 x 3640	



Viet Nam:
Complex of Huế Monuments

August 12-20

	3D Scanning	Photography	Video
Captured	611 Scans	43,913 Photos	> 48 hours
Equipment	RTC (517) Z & F (94)	Drone (4343) DSLR (39,570)	
Resolution	< 2mm	> 5464 x 3640	



Brunei Darussalam:
Omar Ali Saifuddien Mosque

September 5-12

	3D Scanning	Photography	Video
Captured	462 Scans	8372 Photos	> 40 hours
Equipment	RTC (385) Z & F (77)	Drone (5075) DSLR (3297)	
Resolution	< 2mm	> 5464 x 3640	



Malaysia:
Historic City of Melaka

Sept 30-Oct 6

	3D Scanning	Photography	Video
Captured	221 Scans	5452 Photos	> 40 hours
Equipment	RTC	DSLR	
Resolution	< 2mm	> 6000 x 4000	



The Philippines:
Historic City of Vigan

October 14-20

	3D Scanning	Photography	Video
Captured	243 Scans	6386 Photos	> 32 hours
Equipment	RTC	Drone (1478) DSLR (4908)	
Resolution	< 2mm	> 5464 x 3640	



03 Data Collection

From July-October 2019, we captured tens of thousands of photos, thousands of laser scans, and hundreds of hours of video at UNESCO World Heritage Sites in six countries.



3D Scanners



Leica RTC 360



Z+F IMAGER® 5010X



Photogrammetry and Mapping Source



DJI MAVIC2 PRO



Canon EOS 5D Mark IV



Nikon D5600



Equipment for 360 HMD VR contents



DJI M600 PRO



Insta 360 Pro2



GoPro hero 4



GoPro hero 6



Equipment for UHD 4K contents



PANASONIC DVX200



DJI Inspire 2



Canon EOS-1D X Mark II



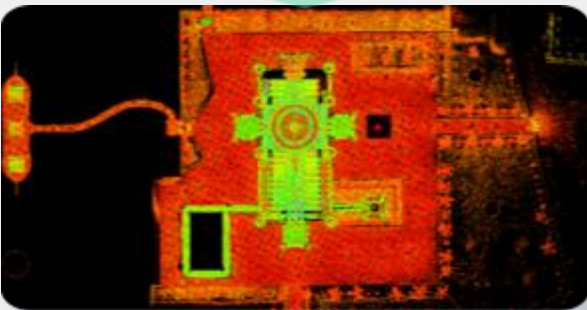
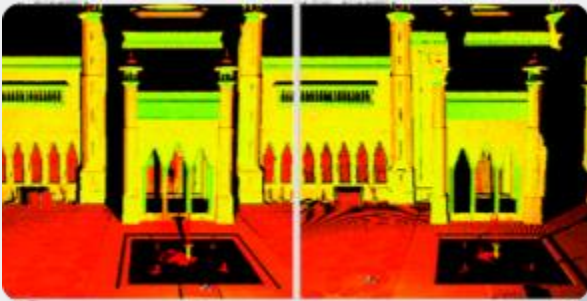
SONY A7M3

04 3D Scan Data: Post-Processing

Our 3D scan data processing aims to generate the **most accurate images** possible. This is a three-step process of stitching together point clouds, removing noise from and adding colour and texture to each scene.

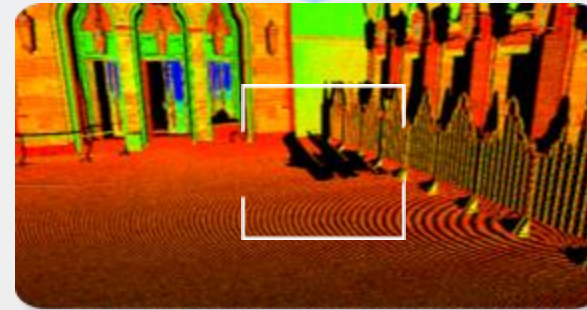
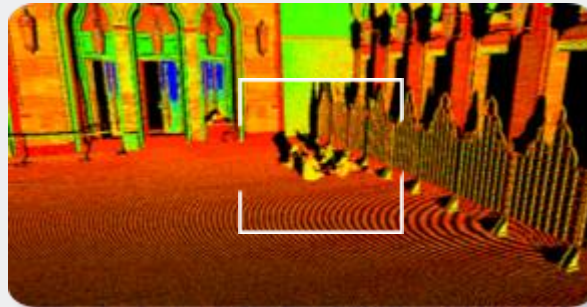
Registration

Two different point clouds are stitched together by identifying three or more matching points in each



