PROGRESS REPORT

Reporting UN Organization	:	**United Nations Educational Scientific and Cultural Organization (UNESCO)**
Country	:	**Lebanon**
Project No.	:	**222LEB4000** LRF-6
Project Title	:	Capacity Building of human resources for digital documentation of World Heritage Sites affected by 2006 war in lebanon
LRF Signature date	:	22 August 2007
Project Start date	:	December 2007
Project end date	:	**31 December 2010**
Reporting Period	:	April-May-June 2010

I. PURPOSE

Project Summary:

UNESCO assessment mission for (July–August 2006) war damages on World Heritage Sites of Lebanon expressed concern regarding the routine maintenance of those sites and recommended to prioritize the establishment of an integrate action plan for tangible cultural heritage conservation all over the country. This Action Plan should be considered as an umbrella for few most important components such are:

- Establishment of risks' map for World Heritage Site;
- Establishment of digital exhaustive technical documentation for World Heritage Site;
- Capacity building of human resources able to address above components;

Project Objective:

To build capacities of Human Resources in charge, or potentially linked with, the conservation, the development and the enhancement of tangible cultural heritage in Lebanon. The main target group will be the DGA staff, but also Lebanese University (UL) students, while the main subject of the action is to establish accurate high definition 3D digital data and documentation for World Heritage Sites through pilot on-site operation for Baalbek or Tyre World Heritage Sites

Project Outputs:

- To contribute to the risk mapping of the affected World Heritage Sites in Lebanon
- To ensure the state of conservation of the affected World Heritage Sites in Lebanon
- To build capacities of human resources for conservation and enhancement of cultural heritage sites in Lebanon
- To establish a model of full survey of one of the affected World Heritage Sites in Lebanon

Project Linkages to National Priorities and Reconstruction Goals:

- To ensure the state of conservation of the affected World Heritage Sites in Lebanon

Project Implementation Partners:

Directorate General of Antiquities - Ministry of Culture

II. RESOURCES

Total budget approved	**:**	USD	767,226
Total disbursements as for 30 December 2009	**:**	USD	534,699
Commitments for next quarter	**:**	USD	85,000
Available Balance	**:**	USD	232,527

CATEGORY	TOTAL BUDGET (USD)	TOTAL EXP (USD) to Date
10 Project Personnel	USD 17,971	591.26
20 Sub-Contracts	USD 370,062	236,198.80
30 Training and Seminars	USD 18,000	9,940.38
40 Equipment and maintenance	USD 308,000	252,781.47
50 Miscellaneous	USD 3,000	207.46
80 Support costs	USD 50,193	34,980.39

III. RESULTS

Progress in Project Implementation:

Type	Schedule	Timing and consultant
Assessment of existing information relevant for risk preparedness (Beirut and Baalbek, Lebanon)	March 1to 5, 2010 March 29 to April 4, 2010	1. Condition assessment expert (Dr. Teresa Patricio) 2. Structural integrity expert (Dr. Pierre Smars) 3. 3D Heritage Recording expert (Dr. Bjorn Van Genechten)
Preparation of Site Atlas	March 21 – April 15, 2010	1. DGA staff 2. Junior Expert
Risk Preparedness training: preventive maintenance (Beirut, Lebanon)	April 19 – April 23, 2010	1. Condition assessment expert (Dr. Teresa Patricio) (Involves field training in Baalbek with DGA personnel)
	May 31 – June 4	2. Project Coordinator (Dr. M. Santana) 3. Preventive Maintenance Expert (Prof. Dr. Koen Van Balen)
Preparation of the degradations atlas (Belgium)	April 12 – April 16	1. Condition assessment expert (Dr. Teresa Patricio)
Mapping of surfaces degradations	April 21 – May 21	DGA Staff
Mapping of surfaces degradations	April 21 – May 7	1. Junior Conservation Expert T.)
Control of procedures (Beirut)	May 26 – May 28	1. Condition assessment expert (Dr. Teresa Patricio)
Transfer of information on 3D survey	May 26 – June 11	DGA Staff
Control of interaction 3D survey & mapping (Beirut)	May 24 - 28	1. 3D Heritage Recording expert (Dr. Bjorn Van Genechten)
Risk Preparedness Strategy (Beirut)	June 7 - 11	2. Structural integrity expert (Dr. Pierre Smars) 3. Condition assessment expert (Dr. Teresa Patricio)
Contract with national consultant established for laser scanning survey phase II, for “Bacchus and Venus” temples	May – June 2010	All required parts scanned except the western façade of the Bacchus temple

