AGA KHAN HISTORIC CITIES PROGRAMME

THE CONSERVATION OF THE ALTINBUGHA AL-MARIDANI MOSQUE, CAIRO

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THE AGA KHAN TRUST FOR CULTURE

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Osama Talaat, *Head of the Islamic, Coptic, Antiquities Sector*
Karam el-Badry, *Inspector in charge of al-Darb al-Ahmar District*

Historic Cairo Projects:
Hisham Samir, *General Supervisor, Historic Cairo Projects*
Mahmoud Abd al-Basat, *Head of the Historic Cairo Department*
Mohamed Abou Zied, *Engineering Department*
Asmaa Said and Shima Ibrahim, *Fine Arts Conservation Department*
Sara Abd al-Gafar, *Historical Studies Department*

A project of this scope and significance is always a collaborative effort. The restoration of the Maridani mosque is the result of many contributions from the AKTC's staff and consultants, the AKCS-E team, several specialists, and others from the public and private sectors who have provided technical inputs, made available their skills, and given support throughout the entire conservation process. AKTC would like to thank all who have been associated with its initiative over the past two years, as well as acknowledge the financial assistance received from the European Union.

In particular, the following individuals have contributed to the project:

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The mirhab niche of the Maridani Mosque after restoration *(AKTC Conservation Team, 2021)*.

EXECUTIVE SUMMARY

This report presents the results and conclusions, upon completion of conservation works, of the European Commission/Aga Khan Trust for Culture (AKTC) project to rehabilitate the Maridani Mosque. These began in December 2018 and were completed in June 2021.

The Conservation of the Altinbugha al-Maridani Mosque, located in Cairo's historic Darb al-Ahmar district, is one of the three components of a project awarded a grant by the European Commission, entitled "Creating Access to Cairo's Islamic Cultural Heritage". The Project's aim was to preserve and celebrate Cairo's rich and tangible Islamic cultural heritage, as well as promote cultural tourism as a major stimulus toward local socio-economic development.

Because of its special significance as a monument and its central location along the principal Medieval spine connecting Islamic Cairo's Citadel, its famous souqs and Bab al-Zuweyla, preservation of the Maridani Mosque seemed an ideal choice as a means of responding to the project's development objectives. Its implementation by AKTC was based on the organization's more than twenty years of planning and conservation experience in Cairo's Al Darb al-Ahmar district. In particular, AKTC's Egyptian subsidiary, Aga Khan Cultural Services-Egypt (AKSC-E) would bring its long-term association and engagement in the area, best known as a result of the development of Al-Azhar Park and the urban revitalization efforts in the adjoining Darb al-Ahmar neighbourhood, which, together, had generated over the years a solid socio-economic basis for the development of goods and services for the tourism sector.

Since mid-2013, AKCS-E has passed responsibility for continued engagement with the local community to Mezalla, a locally registered and managed development organization that it helped set up and with which it has continued to collaborate closely ever since. Mezalla's main role has been (and will continue to be) to pass on technical and managerial capacities to the local population, both to develop local crafts for the tourist market and provide marketing skills and training in tourism-related services.

The following activities were funded through the European Commission grant:

- Implementation of the Maridani Mosque conservation works;
- Creation of visitor routes through the district and provision of accompanying physical and socio-economic tourist infrastructure that will allow visitors to appreciate the outstanding Mamluk monuments along Cairo's principal Medieval spine;
- Development of local goods and services related to the expected increase in cultural tourism in response to the gradually larger numbers of visitors to the area and the financial returns these are expected to bring to the entire district.

The skills and substantial experience acquired by AKCS-E in monument conservation since 2001 were of much value in undertaking the Maridani Mosque project, a building in dire need of repair as it had sat untouched since the last restoration campaign more than a century ago by the Comité de Conservation des Monuments de l'Art Arabe (1895-1905).

The mosque was built in 1340 CE by Amir Altinbugha al-Maridani under the patronage of Sultan al-Nasir Muhammad. It is one of the most striking examples of Bahri Mamluk architecture in Cairo. Given the exceptional quality of the monument and its interior decoration, all pre-construction and conservation stages were carried out with the greatest attention to detail and in keeping with the highest international conservation standards. The initial architectural surveys focused not only on the principal structural components of the mosque, but also on its fittings and decorations, such as the historic doors, painted wooden ceilings and stucco carvings. Preparatory work began with a thorough architectural survey and photographic documentation of the building, followed by a detailed analysis and assessment of its condition and state of conservation. The assessment included a review of the structural issues, as well as the state of its decorative features, whose outstanding aesthetic qualities started to come to light after having been hidden for decades under thick layers of dust and grime.

A first and essential component of the project was to ensure the full rehabilitation of the building's envelope to guarantee the durability of the monument over time: this included the replacement of the entire roof and defective water insulation with a new bitumen-based insulation membrane covering the entire roof surface of 1'250 square meters. The roof was then covered by a mortar screed sloped to drain rainwater away. The different kinds of damage and deterioration, such as cracking, partial settlement, material loss and deterioration, were carefully mapped and eventually fixed, including, where necessary, the replacement of individual stone units, particularly at the base of the walls to ensure the building's overall stability.

The stonework of the exterior facades was subjected to gentle cleaning using poultice and hand tools, which revealed the façade's original decorative pattern of alternating bands of red and yellow stone. Fine conservation work was also carried out to preserve the important decorative elements found inside the mosque and its prayer hall. Manual cleaning and labor-intensive conservation techniques were applied to the bicolored stone surfaces of the interior courtyard, as well as the polychrome marble mosaics and marble panels found on the *qibla* wall and *mihrab* niche. The stained gypsum windows were restored by specialists, as were the painted and gilded wooden ceilings surfaces. These called for gentle cleaning, the consolidation of colored surfaces and the reintegration of missing parts. Finally, the lost wooden elements and inlaid panels were replaced to reconstitute the complex geometric design of the *minbar*.

This comprehensive approach called for the recruitment of highly skilled conservators, craftsmen specialized conservation architects, consultant engineer, and training of numerous workers. The project was an opportunity to train junior professionals and apprentices in the various crafts needed to restore the mosque. When necessary, international expertise was called in to reinforce the capacities of the local staff. Throughout the conservation process, regular visits by the inspectors of the Egyptian Ministry of Antiquities provided valuable opportunities to share knowledge and discuss the technical solutions under implementation.

The report's narrative is organized in five parts and annexes as follows:

Part 1 presents the background and objectives of the initiative and introduces the project's components, phasing and budgeting.

Part 2 describes the mosque's urban setting, historical development and principal architectural features, as well as the national legislative framework and international conservation principles that apply to its long-term conservation.

Part 3 discusses the main reasons for the damage and dilapidation observed prior to the inception of works and offers an overview of the approach and scope of the conservation work carried out to stabilise the monument and redress the poor condition of its decorative elements and interior furnishings.

Part 4 reviews the technical challenges faced during the project and elaborates the innovative techniques and solutions identified to redress essential or especially valuable components of the building in very poor condition.

Part 5 summarises the results of the project to explain how it may provide a valuable case study for the rehabilitation of significant monuments in the wider context of historic Cairo.

The Annexes contain a selected bibliography and a summary of the various surveys and investigations carried out during the course of the project.

The series of high-resolution photographs displayed in this brochure were expressly commissioned by AKTC to document and celebrate the renovation of the Maridani mosque after more than a century of neglect. In 2017, Christian Richters photographed the building before work commenced to document the existing conditions. In July 2021, Adrien Buchet photographed the Maridani mosque from the same points of view, just after completion of the conservation works. This paired set of photographs captures the extent of work carried out and the results achieved.

1.0 | THE PROJECT

1.1 KEY EU GRANT INFORMATION

The Maridani Mosque Conservation Project was part of a grant awarded by the European Union to upgrade access for visitors who wish to experience the Islamic cultural heritage of the Darb al-Ahmar historic district of Cairo. The European Union grant was made up of three components:

- Conservation of al-Maridani Mosque, the subject of the present report;
- Creation of an interpretative visitor's route for the district;
- Training and capacity-building of local SMEs for tourism-related activities.

Call for proposals reference no.	EUROPEAN UNION EuropeAid/154927/DD/ACT/EG
Lot number	PROSPECT 154927
Number of the proposal	ENI/2017/154927/26
Name of the lead applicant	Aga Khan Cultural Services – Egypt
Title of the action	Creating Access to Cairo's Islamic Cultural Heritage
Grand signature date	13 December 2017
Location of the action	Cairo, Egypt
Project Budget	Total Budget EUR 1'330'024 EU Grant: EUR 1'197'021 (90% of total) AKF cost share: EUR 133'003 (10% of total)
Start and end dates	1 April 2018 to 31 May 2021 (no cost extension was granted due to reduced project activity during the pandemic crisis)
Duration of the action	37 months (the initial grant duration was 26 months)

RIght: View of the prayer hall looking south before restoration *(Christian Richters, 2017)*.

1.2 PROJECT OBJECTIVE AND DESCRIPTION

The grant, as approved by the European Union, provided funds for the conservation of the exterior envelope and prayer hall of the Maridani Mosque, an imposing monument built in 1338. Despite centuries of wear and tear, the mosque remains a testament to the high-quality architectural skills and workmanship achieved in Cairo during the Bahri Mamluk period, particularly under the long reign of Sultan al-Nasir Muhammad.

The project builds upon the substantial experience gained by the Aga Khan Trust for Culture (AKTC) and its subsidiary, the Aga Khan Cultural Services-Egypt (AKCS-E), over the past two decades in the Darb al-Ahmar district of historic Cairo. The district was the object of considerable attention in conjunction with the creation of the 33-hectare Azhar Park, located on the east side of Darb al-Ahmar. Here the Trust implemented numerous physical and socio-economic development activities aimed at improving the district's general condition. These included conservation works on twelve historic monuments, the restoration of the historic Ayyubid wall, the rehabilitation of numerous public open spaces, and a comprehensive urban planning and housing upgrading programme accompanied by socially relevant initiatives covering micro-credit, education and health.

Above: View of the prayer hall looking south after restoration *(Adrien Buchet, 2021).*

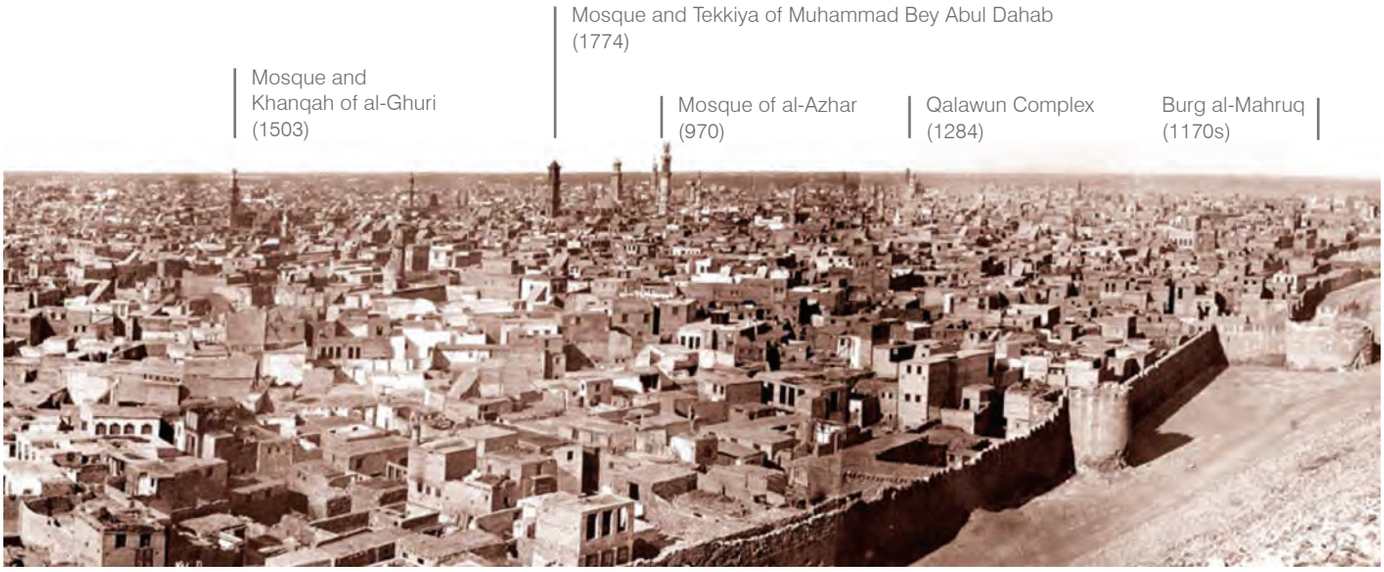
Below: The former Darb-Schouglan school rehabilitated and converted into community centre, one of the initiatives undertaken by AKTC /AKCS-E in the framework of the Darb al-Ahmar area programmes *(AKSC-E Team, 2010).*

The location of the Maridani mosque, along the main thoroughfare between the Souqs and Bab al-Zuweyla, punctuated by the many Mamluk monuments and Darb al-Ahmar's access gates into Al-Azhar Park, made the monument an ideal heritage anchor for the development of activities centred on tourism and the exploration of the area's rich culture.

The conservation project focused in the first instance on securing the external envelope of the monument and then on rehabilitating the interior prayer hall, which was, at the same time, the most exceptional and most dilapidated part of the building. Conservation works concentrated on the covered eastern prayer hall given its quality and significance, very poor condition, and the high level of expertise required for the conservation of its various architectural elements and furnishings. These included the dome and its pendentives, the painted ceiling, the *qibla* wall, the *mihrab* niche, and the wooden minbar and screen separating the interior courtyard from the *qibla* area, all of which were subjected to detailed study and careful attention during the conservation phase.

Upper register: Panoramic view of Islamic Cairo and its monuments taken in a late nineteenth century photograph. The location of the al-Maridani Mosque can be seen on the extreme left side of the image *(Pascal Sebah, 1880).*

Right: The complete rehabilitation of the Maridani mosque's roof was necessary to secure from water infiltration the external envelope of the monument *(Adrien Buchet / AKTC, 2021).*



The project's main accomplishments between 2018 and 2021 are:

- **The complete rehabilitation of the building envelope (roof, exterior facades, minaret and dome)**
  - Stabilisation and emergency repairs of the unstable structural components;
  - Replacement of the entire roofing, water insulation and drainage systems;
  - Conservation of the Tabbana Street elevation and northern monumental gate;
  - Sidewalk paving in basalt stone along the base of the exterior façade;
  - Conservation of the minaret and extrados of the dome.