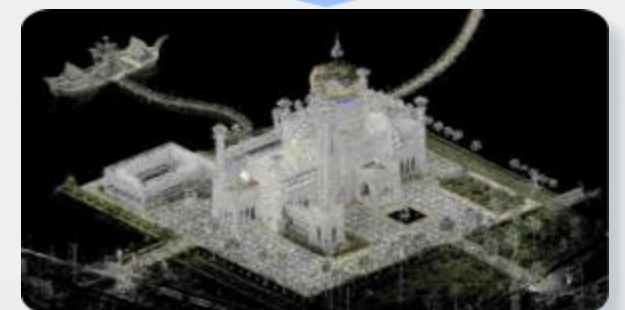
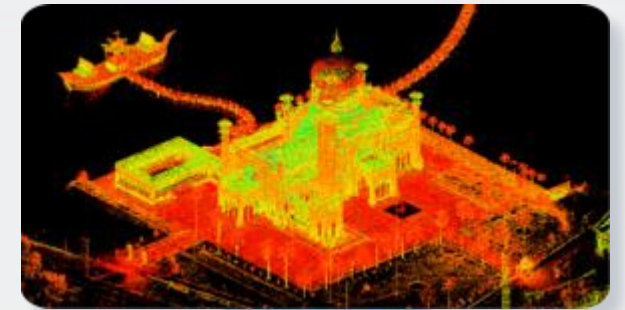
Noise reduction

Removal of extraneous scan data in the frame e.g. people or undesirable objects



Texture mapping

Point cloud data coloured by using photos captured simultaneously with 3D laser scan



04 3D Scan Data: Post-Processing

Our 3D scan data processing aims to generate the **most accurate images** possible. This is a three-step process of stitching together point clouds, removing noise from and adding colour and texture to each scene.

Modelling & 3D Scanning



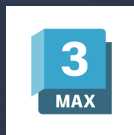
Leica Cyclone



Register 360



Autodesk Maya, Max



Photogrammetry



RealityCapture



Metashape

2D Software



Adobe Photoshop



Adobe Premiere 3D

Contents making



Unreal Engine

05 Photogrammetry: Post-Processing

Painstaking care was taken to ensure that the true dimensions and colours of each Heritage Site were faithfully represented in the digital data.

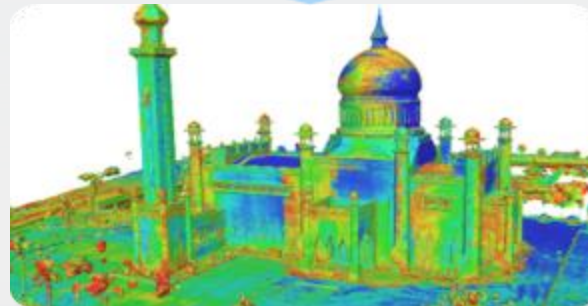
Matching

We use photogrammetry software to stitch together photo data captured on site and establish point groups.



Polygon Data

We use the point groups to generate polygons and then perform noise removal.



Texture mapping

The 3D image is completed by applying textures obtained from photos to the polygon data.

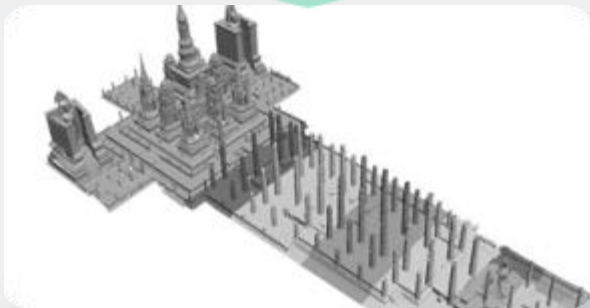
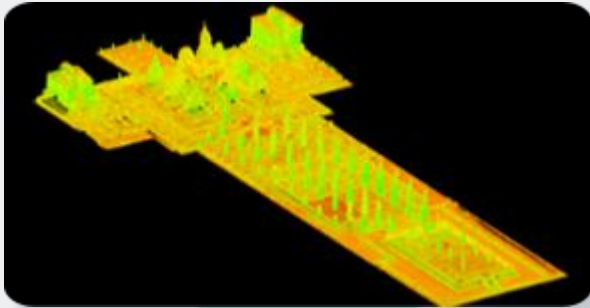


06 3D Model Development Process

Using real-world 3D data from laser scans and photogrammetry, we were able to precisely reconstruct sites with accurate textures, colours, and dimensions

