

NAMES: Group 1 (Jana Stojisavljević, Amarachi Chukwu, Megha Mariya Joseph, René Strammer, Victor Ademoyero, Noemi Pagano, Kevin Schwabauer, Adrian-Florin Vasile)

1. Objective:

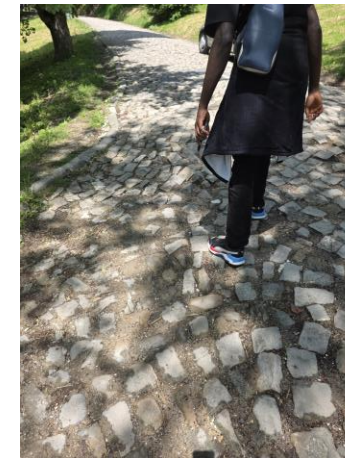
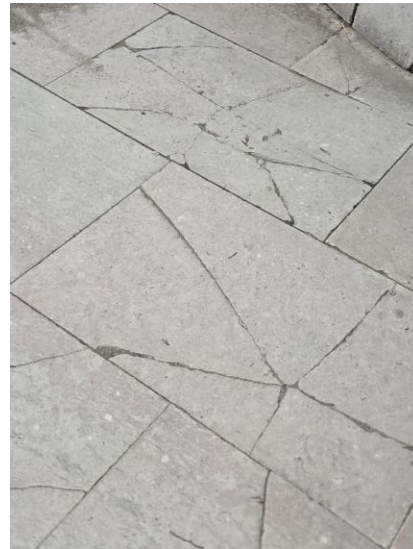
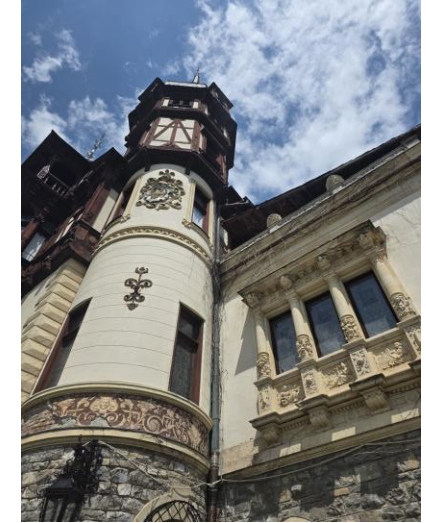
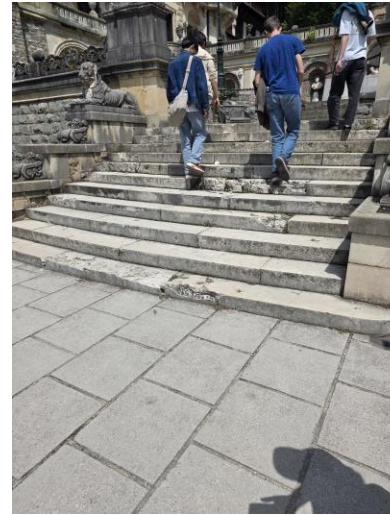
Cultural Heritage Conservation:

1. *Roof inspections.*
2. *Façade monitoring.*
3. *Detection of structural deterioration.*
4. *Creation of 3D models for conservation purpose*

Start date: 01-09-2026

End date: 01-09-2027

Images that support the need for project:

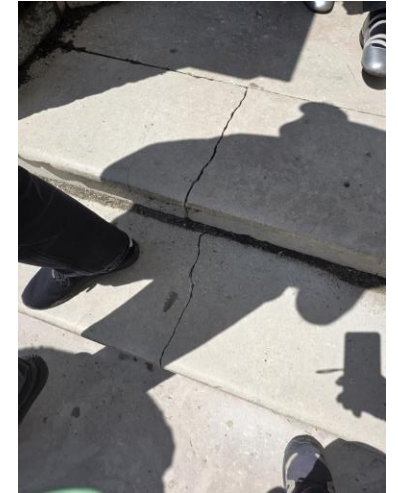


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2. Drone flight plan:

Multiple UAV flights covering:

- *Castle façades and roofs.*
- *Vegetation surrounding the castle.*
- *Paths and visitor areas.*



Combination of nadir and oblique imagery. Surveys repeated annually (or seasonally if resources allow) under similar conditions. Flights planned during periods with fewer tourists to reduce noise and improve reconstruction quality. Due to flight restrictions around the castle, terrestrial surveys (TLS) may complement UAV acquisitions.