- **The conservation of the interior courtyard and prayer hall**
  - Conservation of the interior courtyard's wall elevations and stucco medallions;
  - Repairs to the ablution pavilion in the mosque's courtyard;
  - Conservation of plaster and tile surfaces in the portico along the eastern side of the courtyard;
  - Conservation of the masonry and marble walls, columns and arches of the covered prayer hall;
  - Conservation of the dome intrados and decorated pendentives;
  - Reintegration and surface conservation of the qibla wall's polychrome marble panels;
  - Reintegration and surface conservation of the mihrab's marble mosaics;
  - Partial replacement and conservation of the minbar's wooden elements and inlays;
  - Partial replacement and conservation of the decorated ceilings;
  - Conservation of wooden doors and stained glass gypsum windows;
  - New electrical and lighting system in the interior spaces and for the northern monumental gate;
  - Installation of a new sound system in the prayer hall.

- **The installation of interior finishes**
  - Installation of floor carpets in the prayer hall;
  - Installation of shoe racks at the entrance of the prayer hall.

Above: The restored prayer hall looking towards the north-western corner of the mosque *(Adrien Buchet, 2021).*

1.3 PROJECT PHASING AND SEQUENCE OF ACTIVITIES

Project activities and scheduling were organised in three main phases. These covered the pre-construction, mobilisation and actual implementation phases. Each of these encompassed a sequence of discrete sub-activities and work components as further detailed below.

- **Project surveys and studies: June-August 2018**
  - Architectural surveys and other physical documentation;
  - Assessment of conditions through analytical and technical studies;
  - Identification of conservation options prior to implementation;
  - Formulation of detailed schedules of work.

- **Project mobilisation: September-October 2018**
  - Site handed over to the AKTC/AKCS-E project team;
  - Construction of temporary site office;
  - Identification and recruitment of conservation team and skilled craftsmen;
  - Procurement of tools, site equipment and scaffolding.

- **Implementation of conservation works: November 2018-June 2021**

  Building envelope
  - Cleaning and conservation of the minaret, completed end 2019;
  - Cleaning and conservation of the exterior façade and northern monumental gate;
  - Replacement of defective roofing and installation of water insulation;
  - Conservation of the dome extrados, including matching repairs in concrete.

  Interior works in the prayer hall
  - Conservation of the courtyard elevations and stucco medallions;
  - Conservation and repairs to the ablution pavilion and exterior drainage infrastructure;
  - Conservation of masonry and marble walls, columns and arches of the covered prayer hall;
  - Cleaning and conservation of the painted and gilded ceilings and upper inscription band;
  - Conservation of the dome intrados and decorated wooden pendentives;
  - Repair and conservation of the qibla marble panels and marble mosaics in the mihrab niche;
  - Cleaning and repair of missing sections of minbar wooden elements and inlay work;
  - Cleaning and repair of wooden mashrabiya between the interior courtyard and the prayer hall.

Approximately 70 percent of the Maridani Mosque, including its most technically challenging parts, was restored with the funding made available by the European Union during the period 2018-2021. It is hoped a second phase will be implemented, specifically to carry out the remaining 30 percent

of works needed to complete the conservation of this outstanding monument, especially given the significant results achieved during the present phase. An estimate based on current costs is provided below together with a summary of the amounts spent during the total project development period.

1.4 BUDGET

The table on the next page shows the total amounts budgeted under the European Union grant. It should be noted that, as a result of savings under certain components, it was possible to increase the scope of works carried out for the conservation of the mosque over the 2018-2021 period without the need for additional funds.

- The **European Union budget** covered all necessary works for the rehabilitation and conservation of the building envelope, as well as the conservation of the eastern section of the mosque's interior. Added works included the interior courtyard facades as well as repairs and conservation works in the central ablution pavilion.

Above & Below: The Ottoman ablution pavilion, relocated by the Comité to al-Maridani from the Sultan Hassan Mosque, before and after restoration *(Christophe Bouleau, 2017 and Adrien Buchet, 2021)*.

Description	Amount
Implementation of Conservation Works	773.082 €
Project Manager	71.301 €
Project Junior Accountant	9.445 €
Procurement Officer	12.268 €
Monitoring and Evaluation	4.797 €
Total	**870.893** €

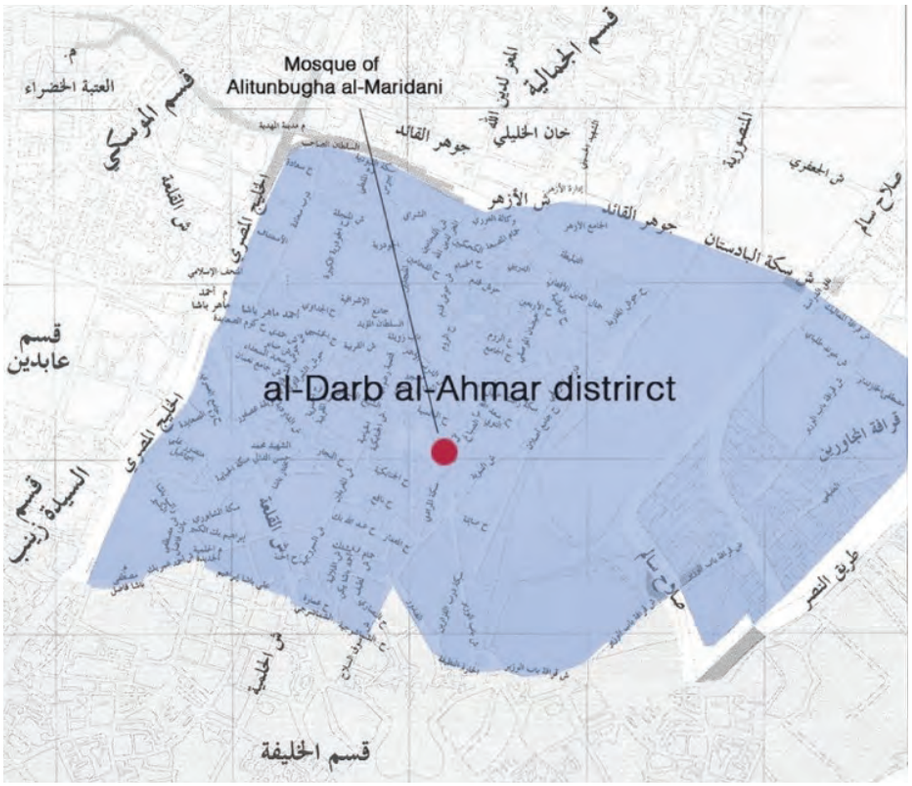
An estimate for supplementary works to complete the restoration: As mentioned above, conservation works carried out on the Maridani Mosque from 2018 to 2021 constitute an estimated 70 percent of the works required to restore the entire mosque. To enable the full restoration of this outstanding monument a supplementary phase of works and a corresponding budget are needed. It is estimated that a further 12 months are required to complete all conservation works, based on a comprehensive estimated budget of just under 500,000 Euros. This figure assumes that the scaffolding and site equipment acquired during Phase 1 will be re-used and the personnel trained during the period 2018-2021 will continue to work on the site. Finding the funds as soon as possible will be crucial to take advantage of the available equipment and personnel, as well as the momentum the project has mustered.

Description		Amount In €	
Implementation of Phase 2			
Conservation Works:			
- North and West exterior facades (brick and stone masonry)		108’000	
- Interior spaces (brick and stone masonry)		63’000	
- Conservation of interior surfaces		181’500	
- Stabilisation of lower section of walls and sidewalk paving		47’500	
	Subtotal	399’500	
Personnel			
Project Manager			28’000
Project Administration Overhead (Administration and Finance)			25’000
Photographic Report			5’000
Publication of Final Results (layout and printing)			5’000
Subtotal		63’000	
Rounded Total			**463.000 € Equivalent to: USD 546’000**

2.0 | THE CONTEXT AND THE MONUMENT

2.1 THE URBAN SETTING

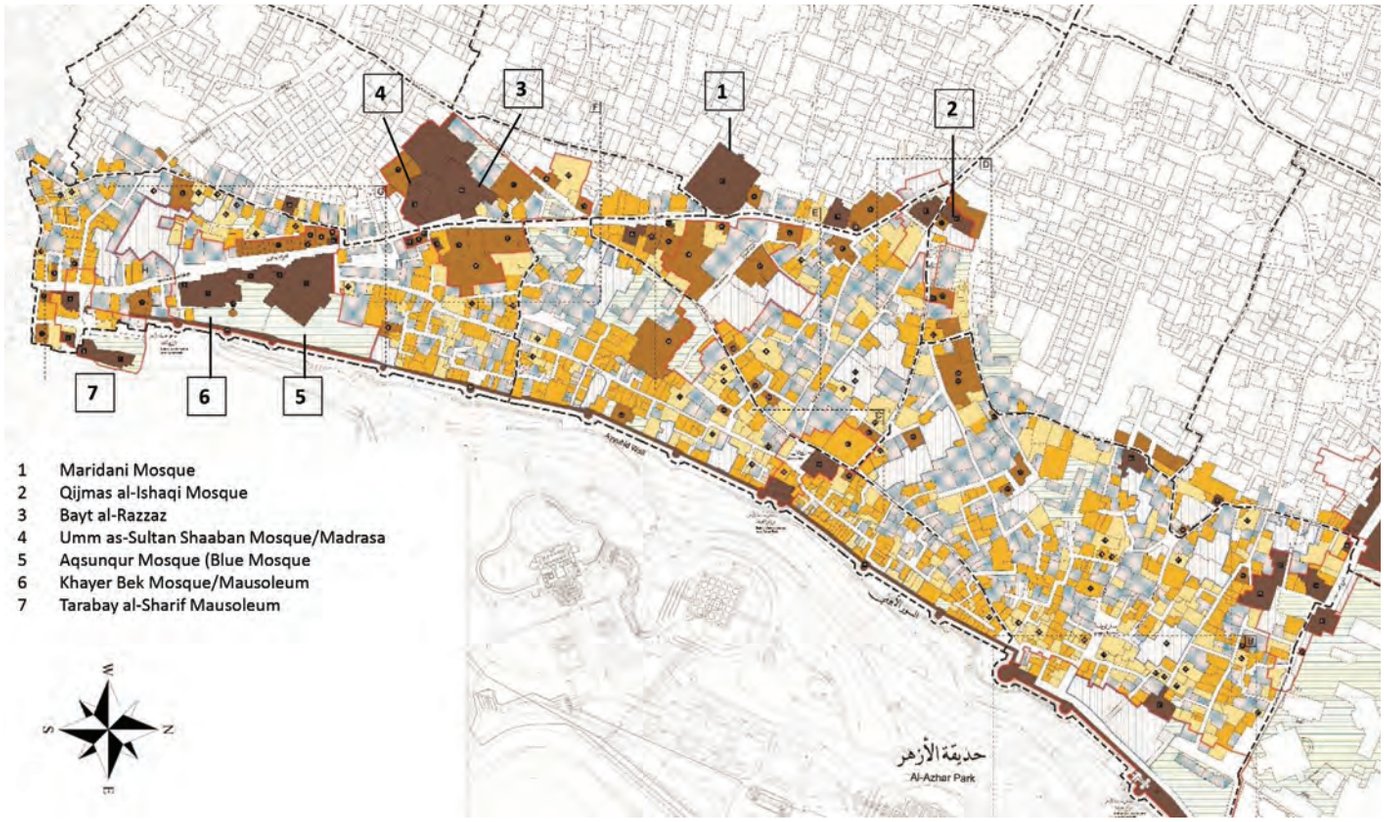
The mosque of Altinbugha al-Maridani is in al-Darb al-Ahmar district, located within the World Heritage property of Historic Cairo named by UNESCO in 1979. The heritage property and the mosque's immediate surroundings include numerous masterpieces of Islamic architecture. Among these, the special urban significance of al-Maridani stems from its intrinsic beauty and its location along Islamic Cairo's main North-South spine, mid-way between the Fatimid gate of Bab Zuweyla and the Ayyubid Citadel.



The mosque was built in 1338 in al-Tabbana street, outside the Fatimid walled city of "al-Qahira" and near the southern gate of Bab Zuwayla. By that time, the old capital "al-Fustāt", located further south, had been largely abandoned. Originally, the site of the mosque was a Fatimid burial ground. It is worth noting that al-Tabbana Street did not exist prior to the construction of the Citadel and the Ayyubid fortifications. The area gained importance during the reign of Sultan al-Nasir Muhammad ibn Qalawun when he spearheaded the urban expansion of al-Darb al-Ahmar through a series of new constructions, including the imposing congregational mosques of his amirs.

Al-Maqrizi mentions that the plot for the Maridani mosque was selected, on the advice of Sultan al-Nasir Muhammad himself, in front of the rab' built by Amir Sayf al-Din Tughay. All-Maqrizi refers to the presence of houses in the

Above left: Boundaries of Darb al-Ahmar showing the urban context of the Maridani Mosque *(Ingy Wakeed / AKTC, 2019).*



Above: Plan of al-Darb al-Ahmar District with the location of al-Maridani Mosque *(AKTC, 2019).*

area before Amir al-Maridani and the sultan purchased the land to build the mosque. To obtain the plot, the sultan forced the owners of the existing houses to sell their properties for half the original price. The plot was then cleared to provide space for the mosque, which is still attached to a pre-existing house along its northern side. The mosque has three entrances: the main one projects into al-Tabbana Street. Facing this entrance, a second entrance, on the southwestern side, opens onto an alley leading to the Suq al-Silah and al-Khayamiyya. The passage between these two entrances provides a pleasant shortcut for passers-by. A third northwestern entrance, opposite the *qibla*, must have been especially important as it is richly decorated. Today, it opens onto a small, secondary alleyway.

The external ablution area and public lavatory are located close to the mosque's western corner. The Comité mentioned the presence of ancient columns and capitals. These were found in the ablution area and transferred to the museum. A waterwheel was also located opposite the small hidden door on the southwestern facade. Due to the lack of *Wakf* endowment documents, it is difficult to determine today whether ancillary spaces and facilities existed in the past in proximity of the mosque.

2.2 HISTORY OF THE MARIDANI MOSQUE

2.2.1 The Life of Amir Altinbugha al-Maridani

Ala al-Din Altinbugha ibn Abdallah Altinbugha al-Maridani (1320 – 1343) was a royal Mamluk who began his career as an imperial guard and cupbearer

to the ninth Bahri Mamluk Sultan al-Nasir Muhammad ibn Qalawun (1284 – 1341). His name seems to indicate that he came from the Mardin province in southeastern Turkey. Al-Maqrizi's historical record of describes him as a tall, good-looking, gentle, generous and considerate young man.