Implementation Constraints and Lessons Learned:

The obstruction by the set up of Baalbek festival delayed the laser scanning survey in addition the travel of some experts was delayed due to the air traffic problems (Iceland volcano eruption)

Key Partnerships & Collaboration

All these activities were undertaken in close coordination with Leuven University and the Directorate General of Antiquities

IV. FUTURE WORK PLAN

- Risk map strategies established by Leuven University
- Laser scanning survey for Bacchus and Venus temples accomplished by national contractor
- TOR for the scientific publications to be finalized

Adjustments to strategies, outcomes or outputs:

The defined action of laser scanning and risk mapping will be undertaken on Baalbeck. This World Heritage site was selected by the DGA.

ARCHAEOLOGICAL SITE OF BAALBEK

Capacity building of human resources for digital documentation of world heritage sites affected by 2006 war in Lebanon

United Nations Educational and Cultural Organization (UNESCO)
& The Directorate General of Antiquities (DGA)

ACTIVITY 3 & beginning of ACTIVITY 4

Mission in Beirut and Baalbek

April 26th – May 1st, 2010

REPORT

By Dr Teresa PATRICIO
May 4th 2010

Summary

Initially the mission was scheduled for the week of 19th April. The flight perturbations in Europe due to the Iceland volcano obliged to postpone the mission to the 26th April. Therefore, from April 26th - May 1st, Dr Teresa Patrício made a mission to Beirut and Baalbek in the framework of the project "Capacity building of human resources for digital documentation of world heritage sites affected by 2006 war in Lebanon". This mission corresponds to first part of Activity 3 and starting of Activity 4 of the project, its aim is the "Risk Preparedness - Training on Surfaces Condition Assessment", and starting the Mapping of surface degradations.

In the terms of reference of the project (September 2009) the training program was scheduled for a complete week and composed by 3 days of theoretical courses at the DGA offices and 2 days of practical exercise in Baalbek (please see annex 1 at the end of the report). It appears that organizational difficulties at the DGA unable the 10 participants (DGA staff) to follow a full week of courses. Therefore, Dr Assaad Seif proposes to Dr Teresa Patrício to compress the theoretical training program for 2 days and to replace the practical exercise with a visit of an archaeological site in Beirut. Nevertheless, 2 participants of the training went to Baalbek with Dr Teresa Patrício to follow the works on surfaces condition assessment.

On April 26th the junior expert Tom Coenegrachts arrived in Beirut to start Activity 4 – Surfaces Condition Mapping of the North-Western semi-circular chamber of the Great Court, Baalbek. Tom Coenegrachts will stay in Baalbek till Mai 15th. To achieve the survey of the complete chamber, Ms Laure Salloum, archaeologist of the Baalbeck region and responsible for the site of Baalbek, installed inside the chamber a movable scaffolding.

Tom Coenegrachts followed the theoretical courses, April 27th and 28th. The 29th of April he went to Baalbek with Dr Teresa Patricio to start surfaces condition mapping of the North-Western semi-circular chamber of the Great Court.

General Schedule of the mission

April 25th — Dr Teresa Patricio arrived in Beirut.

April 26th — Meeting at the DGA with Dr Assaad Seif to prepare the ongoing works
Meeting at the DGA with Mr Ghassan Ghattas, DGA GIS Department: verification of the North-Western semi-circular chamber orthophotos; research of the historical information concerning the North-Western semi-circular chamber; consultation of the DGA iconographical inventory. Various historical materials (reports and iconography) were revealed important for the preparation of a risk preparedness strategy for Baalbek.
Tom Coenegrachts arrived in Beirut.