USING DRONES IN ENVIRONMENTAL SCIENCES



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Flight plan 1: Peles Castle

Oblique Passes for making 3D model of the castle, for monitoring and reconstruction purposes

Peles Castle_Plan1

CREATED 15 minutes ago
UPDATED 15 minutes ago

Duration	Distance	Area	Waypoints	Photos
17:48	7.65km	1.71ha	108	558

Plan your flights with the Litchi Hub, then execute them using DJI Pilot. [Learn how](#)

Drone Model
DJI Matrice 350 RTK

Camera Model
Zenmuse H20

Camera Lens
Wide

Upon Signal Loss
CONTINUE **ABORT**

Mapping Mode
2D MAP **3D MODEL**

Oblique Passes
2 4

Nadir Pass

Area Mapping Settings

Altitude Mode
ABOVE TAKE OFF **ABOVE GROUND**

Altitude
-10 -1 **60** m +1 +10

Terrain Change Threshold
-10 -1 **1** m +1 +10

Gimbal Pitch
-85°

Oblique Ground Sampling Distance
-1 -0.1 **2.1** cm/pixel +0.1 +1

Nadir Ground Sampling Distance
-1 -0.1 **2.09** cm/pixel +0.1 +1

Speed
15.0 m/s

The camera may be unable to capture all photos at this speed

Finish Action
Return to Home (RTH)

Capture Mode

Capture Mode
PHOTO VIDEO MANUAL

Advanced
IMPORT MAPPING AREA

Orientation
279°

Front Overlap
-10 -1 **80** % +1 +10

Side Overlap
-10 -1 **85** % +1 +10

Grid Margin
-10 -1 **0** m +1 +10

Path Mode
Curved Turns

Turn Radius
25 %

Photo Capture Mode
Auto

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Flight plan 2: Small castle near Peles

Oblique Passes for making 3D model of the castle, for monitoring and reconstruction purposes

Peles Castle_Plan2

Area Mapping Settings

Peles Castle_Plan2
CREATED 1 minute ago
UPDATED 1 minute ago

Duration	Distance	Area	Waypoints	Photos
12:32	4.68km	9759m²	90	327

Plan your flights with the Litchi Hub, then execute them using DJI Pilot. [Learn how](#)

Drone Model: DJI Matrice 350 RTK
Camera Model: Zenmuse H20
Camera Lens: Wide

Upon Signal Loss: CONTINUE / ABORT

Mapping Mode: 2D MAP / **3D MODEL**

Oblique Passes: 2 / **4**

Nadir Pass: ☒

Area Mapping Settings

Altitude Mode: ABOVE TAKE OFF / **ABOVE GROUND**

Altitude: -10 -1 **60** m +1 +10

Terrain Change Threshold: -10 -1 **1** m +1 +10

Gimbal Pitch: **-65°**

Oblique Ground Sampling Distance: -1 -0.1 **2.31** cm/pixel +0.1 +1

Nadir Ground Sampling Distance: -1 -0.1 **2.09** cm/pixel +0.1 +1

Speed: **15.0** m/s

The camera may be unable to capture all photos at this speed

Finish Action: **Return to Home (RTH)**

Capture Mode: PHOTO / VIDEO / MANUAL

Advanced

IMPORT MAPPING AREA

Orientation: **117°**

Front Overlap: -10 -1 **80** % +1 +10

Side Overlap: -10 -1 **85** % +1 +10

Grid Margin: -10 -1 **0** m +1 +10

Path Mode: **Curved Turns**

Turn Radius: **25** %

Photo Capture Mode: **Auto**

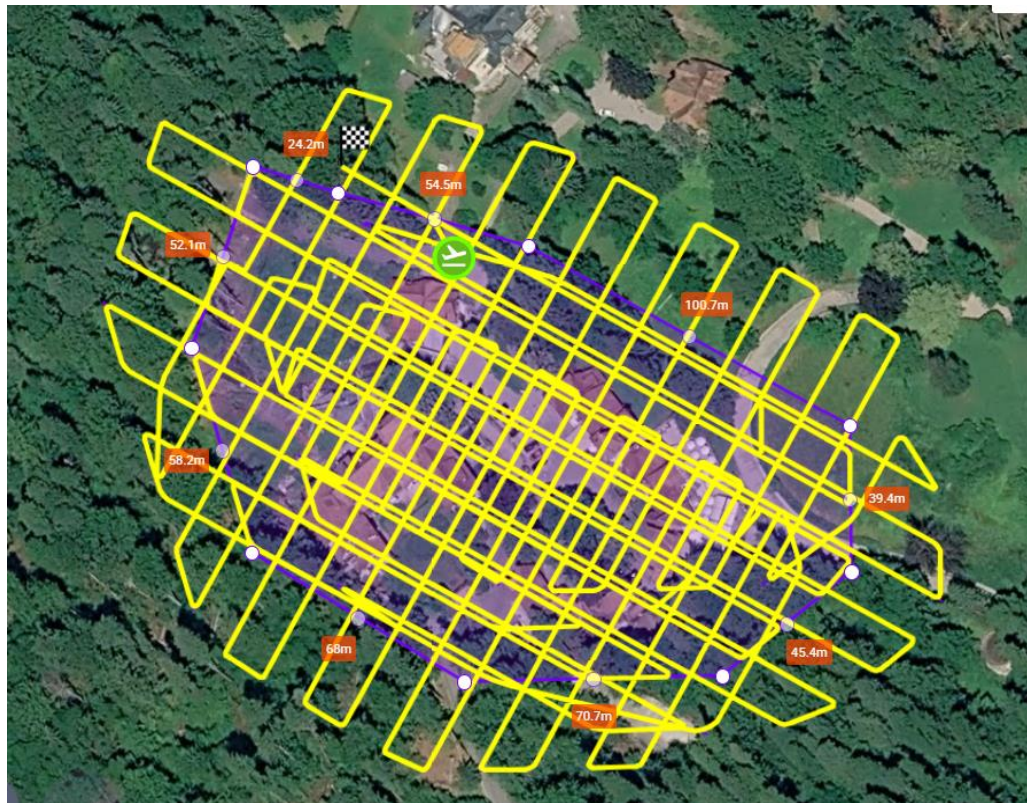
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Flight plan 3: Restaurant area