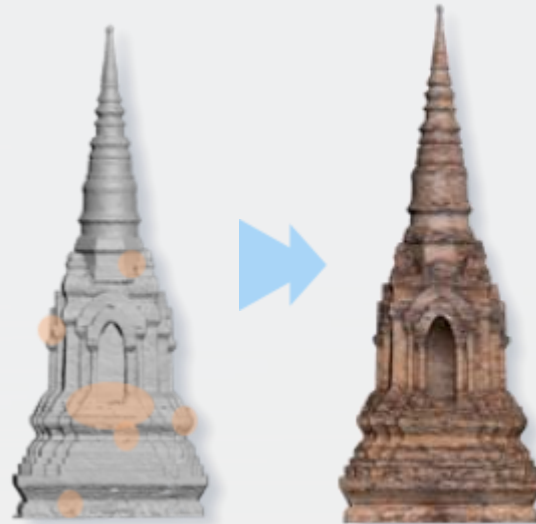
Pre-processing

We use photogrammetry software to stitch together photo data captured on site and establish point groups.



Modelling

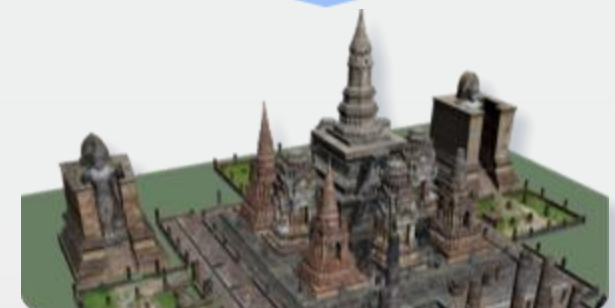
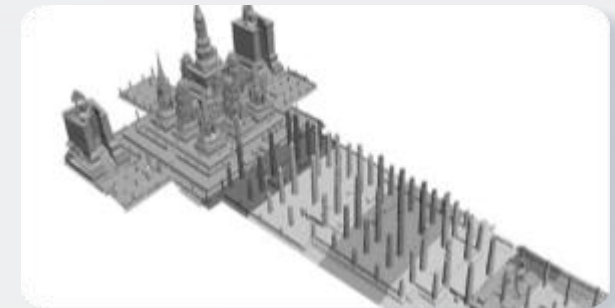
We use the point data to generate polygons, and then perform noise removal



Data are combined and optimised

Texture Mapping

The 3D image is completed by applying textures obtained from photos to the polygon



07 Cotent Development Process

Thorough consultation and **collaboration with local experts** were crucial to the success of our field work.

Through this process we were able to gain a **deeper appreciation** for our subjects, and **share expertise in heritage digitization** with our new friends and partners.



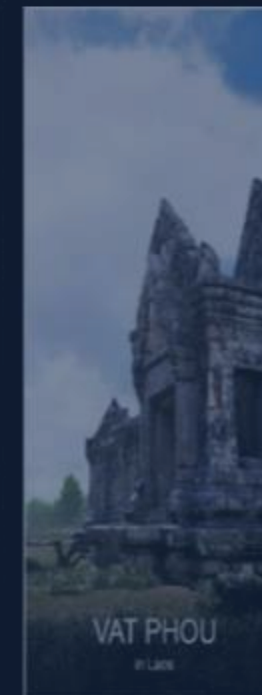
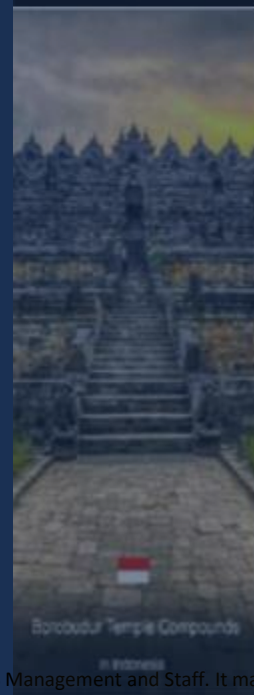
ASEAN

The image features the word "ASEAN" in a large, bold, black sans-serif font. The letters are set against a dark, textured background. Each letter is filled with a different night-time photograph of Southeast Asian architecture, including pagodas and temples, illuminated with warm golden light. The 'A' on the left shows a pagoda with a tiered roof. The 'S' shows a curved structure, possibly a bridge or a temple roof. The 'E' shows a pagoda with a spire. The 'A' in the middle shows a large, multi-tiered pagoda. The 'N' shows a pagoda with a spire. The 'A' on the right shows a pagoda with a spire. The 'N' on the far right shows a pagoda with a spire.