At first, Altinbugha al-Maridani was appointed as a low-rank mamluk officer commanding ten troops. Later, he became responsible for the safekeeping of military musical instruments. He advanced quickly to become Prince of a Hundred, then Prince of a Thousand and eventually married one of al-Nasir Muhammad's daughters, becoming not only one of the sultan's sons-in-law, but one of his favourite *amirs*, whose advice was considered and appreciated. In 1341, when Sultan al-Nasir Muhammad died, he was imprisoned throughout the short reign of Muhammad's son, al-Mansour Abu Bakr, then released when al-Ashraf Kujuk became sultan. His career went on under Kujuk and al-Salih Isma'il: in 1342 al-Maridani was appointed Governor of Hama and, two months later, Governor of Aleppo in Syria where he died of illness in June 1343, not even twenty-five years old.

2.2.2 The Patronage of Sultan al-Nasir Muhammad

Al-Nasir Muhammad ibn Qalawun was a renowned sultan and Mamluk builder who ruled during three separate reigns (1293–1294, 1299–1309 and 1310-1341). His periods of power were distinguished by political stability, urban reforms and patronage of architecture. He believed that his patronage of architectural and urban development projects was an expression of his political power, one that would make people remember his name forevermore as that of a great sultan. The diplomatic and commercial achievements during

Left: Cadastral map of the Maridani Mosque in its urban context *(Tariq al Murri / AKTC, 2018).*

his reign were reflected in the architectural projects he promoted, and through the introduction of new techniques and decorative styles.

This explains the sultan's encouragement not only of his own construction projects, but also those of his favourite *amirs*. A case in point is the mosque of al-Maridani. He provided generous contributions — of cash, some 200,000 dinars — as well as valuable construction materials, such as timber, marble and re-purposed ancient columns made available for the project. In addition, he provided essential technical support by assigning the royal master builder Mu'allim ibn al-Suyufi to the al-Maridani project. Al-Nasir Muhammad's patronage explains why this mosque became one of the richest and finest mosques built in Cairo during the fourteenth century.

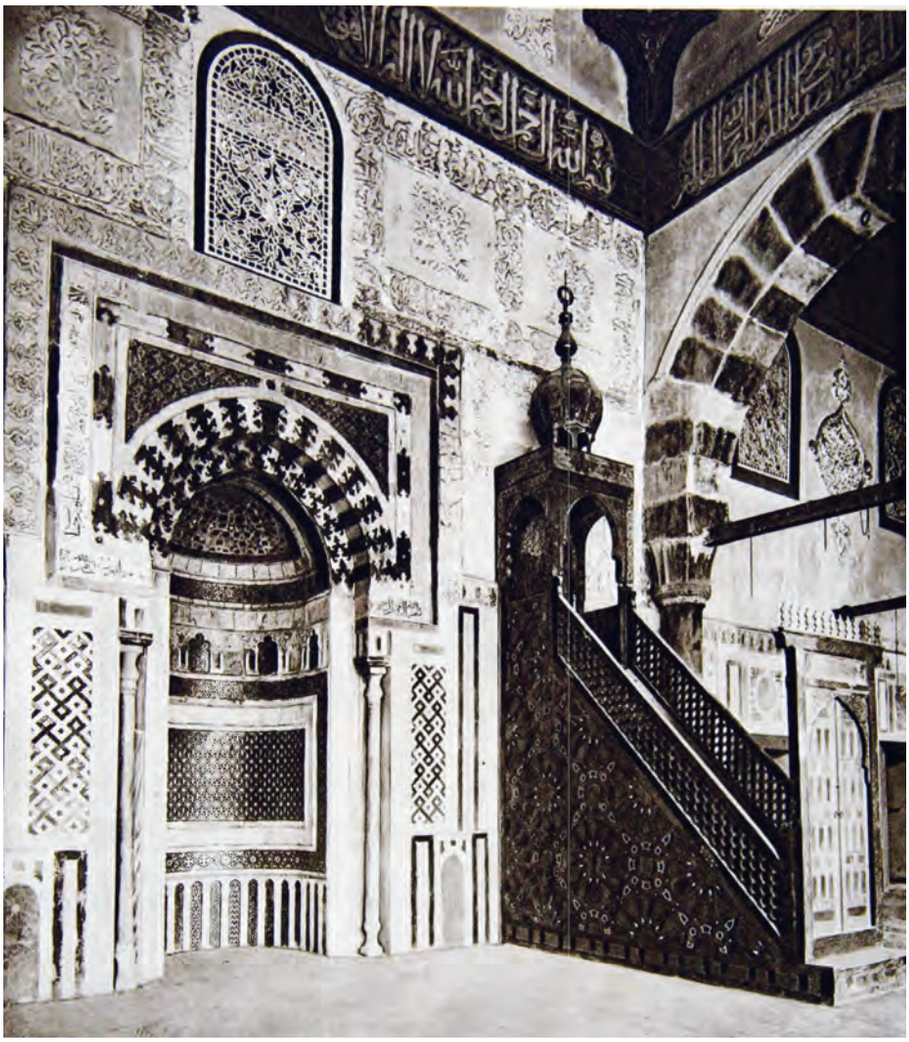
2.2.3 Initial Restoration by the Comité de Conservàtion de l'Art Arabe (1885-1905)

When the technical commission of the Comité de Conservation des Monuments de l'Art Arabe, established in 1881 by Khedive Tawkiq, visited al-Maridani mosque for the first time in 1884, they described it as one of the most beautiful of the fourteenth-century mosques in all of Cairo. However, the monument was in a ruinous condition, requiring immediate emergency measures to avoid the complete collapse of the structure. Despite the better condition of the exterior, described as fair by the Comité Director, Max Herz Bey — named Pasha in 1912 — the southeast corner was in a ruined state, the western side was leaning, some of the collapsed arcades in the courtyard required reconstruction, and the windows were in dire need of replacement. Urgent consolidation measures were undertaken in 1885, postponing to a later stage comprehensive conservation works. Seven years later, when the Comité revisited the mosque in 1892, it determined that further works were necessary to preserve this exceptional mosque and requested the preparation of technical drawings and a cost estimate. A full restoration of the mosque's main entrance was carried out in 1893. In 1896, additional funds were allocated for the reconstruction of the southeast corner, followed by more

Right: The Maridani Mosque's courtyard arches under reconstruction by the "Comité" *(Bulletins of the Comité de Conservation de l'Art Arabe, 1896).*

important works in 1897, including restoration and partial reconstruction of the collapsed arcades and the reinstatement of twelve stucco windows in their original location.

At this time, a design for a new dome in reinforced concrete was finalised, using the Hennebique system, which Max Herz used for the restoration of the Qalawun mosque (1904-05) as well. In 1899, the Comité undertook the reconstruction of the main cupola, the plastering of the courtyard facades and restoration of the wooden ceiling and the *mashrabiya* screen. Between 1901-1903, works took place in the *qibla*, including the restoration of the *mihrab* mosaics, the marble panels, the decorative stucco works, the wooden *mimbar* and the wooden window frames.



Left: The mosque's *mirhab* and *mimbar* after their restoration by the Comité *(Bulletins of the Comité de Conservation de l'Art Arabe, 1906).*

In 1902, a gun powder explosion damaged the restored stucco and coloured glass windows above the *mihrab*. These had to be restored for a second time. In the same year, eighteen original window frames were installed, and a small Ottoman fountain moved from Sultan Hassan's Mosque to the courtyard of the Maridani mosque. This transfer is recorded by the Comité on a marble plaque placed on the fountain. In 1905, when conservation works had been completed and an electrical lighting system installed, the Khedive himself

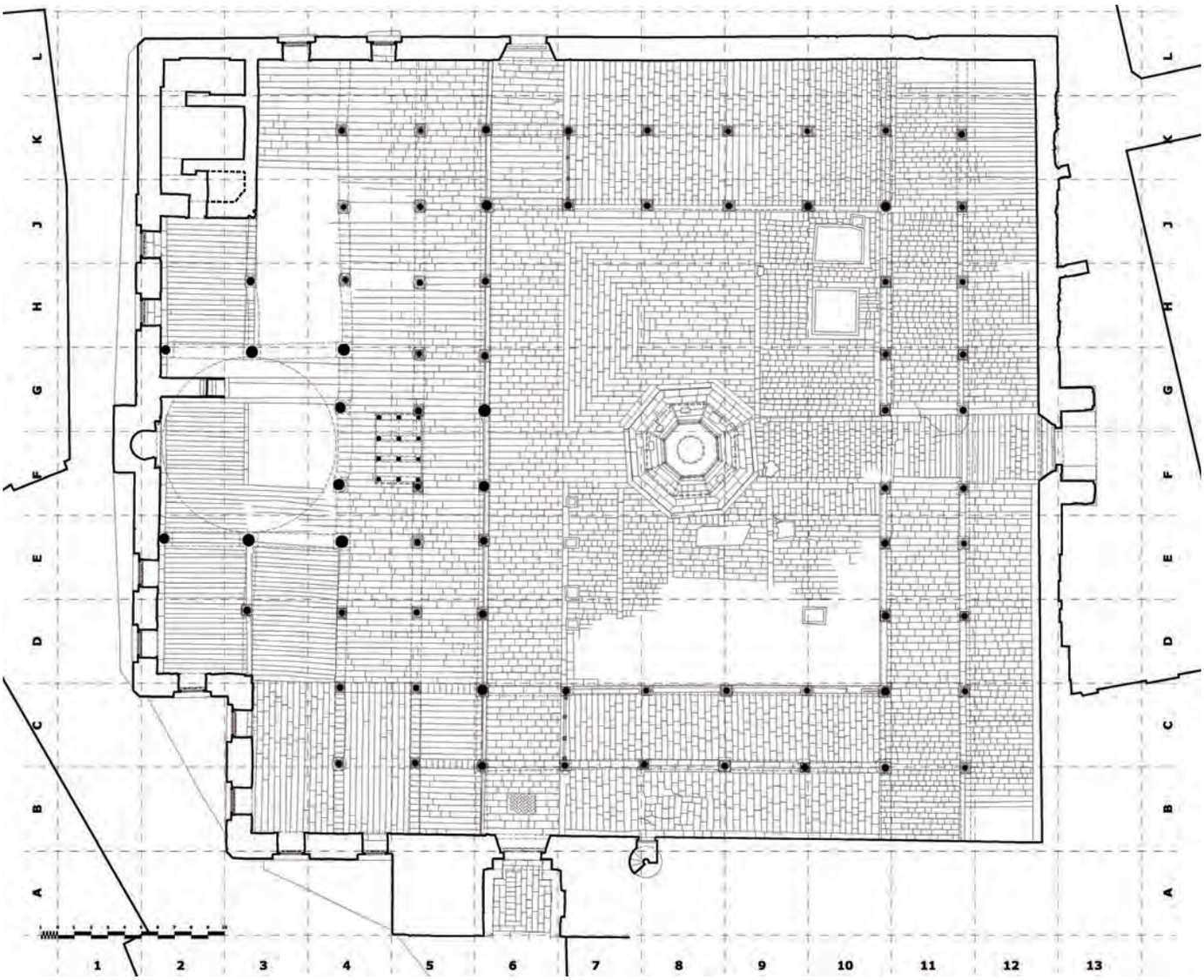
inaugurated the newly restored mosque. In the Comité bulletin of 1905, Max Herz wrote important comments on the mosque of Altinbugha al-Maridani and about the restoration works carried out by the Comité. In keeping with his restoration philosophy, he pointed out that the Comité's approach was not only to preserve this unique mosque, but also enhance its original stylistic characters.

Above right: View of the Maridani Mosque's courtyard in the early 20th century. Note the electrical system in good condition and the use of the ablution area by Quranic students. Trees had not yet been planted *(Comité de Conservation de l'Art Arabe, early 20th c.).*

2.3 THE MOSQUE AND ITS ARCHITECTURAL FEATURES

2.3.1 The plan

The plan of the Maridani mosque measures approximately 55 x 48 metres. Like other congregational mosques built at the time of Sultan al-Nasir Muhammad, it followed the hypostyle-plan arrangement of a covered prayer hall supported by columns, a recurrent typology during the Mamluk Bahri period (1250-1382). The plan of al-Maridani is similar to the plan of al-Nasir Muhammad Mosque at the Citadel. Both are hypostyle mosques with an open courtyard surrounded by four *riwaqs*, or arched halls, and a cupola positioned above the *mihrab* niche. In the Maridani mosque, the arched hall along the side of the *qibla* has four rows of arches supported by ancient columns, while each of the other three halls presents only two rows of arches. In order to fit the plan of the mosque into the surrounding urban fabric and, at the same time, maintain the orientation of the *qibla* towards Mecca, the chief architect, Mu'allim ibn al-Suyufi, resorted to the ingenious solution of chamfering the rectangular plan at the mosque's northeast corner. By this means, the mosque's interior maintained a symmetrical plan around the courtyard and on either side of the *qibla*, where a small room was inserted at the southwest corner. Finally, it should be noted that the architect made the main entrance and the base of the minaret project into the street along the north side of the building, no doubt with the intention of drawing attention to these important features and to the mosque itself.



2.3.2 The facades

The elevations of al-Maridani illustrate a typical Bahri Mamluk facade composition, found also in the Sultan Qalawun complex. The mosque's main facade facing al-Tibbana Street, as well as the southeastern and part of the southwestern facades, are divided into recesses crowned by stalactite hoods, while the rest of the facades are plain. Each recess consists of a large rectangular lower window with iron grilles crowned by a lintel of joggled voussoirs. Above this opening is a double-arched window with stucco decorations arranged in a star pattern crowned by a *qamariyya*, or rounded opening in the form of a stucco grille. Along the southeast façade, parallel to the *qibla*, the *mihrab* projects within a central recess reinforced by a buttress. It should be noted that, in later mosques, this architectural solution was improved by placing the *mihrab* exterior recess in the deeper parts of the walls.

2.3.3 The entrance gates

The mosque of al-Maridani has three axial entrances leading to the central courtyard. They are:

Above right: Ground Floor plan of the Maridani Mosque showing the stone flooring *(Tariq al Murri / AKTC, 2018).*

Above: View of the upper part of the mosque's east elevation with chiselled gypsum plaster openings and upper inscription band *(AKTC Conservation Team, 2020)*.

Below: The northeast monumental portal is the main access to the mosque near the Zuweyla Gate *(AKTC Conservation Team, 2020)*.