Oblique Passes for making 3D model of the castle, for monitoring and reconstruction purposes



Peles Castle_Plan3

CREATED 1 minute ago

UPDATED 1 minute ago

Duration

Distance

Area

Waypoints

Photos

18:06

7.7km

1.73ha

114

568

Plan your flights with the Litchi Hub, then execute them using DJI Pilot. [Learn how](#)

Drone Model

DJI Matrice 350 RTK

Camera Model

Zenmuse H20

Camera Lens

Wide

Upon Signal Loss

CONTINUE

ABORT

Mapping Mode

2D MAP

3D MODEL

Oblique Passes

2

4

Nadir Pass

Altitude Mode

ABOVE TAKE OFF

ABOVE GROUND

Altitude

-10

-1

60

m

+1

+10

Terrain Change Threshold

-10

-1

1

m

+1

+10

Gimbal Pitch

-65

Oblique Ground Sampling Distance

-1

-0.1

2.31

cm/pixel

+0.1

+1

Nadir Ground Sampling Distance

-1

-0.1

2.09

cm/pixel

+0.1

+1

Speed

-

15.0

m/s

+

The camera may be unable to capture all photos at this speed

Finish Action

Return to Home (RTH)

Capture Mode

Finish Action

Return to Home (RTH)

Capture Mode

PHOTO

VIDEO

MANUAL

Advanced

IMPORT MAPPING AREA

Orientation

119 °

Front Overlap

-10

-1

80

%

+1

+10

Side Overlap

-10

-1

85

%

+1

+10

Grid Margin

-10

-1

0

m

+1

+10

Path Mode

Curved Turns

Turn Radius

25

%

Photo Capture Mode

Auto

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Flight plan 4: Vegetation and paths

Nadir Passes (Use of LiDAR as another option) for mapping vegetation and paths, for monitoring and reconstruction purposes

NOTE: on the plan it is clicked oblique but only 1 pass is chosen for NADIR, also this flight needs to be done in 3-4 flights (changing batteries because flight is very long)

Area Mapping Settings

Duration	Distance	Area	Waypoints	Photos
43:52	25.08km	7.55ha	194	1832

Flight Settings:

- Altitude Mode: ABOVE GROUND
- Altitude: 60 m
- Terrain Change Threshold: 1 m
- Gimbal Pitch: -85 °
- Oblique Ground Sampling Distance: 2.1 cm/pixel
- Nadir Ground Sampling Distance: 2.09 cm/pixel
- Speed: 15.0 m/s
- Capture Mode: PHOTO
- Orientation: 279 °
- Front Overlap: 80 %
- Side Overlap: 80 %
- Grid Margin: 0 m
- Path Mode: Curved Turns
- Turn Radius: 25 %
- Photo Capture Mode: Auto