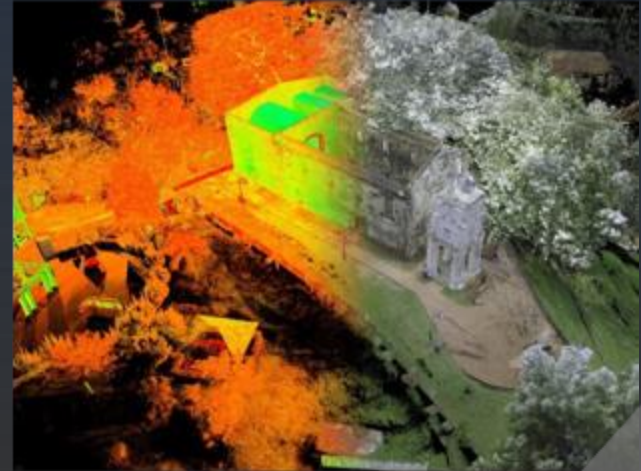
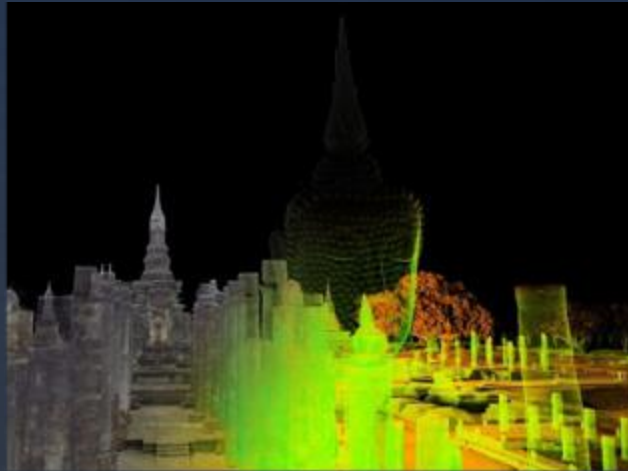
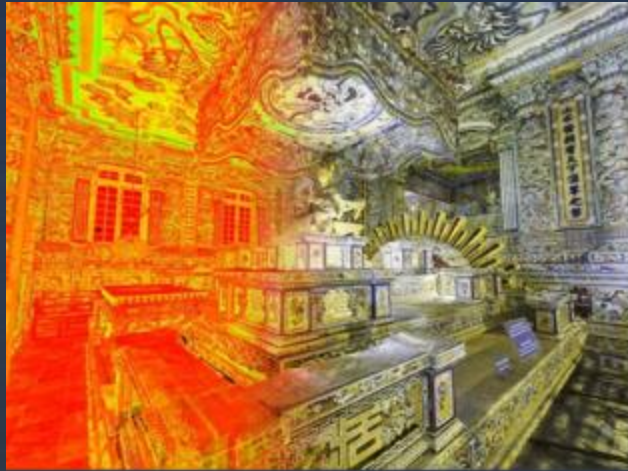
III. Results

- 01 3D Scan Data
- 02 Aerial Drone Photography
- 03 Photogrammetry Data
- 04 3D Models
- 05 360 VR Video
- 06 Interactive VR Content
- 07 UHD 4K Video
- 08 'Making of' Video
- 09 Presentation and Promotion
- 10 Local Reaction



01 3D Scan Data

Under the ASEAN Tourism Strategic Plan (ATSP) 2016-2025.
ASEAN is prioritizing the protection and management of heritage sites



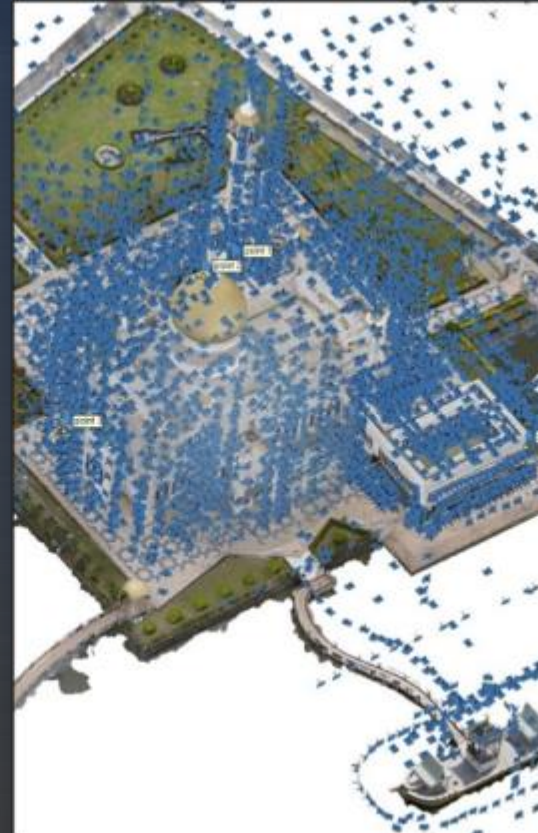
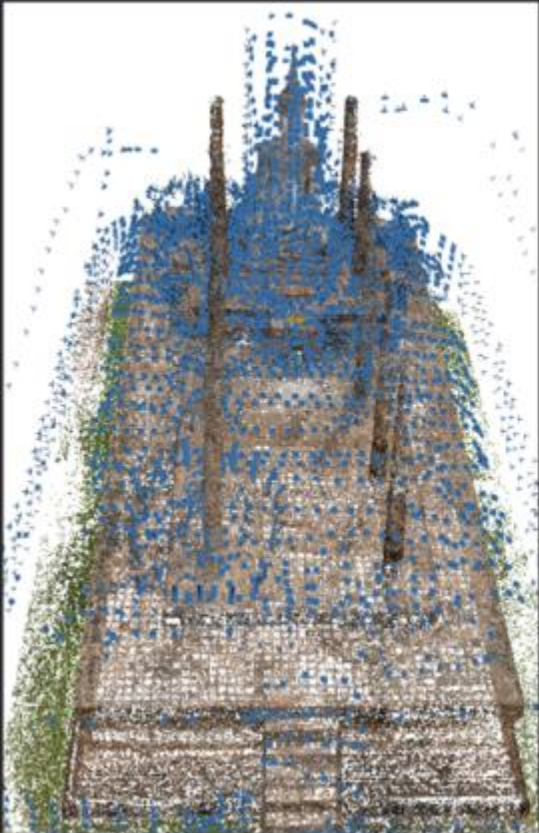
02 Aerial Drone Photography