April 27th — Training on surfaces condition assessment by Dr Teresa Patricio.
Presents: 10 DGA members' staff + Tom Coenegrachts.

April 28th — Training on surfaces condition assessment by Dr Teresa Patricio.
Presents: 10 DGA members' staff + Tom Coenegrachts.

April 29th — Dr Teresa Patricio and Tom Coenegrachts arrived in Baalbek and start Activity 4:

- Visiting the site and general assessment of the surfaces degradations of the Jupiter Temple and Bacchus Temple.
- Identification of the surfaces degradations of the North-Western semi-circular chamber of the Great Court.
- Preparing the illustrated Atlas of the identified stone deterioration patterns.

The developed work was followed by Ms Laure Salloum (archaeologist, Baalbeck region) and Mr. Raffi Gergian (architect/archaeologist, Anjar – Beqaa West).

April 30th — Dr Teresa Patricio and Tom Coenegrachts start the mapping of the surfaces degradations of the North-Western semi-circular chamber of the Great Court on base of the prepared orthophotos by DGA.
At the end of the day Dr Teresa Patricio and Tom Coenegrachts return to Beirut.
Meeting at the Hotel Alexander with Mr Ghassan Ghattas, DGA GIS Department: discussion concerning the transfer of the surfaces condition mapping to the 3D model.

May 1st — Meeting at the DGA offices with Dr Assaad Seif: reporting the results of the Training; reporting the results of the developed work in Baalbek.
Dr Teresa Patricio returns to Belgium and Tom Coenegrachts returns to Baalbek.

The report is divided into 3 main sessions:

In section 1 — Objectives and results of the training on surfaces condition assessment.

In section 2 — Work developed in Baalbek for the surfaces condition mapping of the North-Western semi-circular chamber of the Great Court.

In section 3 — Annexes.

Section I. Training on Surfaces Condition Assessment

Objectives & results

The training sessions are aimed to provide an overview of the understanding of condition assessment of surface degradations and to prepare the necessary recording of additional information to prepare a 'Risk Preparedness Strategy' (RPS) of the Baalbek World Heritage Site, based on accurate high definition 3D digital data recorded using a laser scanner. The target group was the DGA staff; the group composed by archaeologists and architects had 10 participants:

Laure Salloum,	archaeologist,	Baalbeck region
Myriam Ziadè,	archaeologist,	Saida region
Oussama Kallab,	architect restorer	
Samar Karan,	archaeologist,	North Lebanon
Raffi Gergian,	architect/archaeologist,	Anjar – Beqaa West
Hisham Sayegh,	archaeologist,	Beirout and suburbs
Tania Zaven,	archaeologist,	Byblos
Kaled rifai,	architect,	DGA Beirut
Naser Siqlawi,	archaeologist,	Tyr – South
Ghassan Ghattas,	topographer	GIS Department, Beirut

The training approach was conciliating theory and practice and the involvement of the participants was achieved during the courses and visit:

- Theory was illustrated with practical cases – projects from archaeological sites in Turkey, Belgium, Syria and Lebanon.
- The participants were presenting specific problems from the archaeological sites where they work in Lebanon.
- The visit of the site, situated in front of the DGA offices, allowed to discus issues related with: materials, history, surface degradations, public presentation, monitoring and preventive maintenance. Moreover the visited remains provide a number of problems, which were understood by the participants using common sense and knowledge obtained during the theoretical sessions.

At the end of the training, the participants demonstrate:

- Understanding of surface degradations (recognizing, recording and mapping the degradations patterns) in the scoop of management and conservation of heritage sites;
- Comprehension of the significance of the diachronic and synchronic dimensions while evaluating surfaces condition.
- Understanding and competence in building strategies for recording heritage places.

Teaching Methodology

The approach was based on providing a theoretical basis illustrated by specific fieldwork activities. The participants were immersing not only in concepts, but in real first hand problems when mapping the surfaces conditions.