- ***The northeast portal*** is the mosque's main entrance. It is regarded as one of the finest Bahri Mamluk portals, a lavish testament to the generosity of Sultan al-Nasir Muhammad towards Altinbugha al-Maridani. The rectangular portal is located at the back of a plain vaulted bay flanked by two stone benches and is crowned by a stalactite hood. Here high-quality craftsmanship can be observed in the decorative details, such as the elaborate stone carvings and intricate marble inlays. Above the plain wooden door is an inlaid lintel with alternating-colored stones, crowned by a tympanum and an arch with joggled voussoirs of interlocked stones, a typical treatment found in many Mamluk facades. Above it is a window grille of fine metalwork placed between two small columns and two marble panels displaying floral decorations in black and white marble. Both sides of the metal grille are of great historic importance, as they include inscriptions bearing the titles of al-Maridani and Sultan al-Nasir Muhammad. In addition, two blazons with the stemmed cup of the cup-bearer are carved on either side of the metal grille. These are the only surviving heraldic emblems in the mosque.

- ***The northwest portal:*** this elaborate portal is different from the one on the northeastern side. It presents a projecting half conch that rests on *muqarnas* pendentives. It is decorated with a sunrise motif in alternating colored stone inlay. Between the pendentives over the inscription is a large carved medallion with further inscriptions that comprise a smaller medallion with multi-coloured mosaic tile decorations. Such lavish decorations may reflect the portal's significant position opposite the *qibla*, as well as the fact that this entrance used to face an important street. This is no longer the case today as the portal faces a small alleyway.

2.3.4 Special Architectural Features of the Covered Prayer Hall

The prayer hall contains some of the most remarkable and striking examples of Bhari Mamluk decorative features and furnishings.

- ***The Mashrabiya Screen:*** among the special decorations found in the *quibla*, the *mashrabiya* screen deserves special mention. The elaborate screen in al-Maridani is one of the few surviving wooden screens in the mosques of Cairo. Together with the wooden screen of the Fatimid Mosque of al-Salih Tala'i and that of Sultan Qalawun's mausoleum, it represents a unique feature entirely made of timber, a valuable and expensive material in Egypt. This particular screen is an early example of wooden latticework craftsmanship in Cairo. It is made of oval shapes of turned wood joined together by ribbed connections delicately carved on either side. The upper part of the screen, on both sides, presents Quranic inscriptions: the one towards the courtyard displays the Surah al-Mu'minun (Qur'an 23:1-14), while the inner one, towards the arched hall, displays the Surah An-Najm (Qur'an 53:1-23). The screen was restored by the Comité in 1899 with some of its original elements still in place. The *mashrabiya* separates the prayer hall from the interior court and filters a pleasant light towards the *qibla*. Unique and of top quality, it is considered the highlight of the courtyard facade along the side of the *qibla*.

- ***The Mihrab:*** the marble decoration of the mihrab in the Maridani mosque is an example of the Bahri Mamluk tradition of panelling walls with polychrome marble decorations. In this case, the decorative theme is inspired by the one in the mausoleum of Sultan Qalawun at Bayn al-Qasrayn. The interior walls of the qibla are panelled with marble and mother of pearl inlays

Above: The *masharabiya* screen, here under restoration, separates the prayer hall from the inner courtyard *(AKTC Conservation Team, 2020).*

Above: The *mirhab* marble mosaics, *qibla* marble panels and *minbar* wooden panels after restoration *(AKTC Conservation Team, 2021)*.

arranged in an arrow pattern, a motif common in Egypt and Syria during the Bahri Mamluk era. The walls are further decorated with panels displaying a square Kufic script that forms an interlaced strapwork design with the name of Muhammad. When the Comité experts visited the mosque in the late nineteenth century, they noted that such marble panels were employed only in the prayer hall fronting the qibla. This *mihrab* is one of the most beautiful Mamluk *mihrabs*: It includes decorative features influenced by the Umayyad Mosque in Damascus, first found in Cairo in the mausoleum of Sultan Qalawun. The *mihrab* is flanked by two columns and is inlaid with polychrome marble and mother-of-pearl arranged in a geometric pattern. It is surrounded by stucco decorations, turquoise colonettes, joggled alternating stone voussoirs and decorative marble frames. It also includes small faience colonettes supporting trilobate arches. Some of the niches are decorated with mosaics, while others present stucco decorations. The *mihrab's* hood has inlayed star-patterns of different colours and is framed by Quranic inscriptions in stucco displaying the Throne Verse (Qur'an, 2:255), as well as verses of the Surah al-Baqarah (Qur'an, 2:143-144) and Surah al-Nur (Qur'an, 24:35-38).

- ***The Minbar:*** it is made of smaller units of wooden panels joined to form the structure of the pulpit. The carved and inlaid panels present geometric patterns framed by a double band of ivory displaying rhombus, octagonal, hexagonal and star shapes. Each panel includes foliated scrollwork decoration carved in relief with strapwork behind. The central decoration is framed by two thin bands of bone and ivory. A carved border filled with an oval pattern can be observed between the two bands. The *minbar* was restored in 1902 as part of the restoration works carried out by the Comité de Conservation de l'Art Arabe. The Comité report mentioned that the inlays of the *minbar* panels had been stolen and moved to Europe. They were returned to Egypt in 1901. Thirty-nine of them were reinstated in their original location.

Above: The *mirhab* marble mosaics, *qibla* marble panels and *minbar* wooden panels before restoration *(AKTC Conservation Team, 2021).*

2.4 PRESERVATION AND PROTECTION: THE LEGISLATIVE FRAMEWORK

At the national level, the Maridani mosque, identified as no. 120 in the List of Historic Monuments in Cairo, is protected under the Egyptian Antiquities Protection Law (Law 117/1983) as a listed historic monument. The law establishes the legal definition of antiquities and places the monuments under the jurisdiction of the Ministry of Tourism and Antiquities. In addition,

Above: The mosque's prayer hall, qibla wall and mihrab after the completion of conservation works *(AKTC Conservation Team, 2021)*.

Law 144/2006 and its Executive Regulations specify protective measures for listed buildings and regulate demolitions of ordinary historic structures. More recently, the law of 1983 was amended by the Antiquities Protection Law n°3 in February 2010, thus becoming the most recent legal pronouncement regulating the protection of historic monuments in Egypt.

At the international level, Egypt, as a signatory of the World Heritage Convention adopted by UNESCO in 1972, is bound by the stipulations that define and regulate the protection of natural and cultural heritage sites around the world. Despite the inscription of Historic Cairo in 1979 as one of the first urban ensembles to be placed on the list of World Heritage Sites (WHS), the area is threatened by various factors. These include neglect and lack of maintenance, dilapidated infrastructure, uncontrolled urban development and the absence of an effective management system. Increased public visitation of al-Azhar Park, however, has raised the profile of the adjacent historic district of al-Darb al-Ahmar and its magnificent heritage buildings, visible from the hills within the park. Among these, the Maridani Mosque is certainly one of the most beautiful and significant.

2.5 INTERNATIONAL CONSERVATION PRINCIPLES

Recommendations for the conservation of the Maridani Mosque follow international principles that have developed incrementally over the course of the twentieth century, starting with the 1931 Athens Conference on the

Restoration of Historic Buildings. This conference represented a major step forward in the evolution of conservation ideas as it reflected a growing consciousness of the concept of universal heritage shared by all nations. The mosque today is thus protected by numerous conventions, recommendations and international charters. These documents have enabled the dissemination of fundamental principles and the designation of guidelines and practical procedures for conservation at the international level.

In 1964 the Second Congress of Architects and Specialists of Historic Buildings held in Venice produced the International Charter for the Conservation and Restoration of Monuments and Sites, better known as the “Venice Charter”. It was on this occasion that the International Council on Monuments and Sites (ICOMOS) was established. The Venice Charter expanded the concept of monument to include more modest forms of tangible heritage that by that time had acquired cultural relevance. The Charter continues to provide to this day the fundamental principles for modern conservation. Among these, it established important distinctions between various forms of intervention, particularly between “conservation” and “restoration”.

Conservation comprises all operations that are needed to secure on a regular basis the maintenance of a monument, including its immediate context, thus preserving the scale and relationships of a monument with its surrounding setting. “Restoration”, on the other hand, is a highly specialized undertaking that may be necessary to return a monument to its original form, but only if this can be justified based on an in-depth archaeological and historical study. Restoration is thus predicated on respecting the original documentation and material evidence of a monument with the objective of reinstating the legibility of its historic and aesthetic significance. In an often-quoted passage, the Charter of Venice famously declared that restoration “must stop at the point where conjecture begins.”

The main concepts of the Charter of Venice were followed and further elaborated in the Burra Charter, prepared in Australia in 1979. It defined the basic principles and procedures to be followed in conserving heritage places. It brought forward the notion of “cultural significance” to reflect the values associated with the aesthetic, historic and scientific relevance of a heritage place in the life of a community, thus introducing a social dimension to the preservation of monuments and sites. The Burra Charter identified three levels of intervention to be applied to heritage structures:

1. ***Preservation*** aimed at maintaining a place in its existing state to prevent further deterioration.
2. ***Restoration*** aimed at returning a place to a known earlier state by removing accretions or by reassembling existing elements but without the introduction of new forms and materials.
3. ***Reconstruction*** aimed at returning a place to a known earlier state. It should be noted that Reconstruction is distinguished from Restoration by the introduction of new materials.

In 1987, the Washington Charter defined the objectives and methods necessary for the conservation of historic towns and urban areas. This charter complements the principles established by the previous pronouncements with reference to living heritage settings. Subsequently, the Nara Document on Authenticity, prepared in 1994, recognized authenticity as a central concern in the conservation of monuments and sites, while addressing the need for a broader understanding of cultural diversity and cultural heritage. In 2005, the UNESCO World Heritage Centre issued the Vienna Memorandum, later expanded into the UNESCO Recommendation on the Historic Urban Landscape (2011), with the aim of furthering an integrated urban approach linking forms of sustainable city development with the existing historic fabric in all its contextual and architectural complexity.

These principles were confirmed by the New Urban Agenda issued by UN-Habitat in 2017 following a wide-ranging process of international consultations. For the first time, the Agenda explicitly recognized the role of culture in urban regeneration in an international document dealing with the planning of cities. It recognised the importance of heritage-oriented planning tools to ensure the sustainability and quality of life within the more general process of urban development.

Above: Evening view from the minaret of the Khayer Bek complex showing the main spine of medieval Cairo dotted with monuments along its entire length *(Adrien Buchet / AKTC, 2007)*.

3.0 | BUILDING CONDITION AND RESTORATION WORK

3.1 AN ASSESSMENT OF THE DAMAGE AND CAUSES OF DILAPIDATION

The Maridani Mosque has stood for almost seven hundred years thanks to the high quality of its design and construction, and the outstanding workmanship of its Mamluk builders. Its continued use as a congregational mosque and regular, protracted maintenance through a dedicated wakf endowment greatly contributed to the upkeep of the monument over time. However, despite the mosque's continued use, the transformation of the traditional endowment system during the nineteenth and twentieth centuries, and the gradual disappearance of master builders and craftsmen, led to the progressive deterioration of this and many other distinguished monuments in Cairo.

The oldest historical photographs taken at the turn of the nineteenth century already show evidence of the mosque's poor condition and the need to shore the structure prior to the restoration campaign carried out between 1898 and 1905 by the "Comité de Conservation de l'Art Arabe". Since then, now more than a hundred years ago, there has been no significant maintenance or conservation work on the mosque, except for some minimal repairs and cleaning to enable its use for religious purposes.

The AKTC team assessed the damage and state of deterioration of the monument prior to initiating conservation work in 2018. The most important causes of the dilapidation may be summarised as follows:

- Capillary rise of moisture leading to the migration of soluble salts and their crystallisation within the stones, causing severe disfiguration of the wall surfaces and the decay of masonry units;

- Protracted rainwater ingress through the roof undermining structural elements of the ceilings and dome that have caused extensive damage;

- Sustained erosion due to rain and the prevailing northeasterly, sand-laden wind affecting the mosque's superstructures, the minaret and the cupola in particular, resulting in deteriorated plaster and stone weathering;

- Permanent airborne pollution from street traffic and atmospheric pollutants causing dirt and harmful deposits to accumulate on all exterior surfaces;

- Severe contamination of ground soil resulting from the illegal disposal of solid waste adversely affecting stone conditions at the base of the monument.

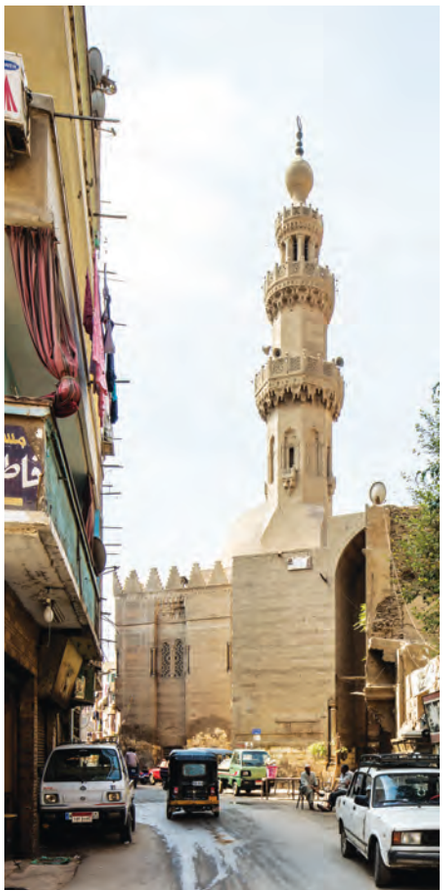
These general forms of dilapidation, when examined in greater detail, have

Above: Unstable conditions on the north side of mosque's interior courtyard prior to the restoration works undertaken by the "Comité" *(Bulletins of the Comité de Conservation de l'Art Arabe, circa 1884).*

Above: The effects of raising damp on the lower sections of the exterior facades *(Christophe Bouleau / AKTC, 2016).*

been brought about by extrinsic causes. These, in turn, are the result of a combination of environmental threats and man-made actions. As already noted, environmental threats include rising damp due to leakages in the public infrastructure. Because of scarcely maintained underground networks, permanent leakages from sewer and water pipes create pockets of humidity in the soil which then transmigrate through capillary suction into the foundations and lower sections of bearing walls up to a height of three metres. Moisture carries with it soluble salts into the buildings whose masonry units deteriorate rapidly. The result is efflorescence, which manifests itself in a whitish haze. Dressed stone loses its facing and marble panels may detach and even warp and bow. The presence of efflorescence also indicates salt accumulations under the surface of the masonry, the so-called sub-florescence, which is potentially even more damaging as it undermines the very core of the stone.

As mentioned, an additional threat consists of weathering caused by wind erosion. The latter is exerted by the prevailing northeasterly wind laden with sand that affects the upper surfaces of the monument, particularly the minaret and the dome. The effect is the progressive disintegration of the plaster surfaces and the stonework that will lead to a loss of material. The increasingly granular and rounded surfaces are the visible evidence of this process. Sharp corners turn roundish, while carved, projecting architectural details lose definition and become increasingly flat and blurred.