Utilising aerial drones, we were able to quickly capture high resolution footage of vast areas of UNESCO sites, both for our 360° virtual reality content and 2D mapping purposes. Aerial photography was also crucial for filling in 'blind spots' in our scan data.



03 Photogrammetry Data

Surveying techniques enabled us to **pinpoint locations** in our terrestrial and aerial photography in three dimensions. From there, we were able to **combine the data** and create point clouds and mesh **models of the exterior and interior** of each heritage site.



04 3D Models

Incorporating our scan, photographic and floor-plan data of each World Heritage Site, we developed high-quality models that are not mere visual representations, but contain real-world topographical and spatial data.



05 360 VR Video

THAILAND
SUKHOTHAI



06 Interactive VR Content



06 Interactive VR Content



06 Interactive VR Content





07 UHD 4K Video

앙코르와트
ANGKOR WAT

08 'Making of' Video





No Chi Minh City

China

MALAY ISLANDS

Palawan

Philippines

Visayas

Sulawesi

Kota Bharu

AYCIA

Singapore

Sumatra

GREATER SUNDA ISLANDS

Jakarta

Semarang

Surabaya

Java

Yogyakarta

Makassar

Sumbawa

Sulawesi (Celebes)

Borneo

Naruntan

Celebes Sea

Zamboanga

Davao

Mindanao

Koror

PALAU

PALAU ISLANDS

Halmahera

Sulawesi

Ambon

Banda Sea

Oli

KEPULAUAN TAYWAN

09 Presentation and Promotion



09 Presentation and Promotion





10 Local Reaction



Leong Cheng Yee

Events & Exhibitions Director
Singapore National Parks Board

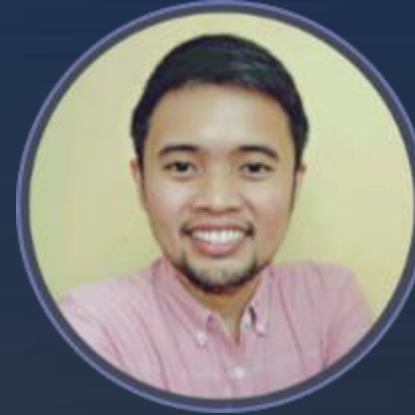
" Exploring the Botanic Gardens in VR for the first time was such a joy. This content is a testament to the lead Korea has taken in the digital heritage sector."



Sivilay Komphabay

Chief of Landscape Protection and Development, Laos Vat Phou Champasak World Heritage Site Office

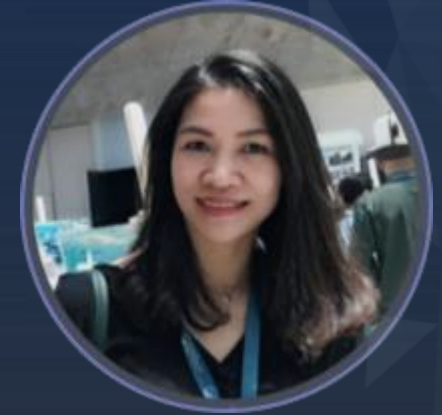
"Laotian technicians have honed their skills by working closely with Korean experts. I want Korean expertise and Laotian manpower to come together to preserve and maintain our historic sites."