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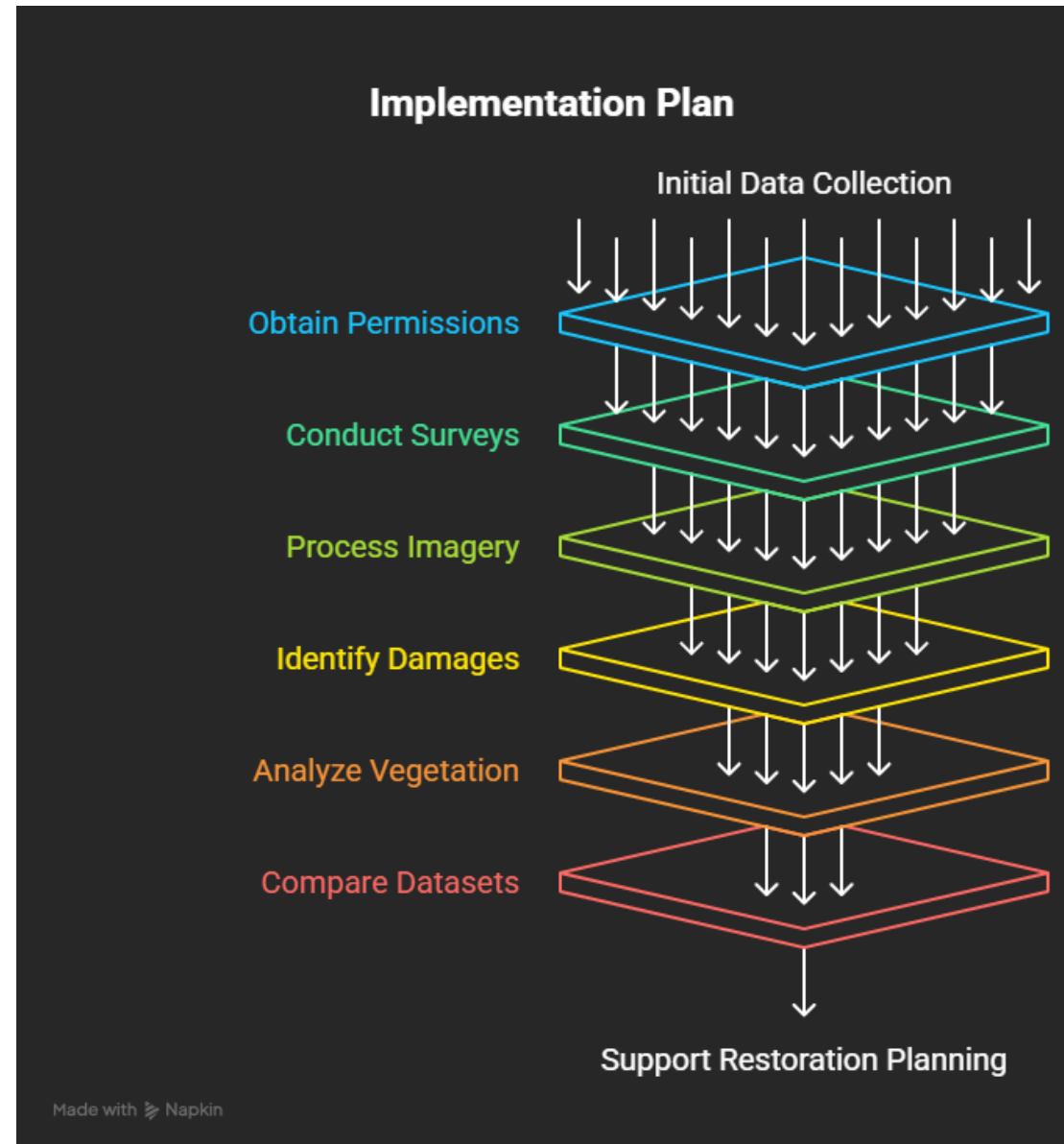
3. Type of data collected and sensor used:

1. UAV RGB camera
2. GNSS for accurate georeferencing
3. TLS (Terrestrial Laser Scanner) for restricted or inaccessible areas.
4. Smartphone images for detailed documentation and potential machine learning training datasets.



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4. Implementation plan:



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Budget:

Item	Budget per day	Whole budget per item	Note
Drone_reservation	400	11200	1 week in a month, 4 months
Licences	2	3000	
Reservations of castle	10	280	
Personal expenses	114,2857143	1000	1 week in a month, 4 months + travel
Paycheck	116	41500	Net pay (after taxes, ect.)
Insurance	14,26	5204,9	
Data analysis- software	2,95	3499	
		399618,2	
		400.000 €	

NOTE FOR HIGH BUDGET: Budget is made on 1 year bases, with full paychecks for whole year for 8 people, with 4 times traveling to Romania (Peles castle area) because of seasonly collection of data which is happening 4 times in a year of the project, that includes 4 times reservation of drones, insurances, ect.

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5. Risk and limitations:

1. *No-fly zone restrictions around the castle.*
2. *Need for permissions from authorities and site managers.*
3. *Strong wind, rain and adverse weather conditions.*
4. *Limited battery life.*
5. *Presence of tourists may affect data quality.*



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6. Expected outcomes:

1. *High-resolution 3D model (Digital Twin) of Peleş Castle.*
2. *Updated maps of the castle and surrounding area.*
3. *Identification and monitoring of cracks and deterioration.*
4. *Vegetation assessment and management recommendations.*
5. *Multi-temporal database supporting restoration monitoring.*
6. *Improved decision-making for sustainable heritage conservation.*