Acid rainfall and air pollution also contribute strongly to the deleterious weathering effect. The Maridani mosque lies along the main north-south spine of Islamic Cairo that stretches from Bab al-Futuh in the north to Bab Zuweila in the south. It is a vibrant street with many artisans' workshops, retail shops and warehouses that attract a great deal of motorised traffic. This vehicular traffic is the source of significant air pollution where dust and solid particles are deposited on the surface of buildings. Nitrogen oxides and sulphur dioxides released through the exhaust from cars, lorries and buses are especially damaging when in contact with acid-soluble, carbonate stone. Their presence not only increases the rate of weathering, but also softens and undermines the compactness of the stone by creating cavities in non-homogeneous masonry materials. This is the case of the limestone used in the original construction of the Maridani mosque.

Mention must also be made of the monument's almost complete lack of maintenance. There is no general mechanism to manage and maintain cultural properties. Apart from the areas used for prayer, these monuments hardly receive any sustained, targeted care. And even in the areas reserved for religious functions, the lack of awareness on the part of the assigned caretakers of the special requirements of these buildings has led to poor if not damaging repairs, and to the introduction of furniture, fittings and lighting that are totally inadequate for the setting. Finally, security and supervision are lax. In the case of the Maridani mosque, lapses in security outside of prayer time can be blamed for the disappearance of the *minbar* inlays in 2018.

Above Left: Wind erosion had affected the upper section of the minaret *(Christophe Bouleau / AKTC, 2016).*

Above Right: Heavy vehicular traffic on Tabbana Street is a source the air pollution that undermines the limestone used in the original construction *(Christian Richters / AKTC, 2017).*

The assessment concluded that the Maridani mosque's state of dilapidation, intensified by the lack of regular maintenance and made worse by the application of inappropriate repairs, using unsuitable materials and techniques, was so severe that a comprehensive rehabilitation effort had to be urgently undertaken to ensure the continued preservation of the structure, as well as its decorative elements and significant furnishings.

Above: The introduction of modern furniture, fittings and lighting are totally inappropriate to the monument's quality and its setting *(Christophe Bouleau / AKTC, 2016).*

Right: Treatment of corroded reinforcement bars in the intrados of the dome. Restoration by the "Comité de conservation de l'Art Arabe" at the beginning of the last century introduced an innovative reinforced concrete technology, the Hennebique system, which proved highly detrimental and incompatible with the techniques and materials employed in the original construction *(AKTC Conservation Team, 2020).*

3.2 APPROACH AND SCOPE OF CONSERVATION WORK

Two determinations were made early on in defining the conservation programme: the first, essential one was to ensure the full rehabilitation of the building's envelope to guarantee the durability of the monument over time; and the second was to concentrate most of the effort in the mosque's main prayer hall. The rationale underpinning this second decision was that the most significant artistic and historic components of the monument are concentrated in this space. They were also the ones in worse condition and at greater risk of loss. All concerned parties, including the highly skilled conservators, craftsmen, specialized conservation architects, consultant engineer, and many workers were motivated by the possibility of returning this magnificent space to its former integrity, with its lavishly decorated components and furnishings reinstated, and the original compositions, material and finishes restored.

The approach of the AKTC team followed internationally accepted conservation criteria and standards and identified ways in which these could best be adapted to the condition of the Maridani mosque. The approach may be summarised as follows:

- To respect the existing fabric, including any alterations made during the course of the building's history. Its present state would be maintained where no clear evidence of previous configurations exists. In cases where evidence of a pre-existing condition could be found, the relative advantages and disadvantages of the observable transformation were to be assessed, and a decision made to return to the previous configuration in cases where this led to a greater appreciation of the original character of the monument;

- To conserve rather than replace salvageable elements of the structure, decoration and furnishings. In cases where replacement was unavoidable, AKTC would make use of techniques and materials that are similar or compatible with the original, a process known as 'matching in kind';

- To improve through new conservation interventions the quality of the fabric and its long-term conservation in all cases where intrinsic structural and construction faults could be detected. Whenever possible, this would be done using techniques that are easily replicated and consistent with the resources and traditional skills available locally or learnable through training;

- To fit any necessary modifications in such a way as to avoid disruption, loss or disfigurement of the original fabric, as well as alterations to any elements of contextual significance.

These criteria were applied first to the envelope of the building and to the covered prayer hall of the Maridani mosque, both in its entirety and with respect to the individual decorative elements and furnishings. Work on the envelope included the replacement of the entire roof and defective water

Above: General view of the flat roof of the mosque after rehabilitation *(Adrien Buchet / AKTC, 2021).*

Below: Replacing limestone floor units in the Maridani prayer hall *(AKTC Conservation Team, 2020).*

insulation with a new bitumen-based insulation membrane covering the entire roof surface of 1'250 square meters. The roof was then covered by a mortar screed sloped to drain rainwater away. At the same time, the different kinds of damage and deterioration, such as cracking, partial settlement, material loss and deterioration, were carefully mapped and eventually fixed, including, where necessary, the replacement of individual stone units, particularly at the base of the walls to ensure the building's overall stability. The stonework of the exterior facades was subjected to gentle cleaning using poultice and hand tools, which revealed the façade's original decorative pattern of alternating bands of red and yellow stone.

Fine conservation work was also carried out to preserve the important decorative elements found inside the mosque and its prayer hall. These include some of the most remarkable artistic achievements from the Bhari Mamluk period. Each of these elements became the object of a special dedicated restoration effort carried out with the contribution of different material specialists and craftsmen with knowledge in the use of traditional materials and techniques.

- The wooden panelling, positioned between the prayer hall and the courtyard, is unique for its size and complexity. It measures forty-six metres in length with alternating panels made of turned woodwork and

carved wooden latticework (*mashrabiya*). The panelling was in relatively good condition but required partial replacements and the application of a traditional wax finish known for its protective effectiveness and the quality of its aesthetic results.

- The *minbar* was the second important woodwork restoration carried out within the framework of Maridani project. The minbar's very survival in the mosque, in its current, reasonably complete state despite the recent disappearance of some of its inlay work, is by itself extraordinary. It was only in 1901 that it could be reassembled, after its panels had been stolen and exported to Europe at the end of the nineteenth century. The importance of the minbar as a part of a mosque's required interior furnishing cannot be underestimated. An essential component of the *qibla* wall, it functions as a pulpit from where prayers are led. It is also an element of high aesthetic and inspirational value, embellished with Koranic verses and geometrical and floral patterns. Each panel of the Maridani *minbar* was painstakingly reintegrated to the highest standard by employing some of the best local specialists in woodcarving, inlay, interlocking and finishing work, all done by hand without the use of any fixing materials.

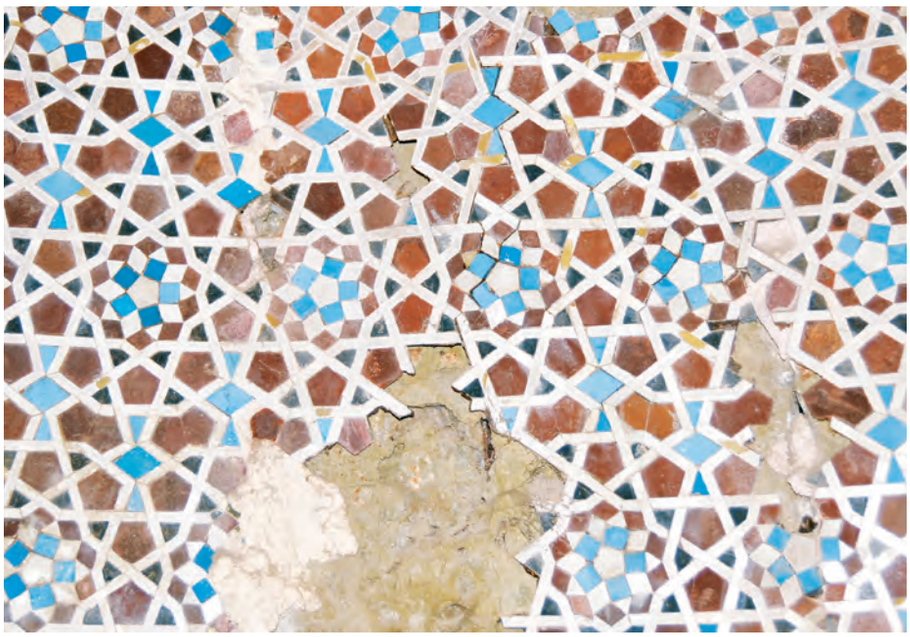
- Great care and attention were devoted to the treatment of the re-purposed Pharaonic architectural elements in the prayer hall, presented as a gift by Sultan al-Nasir Muhammad to his son-in-law. Eight capitals and fourteen out of the eighty columns supporting the ceiling and dome of the hall were carved in antiquity from Aswan granite and stand today, fully preserved, to support the arches and dome of the mosque.

Above: Replacing lost wooden elements and decorative inlays to reconstitute the complex geometric design of the prayer hall's *minbar (AKTC Conservation Team, 2020).*

Below: Restored capital of one of the re-purposed Pharaonic architectural elements in the prayer hall *(Adrien Buchet / AKTC, 2021).*

Left: Cleaning and treating the carved latticework of the courtyard's wooden panelling *(AKTC Conservation Team, 2020).*

- The highly significant polychrome inlaid marble panels on the *qibla* wall and inner niche of the *mihrab* are from the Bhari Mamluk period and were the subject of a special restoration effort. They were found in an advanced state of deterioration and suffering material loss due to capillary rising damp and the effects of rusting metal. Each panel had to be dismantled and, after insulating the wall against the rising damp and treatment of the reinforced metal bars, reassembled in its location following the reintegration of each panel's marble inlays.



Above: The advanced state of deterioration and significant losses of the marble mosaics in the north section of the *qibla* wall prior to conservation *(Christophe Bouleau / AKTC, 2016).*

Above Right: Front view of the *mirhab* before conservation. Detached marble panels and mother of pearl mosaics as a result of the corroded reinforcement bars installed during the restoration works carried out by the "Comité de conservation de l'Art Arabe" *(Christophe Bouleau / AKTC, 2016).*

Below: Close up of losses in the *mihrab* mosaic decoration due to capillary rising damp and the effects of rusting metal *(Christophe Bouleau / AKTC, 2016).*

- The dome of the mosque, above the *mihrab* and *minbar*, was carefully assessed for damage, prior to carrying out the necessary repairs and cleaning. The areas where plasterwork had cracked or fallen off were carefully reintegrated with matching plaster. Attention was also paid to the ornamental vaulting (*muqarnas*). These decorative wooden 'stalactites' are mounted in the transitional spaces at each of the corners between the upright walls and the circle of the dome. Despite their advanced state of disrepair, they still showed traces of painting and gilding. These were stabilised and the traces of the surviving painted decoration carefully restored.

- The painted and gilded wooden ceiling, covering the largest part of the prayer hall, was meticulously cleaned. The ceiling sections where the painted colours had been reintegrated by the "Comité" were stabilised, while new wood re-integrations were left unpainted.

The advanced conservation of the Maridani mosque and prayer hall is a significant achievement in and of itself. But it should be viewed in a wider context, as the work goes beyond the building itself, providing a valuable case study of what it takes to rehabilitate an outstanding monument from one of Islam's most significant and intense periods of artistic and architectural achievement.

Above: Restored stalactite squinches at the corners of the prayer hall's dome above the mihrab *(Adrien Buchet / AKTC, 2021).*

Below: View of the painted and gilded wooden ceiling above the prayer hall after restoration *(Adrien Buchet / AKTC, 2021).*

4.0 | CONSERVATION CHALLENGES AND PROCESS

As observed in Section 03, two determinations were made early on in defining the conservation programme. The first, essential one, was to ensure the full rehabilitation of the building's envelope in order to guarantee the durability of the monument over time; and the second was to concentrate most of the effort in the mosque's main prayer hall along the *qibla* wall.

The rationale for focusing conservation work on the interior was based on the need to address the most challenging and dilapidated parts of the mosque. At the same time, these areas corresponded with those presenting the highest level of historic and artistic significance within the monument. Each constituted, by itself, a significant conservation challenge from a technical standpoint. These were also the components most likely to present a higher demonstrative value. The results obtained in preserving them could in fact serve as models of conservation applicable to other monuments and sites in historic Cairo.

The challenge did not result only from the intrinsic complexity of the architectural elements and furnishings found within the prayer hall, often combining different materials and requiring the concurrence of diverse crafts throughout the restoration process. Special demands also stemmed from the fact that these features required more innovation than others. For many of the activities described below, there was in fact no proven track record or formalised process to adhere to. Consequently, the conservation process had to be tackled incrementally by testing and eventually identifying the most suitable solutions for each case and, within each case, the specific operations to be carried out.

The aim of the illustrated descriptions below is to provide a summary of the challenges and techniques adopted. These can serve as a reference for the implementation of similar conservation works for other monuments and sites.

4.1 SECURING THE BUILDING ENVELOPE

These operations were essential to stabilise and secure the exterior envelope of the monument. Without this fundamental set of construction activities, particularly focused on the roof and exterior of the monument, any conservation carried out within the interior spaces of the mosque would be short-lived and ineffectual. As already mentioned, for both the roof and the exterior wall, the dilapidation phenomena stemmed from the infiltration of water and humidity, either directly through cracks and defective insulation on the flat roof, or by capillary suction at the base of the walls, a phenomenon that had led to the severe deterioration of individual stones and required extensive repairs and even substitution.

4.1.1 Repair of the flat roof

The dilapidated condition of the roof's insulation and infiltration of rainwater had caused the deterioration to the painted ceilings underneath. Making the flat roof water-tight by introducing an effective water-proofing membrane was therefore a pre-condition for undertaking conservation work on the decorated ceilings. While specifications for the repair of roofs are well documented, the challenge in this case came from the vast size of the Maridani mosque roof, making it necessary to work in stages and introduce expansion joints to avoid the cracking of the screed finish and penetration of rainwater.

The process of re-establishing an effective roof cover required the following stages for each of the roof sections to be repaired:

- Dismantling of the cracked and deteriorated screed and insulation cover surfaces to the level of the flat boards above the structural timber.
- Replacement of any deteriorated boards affected by wood rot.
- Introduction of a thin polyethylene membrane above the boards covered by a smooth mix of lime and sand mortar 5 to 7cm thick.
- Installation of a water-proof membrane made of torch-applied bitumen sheets.
- Application of the mortar screed in between expansion joints every 8 to 10 metres to avoid cracking during shrinkage and movement from thermal expansion and contraction cycles.
- Laying of the final layer of mortar screed to suitable falls in order to drain rainwater to the projecting spouts positioned along the edge of the roof.