Deliverables

A set of documentation in digital form was delivered to the participants:

- Lectures program with the description of the objectives and methodology of the training
- Bibliography
- Atlas of the surface degradations used for the preparation of the 'Risk Preparedness Strategy' (RPS) of Baalbek World Heritage Site.
- *Illustrated glossary on stone deterioration patterns/Glossaire illustré sur les formes d'altération de la*

Pierre, (Monuments and Sites XV), ICOMOS International Scientific Committee for Stone (ISCS), ICOMOS, 2008.

- Syllabus prepared by Dr Teresa Patrício on: the history of archaeological conservation, the degradations causes of archaeological sites (risks and aleas), management of archaeological sites, methodology for planning conservation of archaeological sites.
- PowerPoint presentation on 'Surface Degradations Patterns' prepared by Dr Teresa Patrício and used for the theoretical course of Session 3
- Various examples of mapping surface degradations prepared by Dr Teresa Patrício.

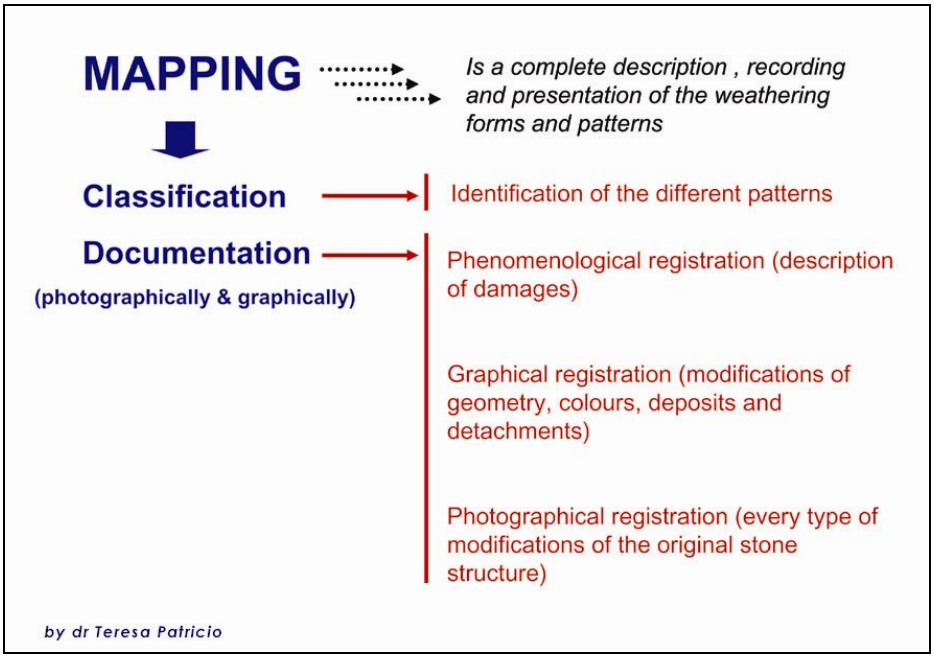
Program of the courses

DAY 1	**27 April 2010**	Beirut – DGA offices	10 participants - DGA staff	
Hours	***Activity***		***Equipment***	***Manuals***
10:00 – 11:00	Session 1: The degradations causes of the archaeological sites		Digital projector	Reference bibliography
11:00 – 11:30	Session 2: The synchronic and diachronic dimension		Digital projector	Reference bibliography
11:30 – 12:00	Break			
12:00 – 13:00	(Continuation Session 2)		Digital projector	Reference bibliography
13:00 - 13:30	Session 3: The surfaces degradations patterns		Digital projector	Reference bibliography
13:30 – 14:00	Questions and answers session			
DAY 2	**28 April 2010**	Beirut – DGA offices	10 participants - DGA staff	
Hours	***Activity***		***Equipment***	***Manuals***
10:00 – 11:00	(Continuation Session 3)		Digital projector	Reference bibliography
11:00 – 12:00	Session 4: Documentation & Mapping of surface degradations		Digital projector	
12:00 - 12:30	Questions and answers session			Reference bibliography
12:30 – 14:00	Session 5: Visit of an archaeological site in Beirut			