Karl Albais

World Heritage Sites Coordinator
Philippines National Commission for Culture and the Arts

"With the toll the pandemic has taken on international tourism, the digitisation of Vigan couldn't have come at a better time."

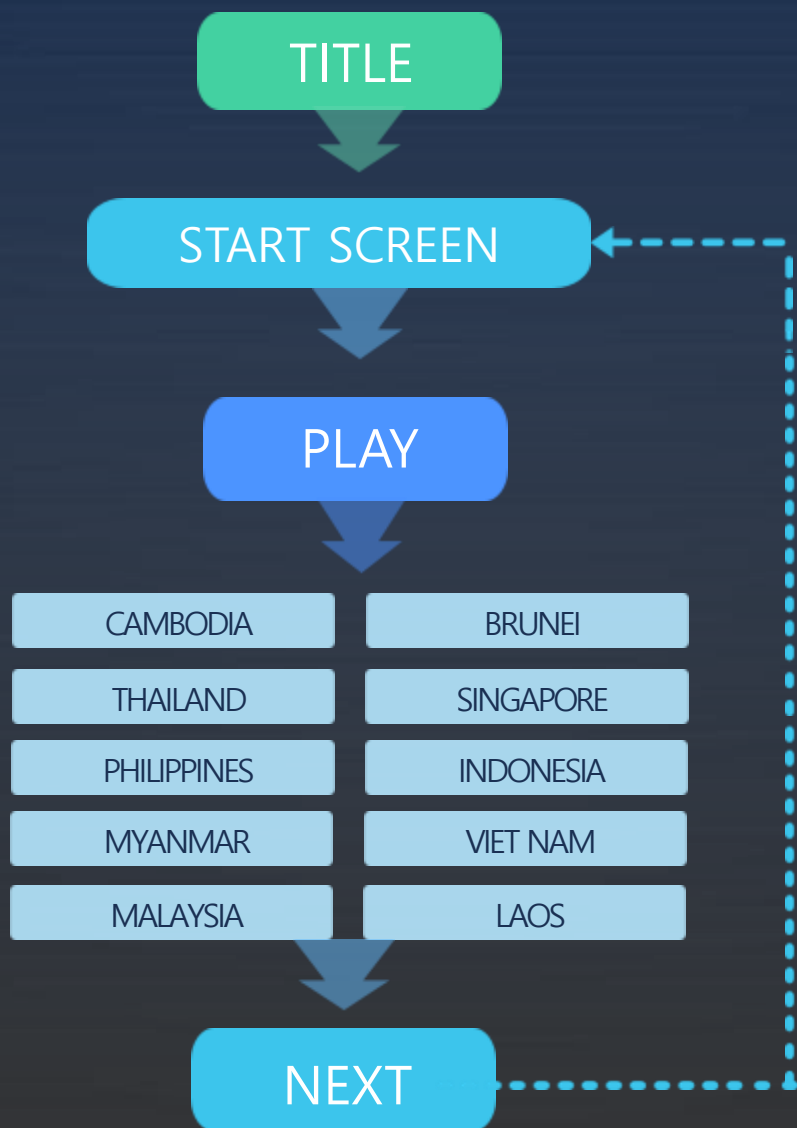


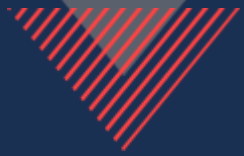
Le Thi Thanh Binh

Head of Cooperation and External Affairs
Vietnam Complex of Hue Monuments

"The data and technology transferred to us by the team from Korea are going to be of great use to our conservation and promotion efforts."

10 ASEAN VR Omnibus





IV. Forging Ahead



Where Next?

With Korea's annual AKCF contribution doubling to \$14m USD in 2019, ASEAN ambassador Lim Sung-nam stressed that ICT should be added as a fourth priority sector for ASEAN ahead of the 4th industrial revolution.

Pioneering new forms of cultural heritage content with Korea's cutting edge technology to ensure the continued success of the Korean Wave in South East Asia.