Left: Exposed structural timber and boards on the roof of the Maridani mosque during repairs *(AKTC Conservation Team, 2020).*

Above: Checking the boards for wood rot following the removal of the deteriorating screed and faulty insulation cover *(AKTC Conservation Team, 2020)*.

Middle: Installation of the polyethylene membrane above the boards covered by a thin mix of lime and sand mortar *(AKTC Conservation Team, 2020)*.

Below: Installation of the waterproof membrane made of torch-applied bitumen sheets *(AKTC Conservation Team, 2020)*.

Above: Application of the first mortar screed in between expansion joints *(AKTC Conservation Team, 2020).*

Middle: Laying of the final layer of mortar screed to suitable falls to drain rainwater off the roof *(AKTC Conservation Team, 2020).*

Below: Sealing the expansion joints against water penetration *(AKTC Conservation Team, 2020).*

4.1.2 Masonry cleaning, repairs and replacement

Various forms of intervention had to be applied to the exterior walls of the mosque, ranging from pre-cleaning, cleaning and desalination, repointing, plaster reattachment, masonry repairs, and stone replacement. The following itemised list provides essential details and technical procedures applied to each case.

- *Pre-cleaning:* in the first instance, the purpose of this operation is to remove from the stones cement and other inappropriate repointing. These are incompatible with the original mortar as well as the subsequent application of proper repairs and repointing. By exposing the areas of the masonry surface and the joints affected by inappropriate repairs carried out in the past, the subsequent removal of salts and pollution-related black crust affecting the stones is made easier, thus improving the general appearance of the wall surfaces. Pre-cleaning does in fact include the initial removal of thick layers of salts and black crust from the masonry veneer.

  In al-Maridani, pre-cleaning was carried out by hand, using a hammer and chisels of varying sizes appropriate to the size of the affected areas and individual mortar joints. Where the cement infill is large or deep, using a drill facilitates the removal process by breaking the cement apart. Subsequently, an air compressor with different nozzle attachments facilitates cleaning and removal of loose material from the masonry joints.

- *Stone cleaning and desalination of exterior wall surfaces and muqarnas:* cleaning exterior surfaces saw the application of a variety of techniques adapted case by case to the level and nature of dirt to be removed. In the lower portion of the facades, subject to high salt content and stone damage, stone cleaning was carried out using a dry method of micro sand blasting. Where the stone presented a high degree of disaggregation or flaking, cleaning took place at very low pressure, to remove loose stone particles and accumulated salts from the surface. In the middle and upper portions of the walls, including the delicate *muqarnas,* paper pulp poultices were employed extensively. Prior to their application, the poultices were soaked in five percent ammonium bicarbonate. This is known as the Mora poulticing method from the name of the conservators who first applied it.

  Overall, these cleaning methods not only removed damaging salt and black crusts, but also imparted a uniform appearance to the exterior walls, resulting in a visual reintegration of the masonry units. This proved to be particularly effective in cases where stones from different quarries had been employed at different stages during the life of the monument.

- *Repointing of joints:* the process of repointing must be carried out after cleaning to ensure that most of the salts have been removed from the

Above: Manual brush cleaning of the arch's voussoirs on the upper section of the external walls *(AKTC Conservation Team, 2020).*

Middle: Cleaning by hand with a cotton swab one of the ancient capitals in the prayer hall *(AKTC Conservation Team, 2020).*

Below: Application of a paper pulp poultice to remove salts from the base of the minaret *(AKTC Conservation Team, 2019).*

Above: Applying clay poultices soaked in ammonium carbonate below the cornice of the prayer hall *(AKTC Conservation Team, 2019)*.

Middle: Micro sand blasting applied to the base of the exterior walls *(AKTC Conservation Team, 2019)*.

Below: Micro sand blasting was applied at very low pressure on the upper portions of the courtyard walls, particularly on cornices and the *muqarnas (AKTC Conservation Team, 2021)*.

inner surface of the joints. Repointing is an important operation as it not only protects the stone from water penetration, but also restores the uniform visual appearance of the masonry surfaces.It is to be noted that the exterior facade of al-Maridani presented joints that were considerably eroded with mortar that had lost its adhesive properties and turned soft and crumbly. Following the removal of loose material to ensure a solid surface of adherence, repointing was carried out by filling the masonry joints with a locally manufactured mix of lime-based mortar. The latter offered a high level of compatibility with the surrounding masonry.

The process of repointing consisted of packing the mortar manually into the joints using metal spatulas to achieve a consistent finish, nearly flush with the masonry units. Under extreme heat conditions, the repointed areas were covered with water-soaked burlap to reduce the speed of drying, thereby decreasing the risk of shrinking and cracking.

Above: Repointing with a mix of lime-based mortar with the aid of a spatula to achieve a consistent finish nearly flush with the masonry *(AKTC Conservation Team, 2020)*.

Below: Repointing the *muqarnas* on the street façade after eliminating residual mortar and carrying out a thorough cleaning of the joints *(AKTC Conservation Team, 2021)*.

- *Stone repair:* in some cases, it was decided to repair cracked stone units rather than replacing them. This decision was limited to stones in relatively good condition where detachments had occurred in a few large fragments and where the original size and form of the block had not been compromised. In cases of multiple detachments and loss of parts of the block, total replacement was preferred to infilling missing parts of the original stones with compatible mortar mixes to reconstitute the individual masonry units. The repair of cracked blocks split in large fragments was carried out by injection with a hydraulic masonry grout.

  The process consists of cleaning thoroughly areas that are cracking and detaching to facilitate the contact between masonry and grout. Pre-wetting should then occur in the same areas for further cleaning and to enhance the grout-to-masonry adhesion. This is an essential component of the preparation process as it reduces rapid water absorption, thus avoiding cracking within the grout and detachment of the grout from the masonry. Upon completion of the pre-treatment, the hydraulic grout is applied via injection until it fills the crack up to 5 millimetres from the exposed edge of the masonry surface. After the grout sets, a mortar infill is applied to protect and reintegrate the losses on the masonry surface.

- *Plaster re-attachment and compensation:* these treatments were generally limited to the upper portion of peripheral walls in the prayer hall and above the interior arches where cracking, detachment and loss of the original plaster had occurred. Plaster re-attachment was carried out by eliminating with a soft brush or hand blower any fragments or debris from behind the detached plaster. All visible losses on the plaster surface were then sealed and compensated with a mix of lime putty and sand to match the colour of the original plaster. Eventually, adhesion of the detached plaster to the masonry behind was achieved through the injection of lime-based hydraulic grout behind the plaster fragments to be re-attached. In the case of large areas of detached plaster, small holes were drilled into the plaster prior to injecting the grout. Once the void had been filled and no hollow sound could be detected when tapping on the plaster surface, the edge of the re-attached plaster was sealed with matching mortar.

  Upon completion, paper pulp poulticing was used to clean the plaster surface. In case of total loss of the plaster, or areas patched with cement that had to be removed, a base and finishing coat were applied with the use of new lime-based plaster, using a composition and colour compatible with the original ones. In a number of cases, plaster cast replicas of lost elements were produced with silicone moulds and eventually installed as replacements.

- *Stone replacement at the base of the exterior elevations:* a selection of highly deteriorated masonry units at the base of the walls, deemed unable to support the weight of the courses of stones placed above them, had

Above: Cleaning by hand the ornamental plaster *muqarnas* in one of the finials located at the corner of the mosque *(AKTC Conservation Team, 2021).*

Middle: Mechanical cleaning with brush and swab of the stucco decorations on a roof crenelation abutting the interior courtyard *(AKTC Conservation Team, 2021).*

Below: Injection of lime-based hydraulic grout to re-attach the plaster decoration along the elevation of the interior courtyard *(AKTC Conservation Team, 2021).*

Above: Grouting the voids behind the plaster decorations in one of the crenelations *(AKTC Conservation Team, 2021).*

Middle: Re-attaching the bulb finial on top of a crenelation *(AKTC Conservation Team, 2021).*

Below: Re-placing with a plaster cast replica an ornamental column on the façade of the interior courtyard *(AKTC Conservation Team, 2021).*

to be replaced with new stone infill. In the areas of stone replacement, the rubble core was completely cleared of soil and debris to expose the sound masonry and provide a clean surface for better bonding with the new stone. Where parts of an incoherent core had to be dismantled or deteriorated stones had to be removed, caution was exerted to work by hand with chisel and hammer to minimise the disturbance and avoid undermining the structural stability of the wall.

Replacement was carried out in small 'window-like' sections, from the bottom up, to avoid the removal of mortar and masonry units along horizontal bands in order to minimise the risk of collapse. The stones to be replaced were carefully extracted from the masonry wall to avoid damaging the adjacent stones. The removal of sound header pieces embedded in the core was avoided to prevent the weakening of the wall core. Replacement blocks came from the quarry unfinished and had to be shaped and finished on site by professional stone cutters. They ensured that new stone units met the required size and specifications to fit into position and match the quality of the original limestone blocks.

Load bearing replacement stones were placed using wooden wedges to guarantee evenly distributed joints and facilitate the binding of the new stones to the older ones. The blocks were set in a mortar mix of lime putty, sand and brick dust. A slurry back-up of mortar and rubble served to fill voids between the new stone and the existing rubble core. Joints were tooled to imitate in form and colour those observable in the original stonework. After replacement, the new stones were bush-hammered to blend with the texture of the original blocks to improve the visual uniformity of the exterior wall surfaces.

Above: The final stage of stone cutting and finishing was done on site with the use of traditional tools *(Christophe Bouleau / AKTC, 2019).*

Below: Setting the individual blocks in place after the application of bedding mortar mixed with stone fragments to ensure a tight fit with the adjacent stones *(AKTC Conservation Team, 2020).*

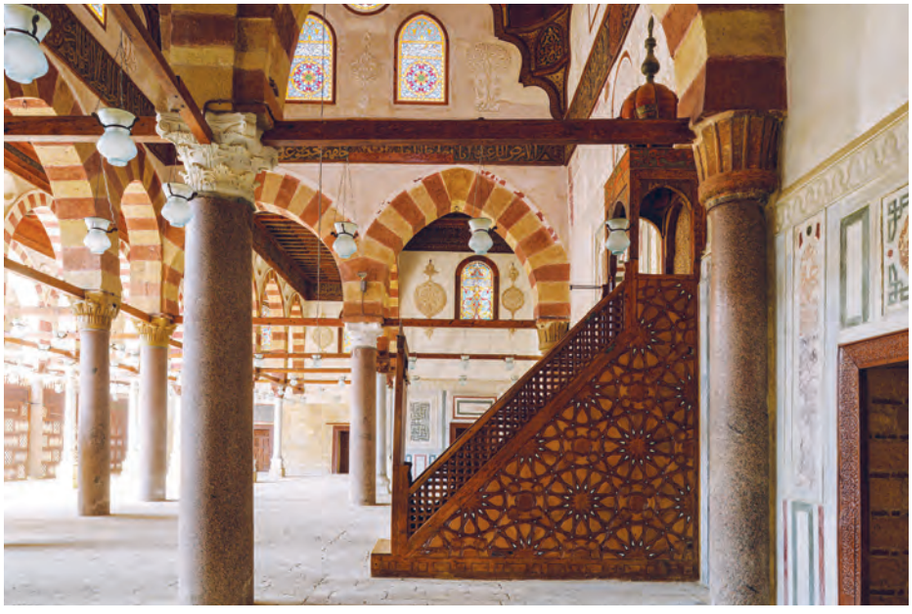
Left: Replaced stone blocks on the exterior of the Tabbana Street façade *(AKTC Conservation Team, 2020).*

4.2 RESTORING THE PRAYER HALL'S ARCHITECTURAL FEATURES AND FURNISHINGS

The main prayer hall presents the most valuable and endangered components of the Maridani mosque. The challenges involved in their conservation were significant as they included aspects of interpretation, philosophical relevance vis-à-vis the extent of conservation work to be carried out, procurement of materials and decorative components, and the selection of highly specialised professionals and craftsmen needed to assess, plan and implement the works. Additional attention had to be paid to the dissemination of the methods and sequence of conservation works to serve as a guide for other, similar cases that are relevant for the preservation of Cairo's exceptional Mamluk heritage. Finally, training had to be factored in to respond to the long-term objectives of the project and contribute to the revitalisation of vanishing crafts, as well as perpetuate a tradition which is essential to the preservation and maintenance of the country's architectural heritage. The following technical notes and visual illustrations document the work carried out toward the conservation of the prayer hall architectural features and furnishings, including marble panelling and mosaics, specialised woodwork in the *minbar* and painted ceiling decorations.

4.2.1 Repair and conservation of the marble panels and mosaics of the qibla wall and mihrab

Historical records mention that Sultan al-Nasir Muhammad donated valuable construction materials for the construction of the mosque, including timber and marble, a testimony of the value of such materials in fourteenth-century Cairo. While the initial campaign to safeguard and restore the mosque carried out by the "Comité de Conservation de l'Art Arabe" between 1895 and 1906 undoubtedly saved the payer hall's marble panels and mosaics from complete loss, their conservation, as carried out at the time, was essentially flawed. The reason is that the restoration of the *qibla* and *mihrab* were implemented with



Right: View of the restored central prayer hall looking north with the *minbar* in the foreground *(Adrien Buchet / AKTC. 2021)*.

the use of reinforced concrete at a time when this new technological innovation first made its appearance and was unquestionably accepted as the all-purpose solution for all sectors of construction. As demonstrated by subsequent experience, the use of cement and the mixing of old and new construction systems, rather than solving, aggravated the problems. Eventually, escalating problems surrounding the use of cement and reinforced concrete proved how unfounded were the hopes of the architects and restorers who, in the early 1900s, had embraced modern construction technologies as the new frontier of restoration practice.

In al-Maridani, vertical iron bars had been inserted under the marble panels and mosaics to strengthen the upright wall and ensure a stronger support for the decorative elements. Over time, moisture affected the supporting stone walls and caused the iron bars to corrode and expand, thus destabilising and dislodging the marble paneling and inlays.

The prevailing mechanism bringing about the deterioration observed was the oxidation of the grid of reinforcing rebars, which led to an increase of the bars' volume. This was in turn aggravated by the presence of soluble salts in the cement in which the metal had been embedded. The protracted penetration of rising damp had in fact determined the expansion of the metal bars, which kept exerting strong pressure on the concrete around them. Over time, the cracking of the reinforced concrete had led to the dislodgement, bowing and bulging of the marble panels, as well as the expulsion of individual tesserae within the marble mosaics. This phenomenon was made worse by the placement of the grid of bars, too close to the panelling and mosaics present on the face of the wall and niche of the *mihrab*.