Section 2. Surface condition mapping

Procedure

As the data available from previous works and research was insufficient it was decided to proceed to a complete Mapping of the surface degradations of the North-Western semi-circular chamber of the Great Court. The Mapping is a complete description, recording and presentation of the various weathering forms and patterns. The Mapping is composed firstly by the classification and identification of the different patterns and secondly by its documentation. The complete documentation is developed on three levels: phenomenological registration, graphical registration and photographical registration.



Scheme of the applied methodology for the mapping of surfaces degradations

Surface condition mapping

The developed work at the North-Western semi-circular chamber of the Great Court consisted firstly to prepare the Degradation Atlas, followed by the documentation by graphical registration of the surface degradations. For the Mapping the standards and specifications defined by the ICOMOS International Scientific Committee for Stone (ISCS), *illustrated glossary on stone deterioration patterns,* were followed.

We can consider that two phases were developed

Phase 1	Classification by the Identification of the existing surface degradations. Phenomenological registration by the description of the observed and identified damages. Photographical registration of every representative type of the identified patterns. Preparation of the illustrated Atlas (please see annex 2).
Phase 2	Starting of the graphical registration of the surface degradations of the North-Western semi-circular chamber of the Great Court on base of the prepared orthophotos by DGA. Tom Coenegrachts is continuing the graphical registration till the 15th of Mai.

In the framework of this project, the mapping information will be transferred to the 3D digital survey by the DGA staff. Once the transfer achieved a qualitative and quantitative analysis will be produced for the design of a Risk Preparedness Strategy for Baalbek.

Time dimension & risk assessment

In the Activity 1 report it was advised to include the time dimension for a good understanding of the evolution of the pathologies. This will greatly facilitate the evaluation of risks; moreover the implementation of the "Risk Map" should allow an easy comparison of the situation at different periods.

Risk assessment will be made taking into account the historical data and the reported changes in time. During the Surface Condition Mapping the modifications of the structure in time are also reported on maps (completions, new additions, and materials).

As we know the North-Western semi-circular chamber of the Great Court suffered changes in time as reconstruction (colonnade, entablature and roof), restoration of surfaces and completion of missing parts (with new stone blocks, concrete and iron), this information is crucial to the comprehension of the nowadays degradations.

To complete the information about the various interventions in past times, the DGA iconographical inventory was consulted and various images from the 1960's restoration works were selected:

Page0001.tif – general view after restoration

Page0003.tif – general view of the cupola after restoration

Page0003.tif – general view of the cupola after restoration

Page0004.tif – general view of the cupola after restoration

Page0005.tif – general view of the cupola after restoration

Page0006.tif – general view of the site works

Page0007.tif –view of interior niches after restoration

Page0009.tif – general view before the restoration

Page00010.tif – general view during the restoration of the South corner

Page00011.tif – view of the South wall during restoration

Page00012.tif – view of the South wall during restoration

Page00013.tif – top view of the capitals during restoration

Page00013.tif – top view of the capitals during restoration

Page00015.tif – general view after restoration

Page00016.tif – general view after restoration

Page00017.tif – general view during restoration

Page00018.tif – general view during restoration

Page00019.tif – general view after restoration

Page00020.tif – view of the South wall after restoration

Page00021.tif – detail of the main façade after restoration

Page00022.tif – general view after restoration

Page00023.tif – general view during restoration

Page00024.tif – general view after restoration

Page00025.tif – general view after restoration

Page00026.tif – general view after restoration

Page00027.tif – general view after restoration

There are many historical documents available on Baalbek (previous studies, books, ancient photographs, prints...). The project should be the occasion to organise access to data useful for risk assessment available at the DGA and to organise a structure to keep future data.