Vision

Value

Strategy

Sharing of Korea's ICT resources

Archiving cultural heritage

Expanding ASEAN-ROK collaboration

Developing AR/VR Heritage content

Innovating new tourism concepts

Meeting demand

Data-driven

International cooperation

Realisation of New Southern Policy

Platformisation

Break new ground in cultural tourism with AR/VR content

Construct 3D models from precision scan data and historical research

Collaborate on development and dissemination of digital heritage content

Acceleration of 'NSP 2.0' post-2019 ASEAN-ROK Commemorative Summit

Building an open platform for the 5G era

Policy process

Explore possibilities of 5G for new content

Establish spaces for AR/VR heritage experiences

Expand infrastructure for AR/VR content

Reinforce and promote 'K-Brand'

Apply AR/VR technologies to Korean Wave content

Establish foothold and physical presence overseas



Advancement of AKCF's priority sectors: culture, education and environment



Institutional framework: ASEAN-ROK Plan of Action (2021-2025)

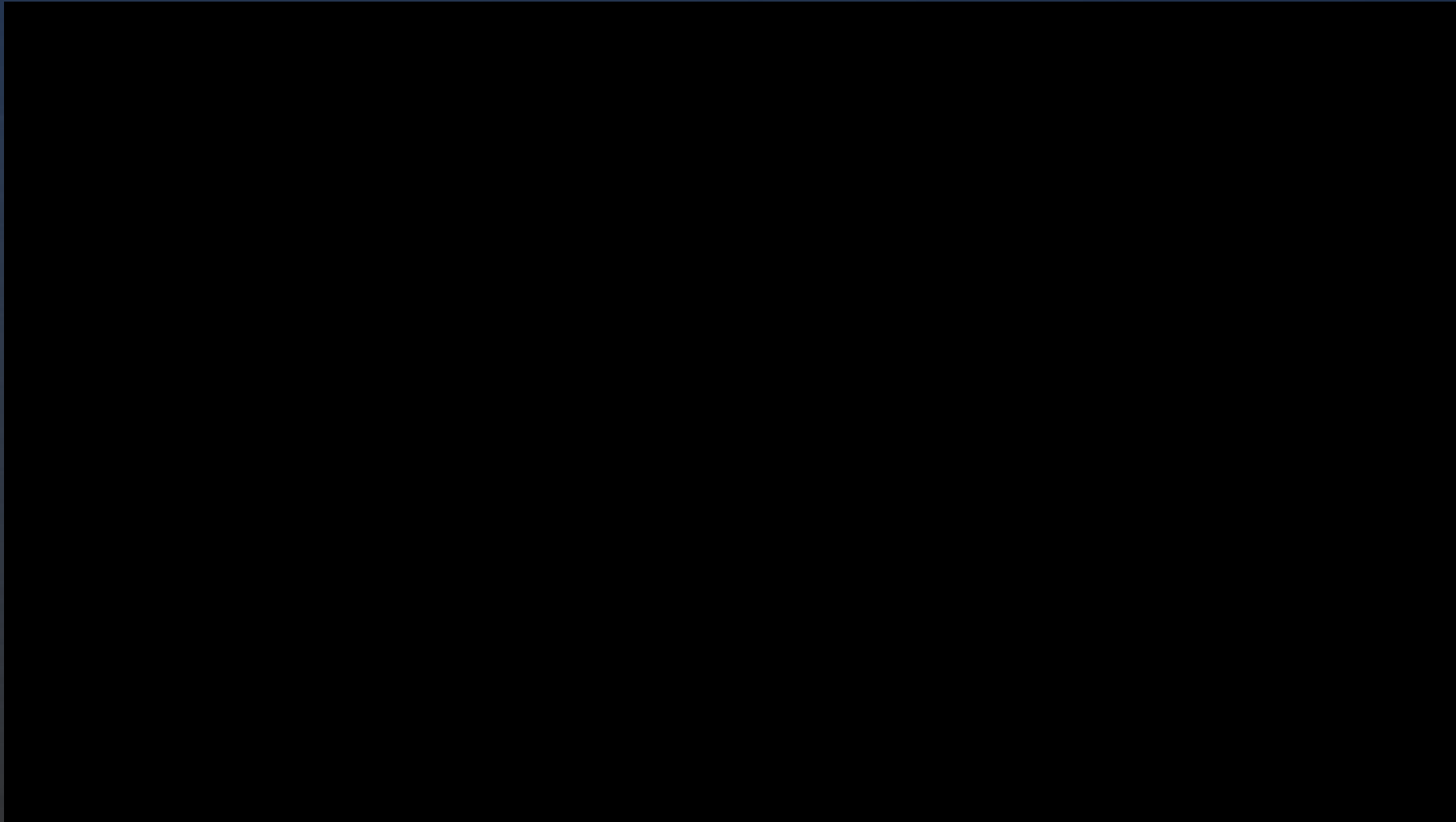
Where Next?