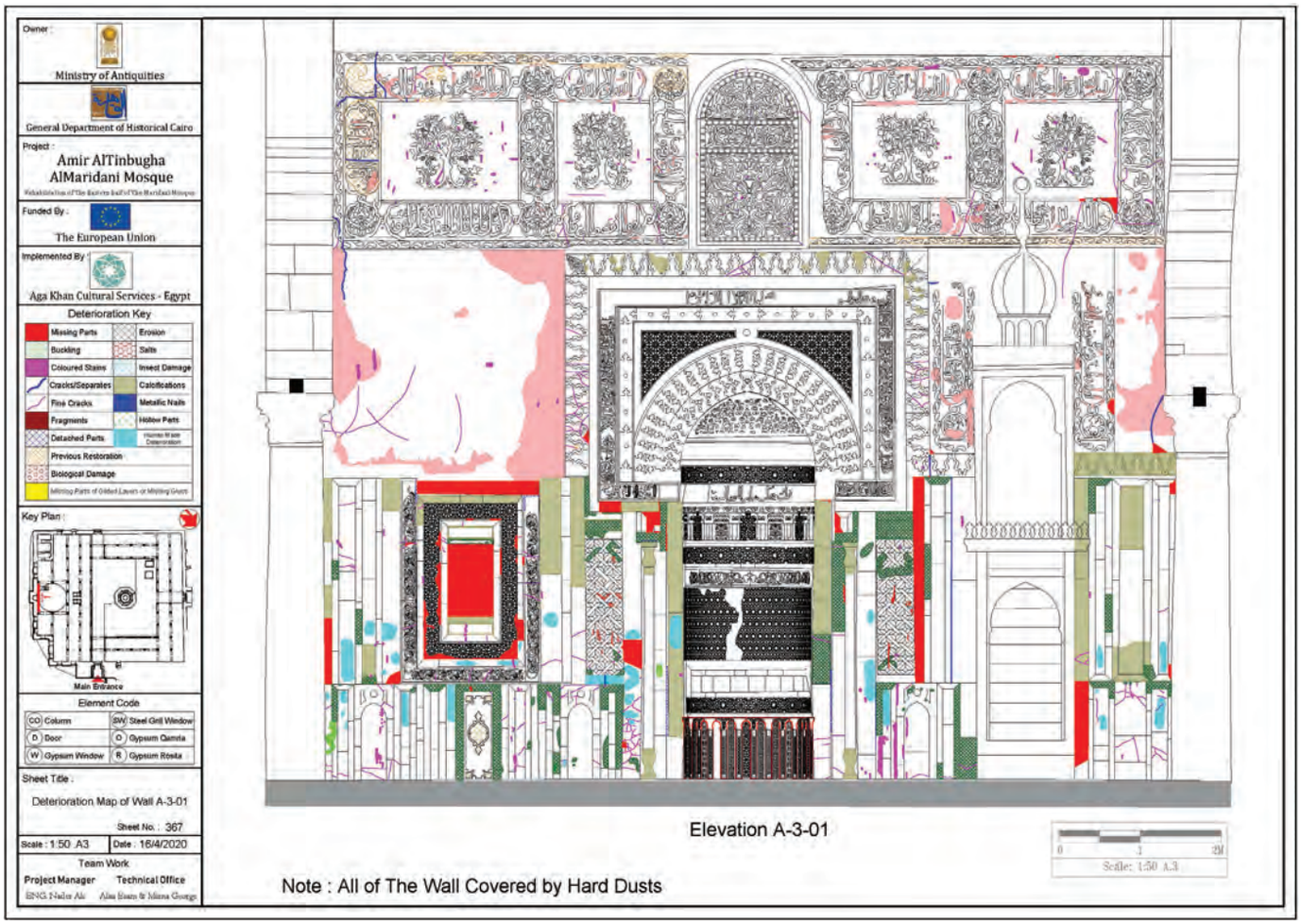
Given the dilapidation observed, two adverse factors had to be considered in undertaking the conservation of the panelled *qibla* wall and decorated *mihrab* niche:

- The extent of corrosion resulting from the presence of the iron bars under the panels and marble mosaics introduced by the Comité at the beginning of the twentieth century.

- The extent of loss in the marble decoration, estimated in certain areas to be in the order of 70 percent, a factor aggravated by the lack of documented evidence regarding the original decoration.

A decision was made at the very beginning of the restoration process to address forcefully the issue of corrosion by removing entirely the metal bars that had affected the decorated surfaces. To this effect, the conservation team embarked on a comprehensive campaign to disassemble the marble panels and mosaics, as well as remove the corroded iron bars and cement mortar present in the wall. Critical throughout this process was the establishment of a facsimile formwork at scale 1:1 with the identification and numbering of the disassembled elements in order to ensure that their reassembling

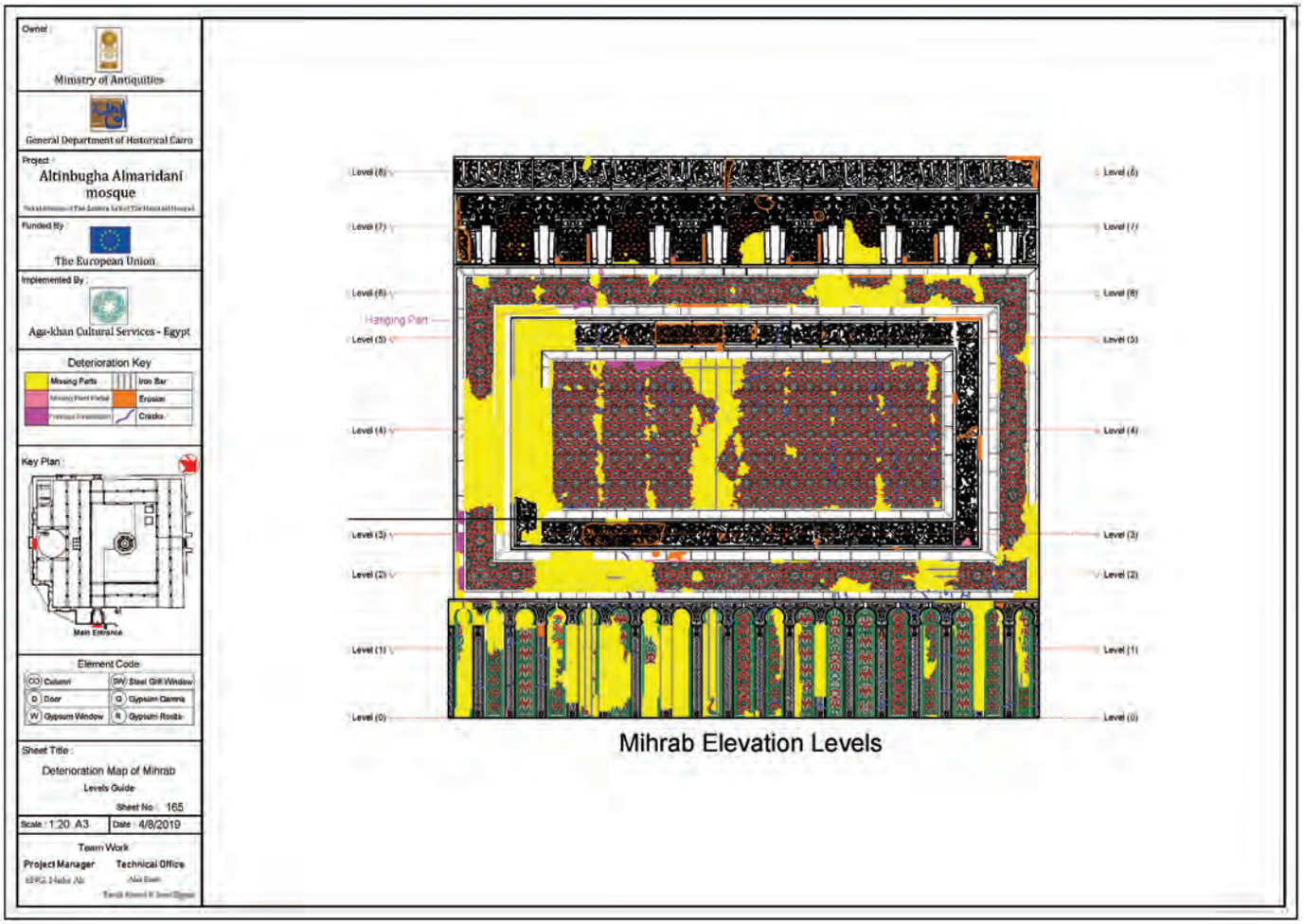
Above: Extent of loss of mosaics and oxidation of the grid of reinforcing rebars observed in the niche of the *mihrab (AKTC Conservation Team, 2020).*



would reproduce faithfully the original decorative patterns. Shop drawings complemented the facsimile by documenting section by section the original elements and the presence of lacunae in order to guide the re-assembly and re-integration process. Equally critical was the identification of competent craftsmen capable of repositioning each element in its original location and reintegrating the lacunae with the introduction of new marble tiles.

Above: Detailed dilapidation survey of the *qibla* wall and *mihrab* niche showing the various types of damage, loss and principal deterioration phenomena *(AKTC Conservation Team, 2020).*

Right: Tracing of the *mihrab* mosaics prior to the preparation of the facsimile formwork *(AKTC Conservation Team, 2020).*

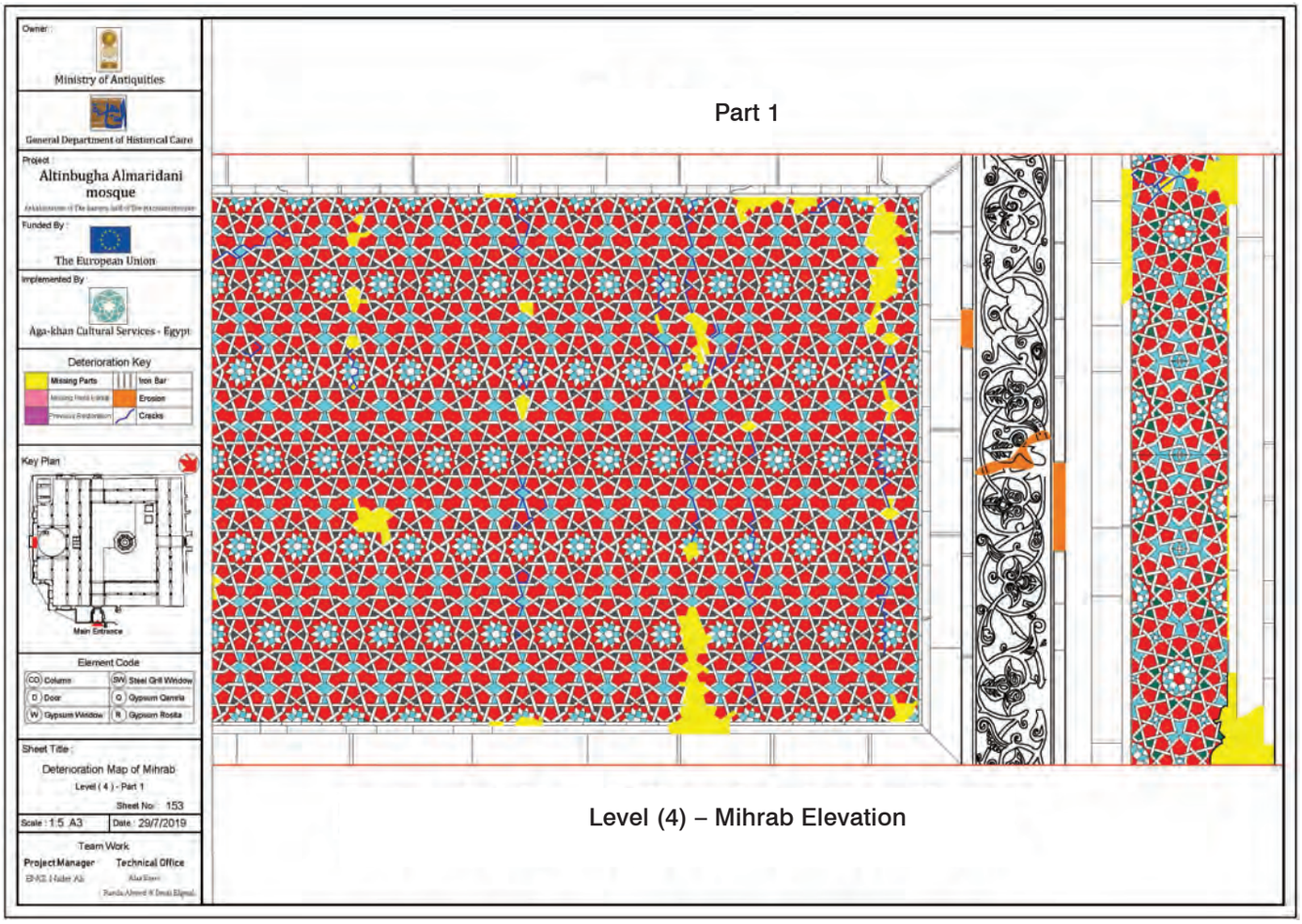


The sequence of treatments was carried out in accordance with the following steps:

- Cleaning and documentation in situ of the existing panels and mosaics affected by the corroded metal bars, including an assessment of conditions.
- Temporary disassembling of the decorative elements located in the dilapidated sections of the wall and niche and provisional numbering and assembly *ex situ.*
- Removal of the corroded rebars and cement and complete cleaning of the area to remove debris.
- Filling of the void left by the removed bars and concrete debris with a waterproof mortar screed.
- Fixing of new plain marble panels onto the stone walls to serve as insulation and support for the re-instatement of the polychrome marble panels and mosaic decoration.

Above: Rectified elevation of the *mihrab* niche with the analytical mapping of conditions including the extent of lacunae, presence of exposed rebars, cracks and traces of previous restoration work *(AKTC Conservation Team, 2020).*

Below: Specialized artisan assembling the marble and mother of pearl tesserae needed to re-integrate the lacunae *(AKTC Conservation Team, 2021).*



Above: Partial rectified elevation of the *mihrab* niche with the mapping of the marble mosaic to identify the extent of repairs and reintegration *(AKTC Conservation Team, 2020).*

Below: Specialized artisan working on the formwork replicating the curvature of the mihrab to reassemble the marble and mother of pearl mosaic prior to installation *(AKTC Conservation Team, 2021).*

- Re-assembly and re-integration of the original mosaics into the 1:1 scale formwork simulating the curvature of the *mihrab.*
- Installation of the re-constituted decoration into the *mihrab* niche.
- Filling of residual joints and lacunae.
- Completion of the documentation of the intervention with the illustration of conditions before and after conservation works.