Bibliographical references that provide important historical information for risk assessment:

- Margarete van Ess (ed.), *Baalbek / Heliopolis. Results of Archaeological and Architectural Research 2002 – 2005*, *German – Lebanese Colloquium, Berlin 2006*, in: BAAL, Bulletin d'Archéologie et d'Architecture Libanaises, volume IV, Ministère de la Culture, Direction

générale des Antiquités, Beyrouth 2008.

- Nina Jidejian, *Baalbek Heliopolis "Cité du Soleil"*, Librairie Orientale, Beirut, 1998.

Recommendations for the ongoing works

We strongly advise:

- To reference in space and in time the existing information
- Photographs and documents should be geo-referenced
- Maps must be produced to synthesise and quantify the information on surface degradations
- Maps must be produced interpreting existing pathologies in terms of risks.

Facilitate access to the information. The following points may be considered:

- Creation of a unique database accessible to all the stake-holders
- Giving a broader access to the "risk map" and related information will help its development and increase its efficiency.

Moreover, after a contact with Dr Jean Yasmine, Dr Teresa Patrício learns about the existence of a Risk Map produced by ARS Projetti in 2008. The consultation of this map is of extreme importance for the improvement of the ongoing works. During Activity 1 Assessment of the existing information, this document was one of the missing elements.

Annexes

Team members

Dr Teresa Patricio: Condition assessment expert

Architect, master in conservation, PhD in Engineering, Independent architect (Belgium)

Tom Coenegrachts: Condition assessment junior expert

Archaeologist (Belgium), master student in conservation,

Contacts in Lebanon

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World Bank PMU

Jean Yasmine, Representative for archaeological sites

Annex 1 – Training schedule initially proposed

Activity 3 Risk Preparedness training: preventive maintenance (Beirut, Lebanon)

1. Surface Condition Assessment by Dr. Teresa Patrício
   (Involves theoretical training in Beirut & training in Baalbek with DGA personnel)

Theoretical sessions

DAY 1	**26 April 2010**	Beirut - DGA offices	DGA students	
Hours	***Activity***		***Equipment***	***Manuals***
09:30 – 11:30	Session 1: The degradations causes of the archaeological sites (aleas, risk & threats)		Digital projector	Syllabus
11:30 – 12:00	Break			
12:00 - 13:30	Session 2: The degradations causes of the archaeological sites (aleas, risk & threats)		Digital projector	Syllabus
13:30 – 14:00	Questions and answers session			
DAY 2	**27 April 2010**	Beirut – DGA offices	DGA students	
Hours	***Activity***		***Equipment***	***Manuals***
09:30 – 11:30	Session 3: The synchronic and diachronic dimension		Digital projector	Syllabus
11:30 – 12:00	Break			
12:00 - 13:30	Session 4: The surface degradations patterns		Digital projector	Syllabus
13:30 – 14:00	Questions and answers session			
DAY 3	**28 April 2010**	Beirut – DGA offices	DGA students	
Hours	***Activity***		***Equipment***	***Manuals***
09:30 – 11:30	Session 5: Documentation & Mapping of surface degradations		Digital projector	Syllabus
11:30 – 12:00	Break			
12:00 - 13:30	Session 6: Baalbek degradations: introduction to the practical sessions		Digital projector	Reference bibliography
13:30 – 14:00	Questions and answers session			

Practical sessions

DAY 4	**29 April 2010**	Site of Baalbek	DGA students + junior expert	
Hours	***Activity***		***Equipment***	***Manuals***
09:30	Departure to Baalbek			
11:30 – 13:00	Practical Session 1: visiting the site and assessment of the surface degradations of the Jupiter Temple			
13:00 – 14:00	Lunch			
14:00 – 15:00	Practical Session 2: Great Court North-Western semi-circular chamber - Preparing the illustrated		Digital camera	

	glossary on stone deterioration patterns		
15:00 – 17:00	Practical Session 3: Great Court North-Western semi-circular chamber - Survey of the surfaces degradations	Ortophotos, transparent film, color pencils	illustrated glossary