2025 ODA PROJECT

Project Management Consultant for Integrated Digital Management and Utilization of Cultural Heritage and Capacity Building in **Uzbekistan**



2025 ODA PROJECT

Project Management Consultant for Integrated Digital Management and Utilization of Cultural Heritage and Capacity Building in **Uzbekistan**

Vision

Creating database for cultural heritage based on digital contents and establishing an integrated digital cultural heritage management platform

Target Area

Tashkent and Bukhara, Uzbekistan

Strategy

Establishing a mid to long-term masterplan

Creation of a database for digital management

Provision of digital tourism contents

Procuring 3D digital recording equipment

Capacity development of human resources



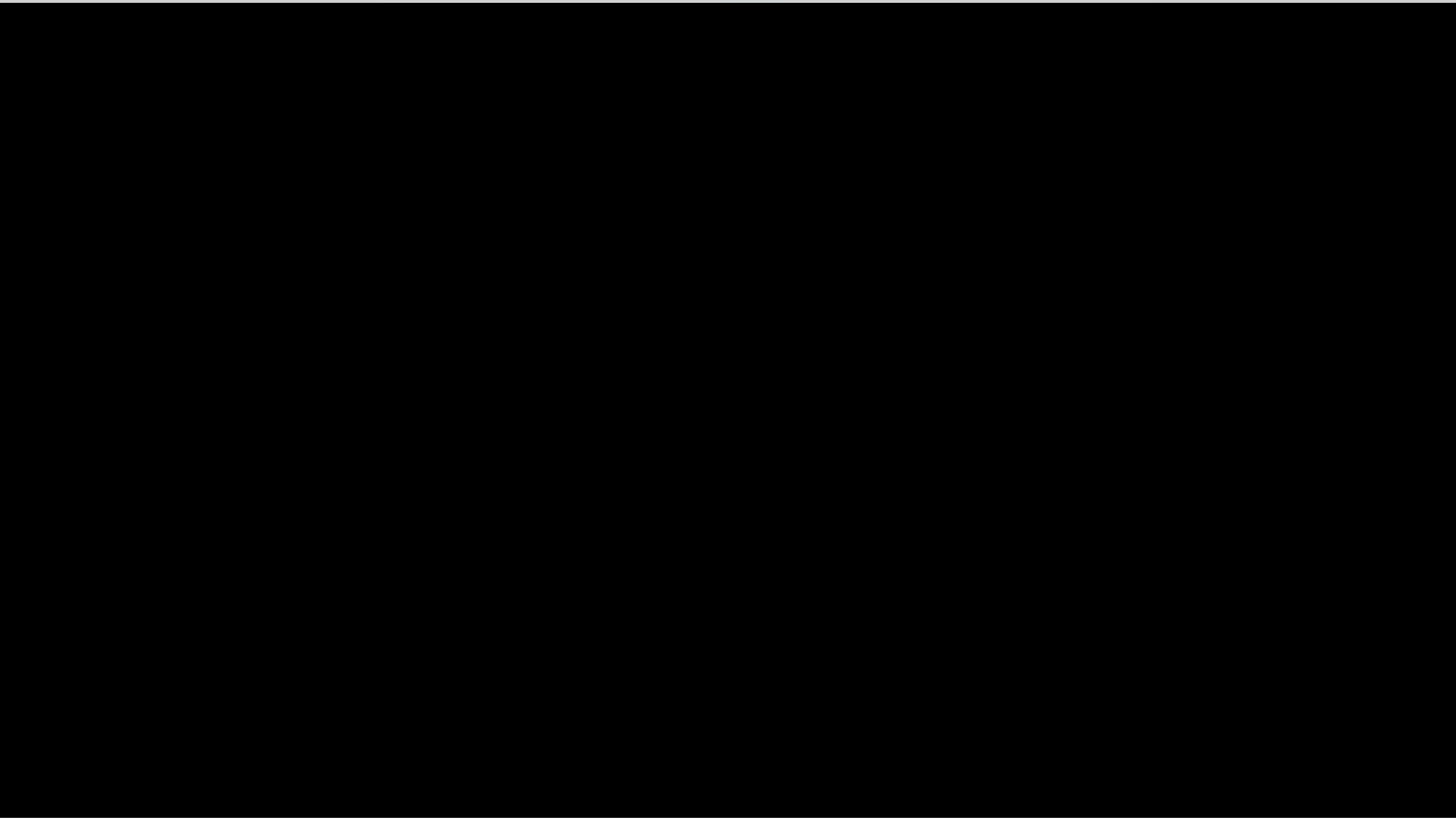
Through the digitization of UNESCO World Heritage, the integrated management system for the cultural heritage, which will contribute to the efficient preservation of the cultural heritage, will be established in Uzbekistan.



▶ How do WIPCO acquire data for projects?

WIPCO Ltd., has extensive experiences in acquiring data for the preservation of cultural heritage using Mobile Mapping System, drones and cameras.







VR실

Thank you



감사합니다



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