DAY 5	**30 April 2010**	Site of Baalbek	DGA students + junior expert
Hours	***Activity***	***Equipment***	***Manuals***
09:30 – 13:00	Practical Session 4: Great Court North-Western semi-circular chamber - Survey of the surfaces degradations	Ortophotos, transparent film, colour pencils	illustrated glossary
13:00 – 14:00	Lunch		
14:00 – 16:00	Practical Session 4: Great Court North-Western semi-circular chamber - Survey of the surfaces degradations	Ortophotos, transparent film, colour pencils	illustrated glossary
16:00	Returning to Beirut		

DAY 6	**1 May 2010**	Beirut – DGA offices	DGA students + junior expert
Hours	***Activity***	***Equipment***	***Manuals***
09:30 – 12:00	Reporting the results of the practical exercise		

Annex 2 – ATLAS of Surface Degradation[1] (DRAFT)

North-Western semi-circular chamber of the Great Court

By Teresa PATRICIO

A - CRACK AND DEFORMATION

A.1 Crack

Individual fissure, clearly visible by the naked eye, resulting on separation of parts

a) Fracture

Crack that crosses completely the stone bloc

b) Star crack

Crack having the form of a star. Rusting iron or mechanical impact are possible causes of this type of damage

c) Hair crack *(not present)*

d) Craquele *(not present)*

e) Splitting

Fracturing of a stone along planes of weakness such as microcracks or clay/silt layers, in case where the structural elements are orientated vertically

[1] The Atlas of Surface Degradations of the North-Western semi-circular chamber of the Great Court follows the standards and specifications of the international conservation world, namely defined criteria's by the ICOMOS International Scientific Committee for Stone (ISCS), *illustrated glossary on stone deterioration patterns*.

	f) Crack *Individual fissure, clearly visible by the naked eye*	

B – DETACHMENT

B.1 Blistering		*(not present)*
B.2 Bursting		*(not present)*
B.3 Delamination	a) Exfoliation	*(not present)*
B.4 Disintegration *Detachment of single grains or aggregates of grains*	a) Crumbling *Detachment of aggregates of grains from the substrate. These aggregates are generally limited in size (less than 2 cm)*	
	b) Granular disintegration	*(not present)*
B.5 Fragmentation *The complete or partial breaking up of a stone, into portions of variable dimensions that are irregular in form, thickness and volume.*	a) Splintering	*(not present)*
	b) Chipping *Breaking of pieces, chips, from the edges of a block*	

B.6 Peeling

Shedding, coming off, or partial detachment of a superficial layer (submillimetric to millimetric)

B.7 Scaling

Detachment of scale or stack of scales, not following any stone structure, detaching like fish scales or parallel to the stone surface. The thickness of a scale is generally of millimetric to centimetric scale

a) Flaking	*(not present)*
b) Contour scaling	*(not present)*
c) Spalling	*(not present)*

C - FEATURES INDUCED BY MATERIAL LOSS

C.1 Alveolization

Formation on surface of cavities (alveoles) which may be interconnected and may have variable shapes and sizes (generally centimetric, sometimes metric)

C.2 Erosion *Loss of original surface, leading to smoothed shapes*	a) Differential erosion *Occurs when erosion does not proceed at the same rate from one area of the stone to the other. As a result, the stone deteriorates irregularly. This feature is found on heterogeneous stones containing harder and/or less porous zones. Differential erosion may result in loss of components or loss of matrix of the stone*	 
	b) Rounding	*(not present)*
	c) Roughening	*(not present)*
C.3 Mechanical Damage *Loss of stone material clearly due to a mechanical action*	a) Impact damage *Mechanical damage due to the impact of a projectile (bullet, shrapnel) or of a hard tool*	

b) Cut *(not present)*

c) Scratch

Manually induced superficial and line-like loss of material due to the action of some pointed object. It can be accidental or intentional

d) Abrasion

Erosion due to wearing down or rubbing away by means of friction, or to the impact of particles

e) Keying

Impact damage resulting from hitting a surface with a pointed tool, in order to get an irregular surface which will assist the adhesion of an added material, a mortar for instance

C.4 Microkarst *(not present)*

C.5 Missing part (gap)

Empty space, obviously located in the place of some formerly existing stone part

C.6 Perforation *(not present)*

C.7 Pitting

Point-like millimetric or submillimetric shallow cavities. The pits generally have a cylindrical or conical shape and are not interconnected

D - DISCOLORATION & DEPOSIT

D.1 Crust

Surface accumulation of materials. May include exogenic deposits together with materials derived from the stone; may have a homogeneous thickness, and thus replicate the stone surface, or have irregular thickness and disturb the reading of the stone surface

a) Black crust

Crust developed generally on areas protected against direct rainfall or water runoff. Black crusts usually adhere firmly to the substrate. They are composed mainly of particles from the atmosphere, trapped into gypsum (CaSO4.2H2O) matrix.

b) Salt crust *(not present)*

D.2 Deposit

Accumulation of exogenic material of variable thickness (splashes of paint or mortar, sea salt aerosols, atmospheric particles such as soot or dust, bird and bat droppings, etc...)

D.3 Discoloration a) Coloration *(not present)*

Change of the stone colour in one to three of the colour parameters: hue, value and chroma.

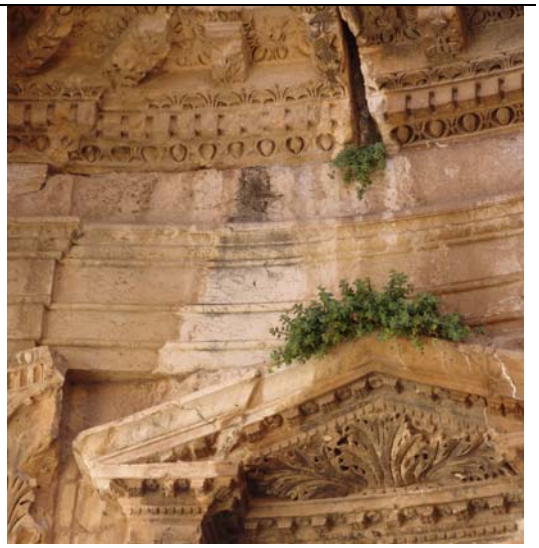
- Hue: the most prominent characteristic of a colour (blue, red, yellow, orange etc..).

- Value: darkness (low hues) or lightness (high hues) of a colour.

- Chroma: purity of a colour.

b) Bleaching

Gain in value due to chemical weathering of minerals (reduction of iron and manganese compounds) or extraction of colouring matter (leaching, washing out)



c) Moist area

d) Staining

Kind of discoloration of limited extend and generally of unattractive appearance

D.4 Efflorescence *(not present)*

D.5 Encrustation (concretion) *(not present)*

D.6 Film *(not present)*

D.7 Glossy aspect

Aspect of a surface that reflects the light totally or partially. The surface has a mirror-like appearance

D.8 Graffiti

Engraving, scratching, cutting or application of paint, ink or similar matter on the stone surface

D.9 Patina

Chromatic modification of the material, generally resulting from natural or artificial ageing and not involving in the most cases visible surface deterioration

D.10 Soiling

Deposit of a very thin layer of exogenous particles (soot) giving a dirty appearance to the stone surface

D.11 Sub florescence *(not present)*

E - BIOLOGICAL COLONIZATION

E.1 Algae *(not present)*

E.2 Lichen

Vegetal organism forming rounded millimetric to centimetric crusty or bushy patches, growing generally on outside parts of a stucture. Lichen are most commonly grey, yellow, orange, green or black

E.3 Moss

Vegetal organism forming small, soft and green cushions. Mosses look like dense micro-leaves packed together. Normally grow in any place permanently or often wet and usually shady

E.4 Mould *(not present)*

E.5 Plant

Vegetal living being, when complete, root, stem, and leaves, though consisting sometimes only of a single leafy expansion (tree, herb, ...)