The repair and conservation of the marble panels and mosaics of the prayer hall were intended as a long-term solution to arrest the deterioration and return the marble decoration of the *qibla* wall and *mihrab* niche to their original appearance documented by the surviving evidence and the archival material and photographic documentation of the restoration works carried out by the "Comité de Conservation de l'Art Arabe" at the turn of the last century.

The complete removal of the "Comité" intervention was justified by the harmful effect it had had and continued to have on one of the most significant and artistically valuable components of the Maridani mosque.

Above: Conservators detaching one of the re-assembled panels prior to re-installation *(AKTC Conservation Team, 2020).*

Middle: Conservators installing the restored mosaic panel in the niche of the *mihrab (AKTC Conservation Team, 2021).*

Below: Reassembling individual marble mosaic components over a 1:1 survey drawing *(AKTC Conservation Team, 2021).*

Above: Identification of the original and replacement marble mosaic components in the southeast corner of the *qibla* wall *(AKTC Conservation Team, 2021)*.

Below: Positioning of plain marble slabs on the *qibla* wall to serve as insulation and support for the subsequent re-instatement of the polychrome marble panels and mosaic decoration *(AKTC Conservation Team, 2020)*.

Above: Restored mosaic frame prior to installation on the *qibla* wall *(AKTC Conservation Team, 2020).*

Middle & Below: The south eastern portion of the *qibla* wall before and after the completion of works *(Christian Richters and Adrien Buchet / AKTC, 2017 and 2021).*

Above: The Maridani *minbar* before restoration by the "Comité" with the small door leading to the interior of the structure and the baldaquin with *mukarnas* and a bulb-form pinnacle *(Bulletin of the Comité de Conservation de l'Art Arabe, 1896).*

Below: The Maridani *minbar* in its simplified form after restoration by the "Comité" *(Bulletin of the Comité de Conservation de l'Art Arabe, 1905).*

4.2.2 Re-integration of the minbar's lost inlays

The *minbar* in the Maridani mosque had a tumultuous history. Its intricate wood inlays were stolen twice, first in the nineteenth century and again in 2008. While there are scanty details about the circumstances surrounding the first theft, we know that in 1901 the "Comité de Conservation de l'Art Arabe" approved the purchase from an antiquities dealer in Paris of "wooden panels inlayed with ivory and ebony" that had disappeared thirty years before. It was believed at the time that "buying those panels will allow a complete restoration of the beautiful mosque".

Once again, in 2008, almost all the inlaid panels installed by the Comité in 1901 were stolen overnight, leaving the *minbar* looking like a skeleton of wooden frames. Only three inlaid elements remained. These were insufficient by themselves to provide details of the decorative features and assembly system that had characterized the lost paneling and inlays.

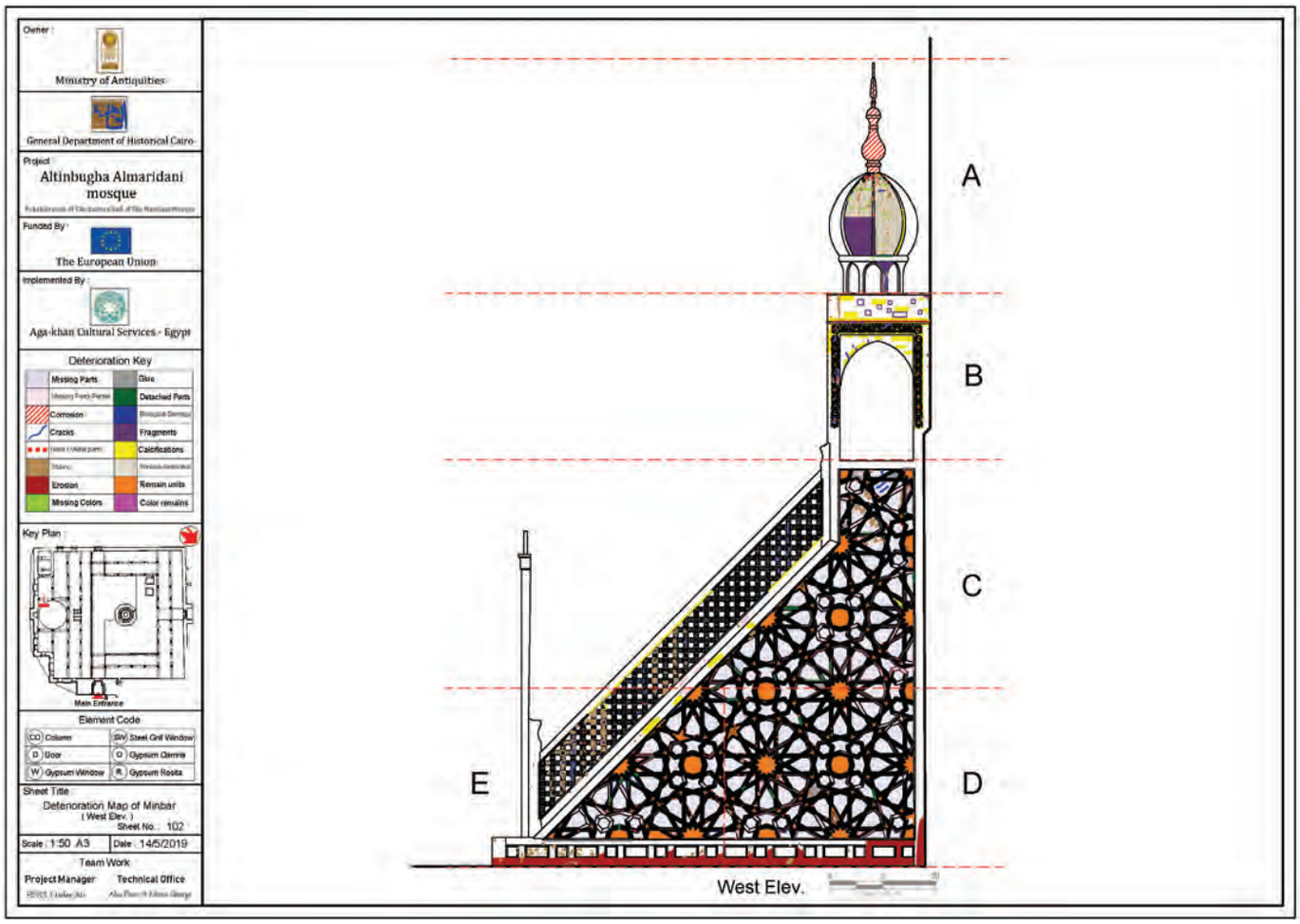
Conservation and repair of the *minbar* was a critical component of the project and expectations were high. Several samples were presented to discuss alternative options. These, as can be expected, were not mere technical exercises. They presented different approaches to be followed in replacing the missing *minbar* components, each with its own philosophical implications. One option was to pursue a strict 'philological' approach aimed at recreating a replica as close as possible to the lost original. This avenue proved difficult to follow as there were insufficient original elements left, while the historical documentation and photos did not provide sufficient detail. The other possibility was that of following a 'stylistic' approach consisting in approximating the original by looking at other examples from the same period and inferring from these a likely decorative arrangement for the panels and inlays of the Maridani *minbar*. This approach presented the risk of producing a deceptive fabrication that pretended to be the 'original' but was in fact an imitation, dangerously close to a 'counterfeit'. This course of action was found unacceptable in light of current conservation principles and was eventually rejected. In the end, a decision was made with the inspectors of the Ministry of Antiquities to follow a simplified design aimed at reestablishing the total harmony of the composition, without attempting, on the one hand, a replica of the original, impossible to obtain given the poor documentation available, and, on the other, a deceptive 'pastiche' of conjectural forms and stylistic motifs.

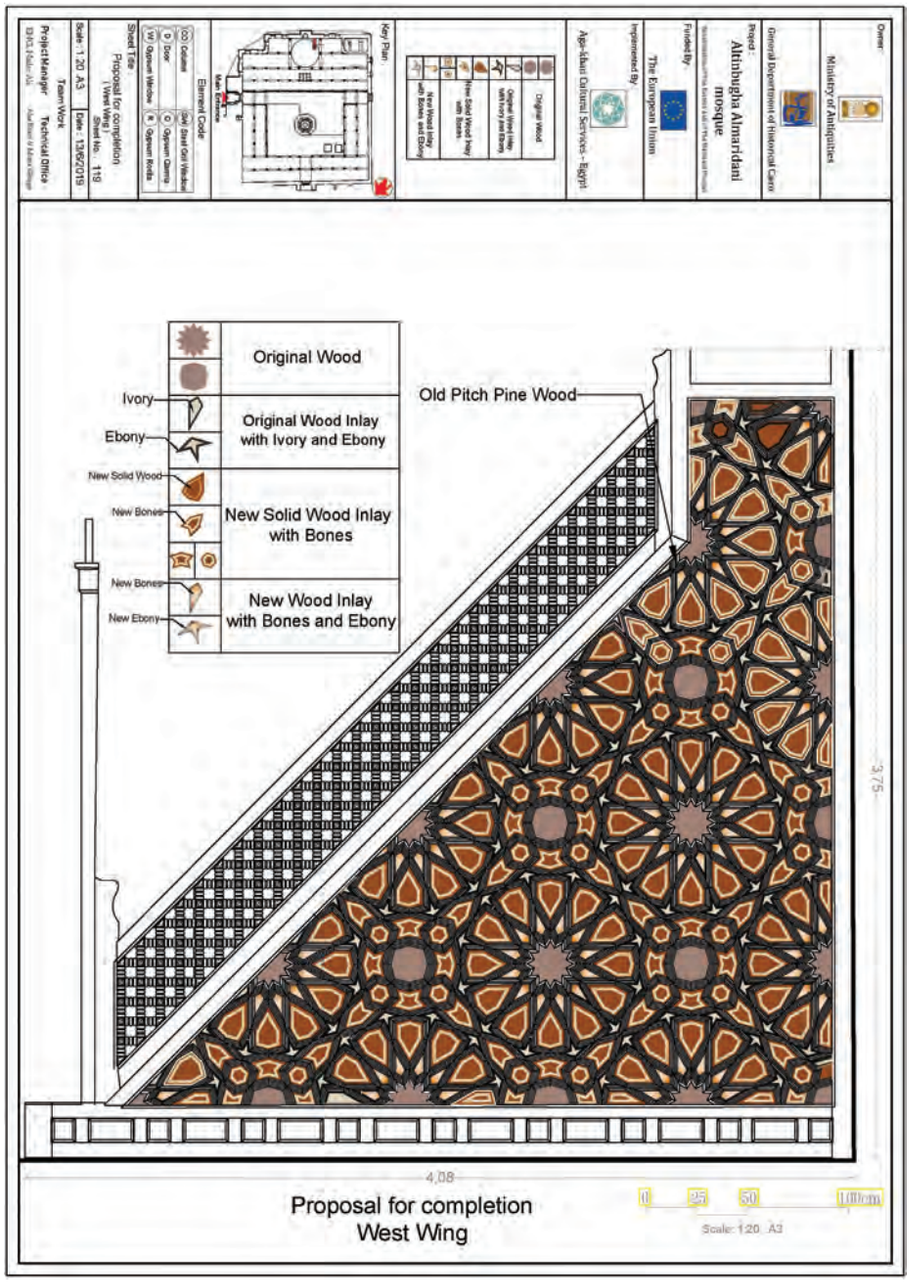
The process of re-composing the lost paneling and inlays of the *minbar* started with an accurate survey of the existing structure, levels of dilapidation and identification of missing components. This resulted in a baseline drawing documenting the *minbar's* existing condition and the extent of required repairs and re-integration. Eventually, a set of shop drawings was prepared to detail the types of repairs and the plans for the manufacturing of the missing components. During this preparatory phase, procurement officers searched for the quality timber—walnut wood was eventually selected—and the inlay material to be used—ebony and bone, the later as a substitute for the original

Left: The skeleton of the *minbar* in 2008 following the theft of its inlaid panels *(Christophe Bouleau / AKTC, 2018).*

Below: Condition survey of the *minbar's* west elevation with the identification of its missing components and other evidence of dilapidation *(AKTC Conservation Team, 2019).*

ivory. Finally, the search was extended to find qualified craftsmen capable of undertaking the challenging task of repairing and integrating the wood components, as well as producing wooden insets and inlays. A skilled master carpenter and master inlayer together with their respective assistants were eventually selected for the rehabilitation and reintegration of the *minbar,* a process that foresaw their close coordination on site.





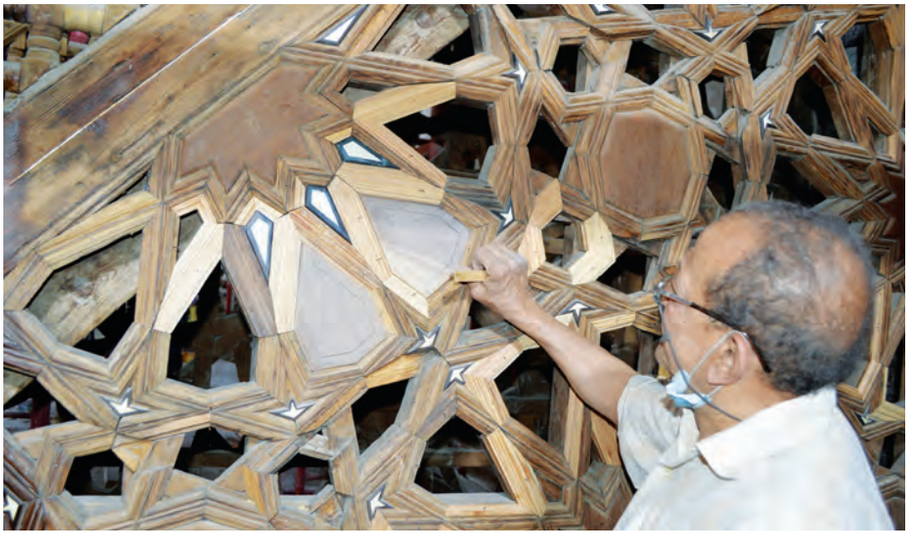
Right: Proposal for the repair and re-integration of the *minbar's* inlaid panels *(AKTC Conservation Team, 2019).*

Left: Sample of one of the inlaid panels mounted on the *minbar's* frame prior to the inception of works *(AKTC Conservation Team, 2019).*

The master carpenter combined the skills and responsibilities of a framer and a joiner to engage in the finer wood-working applications. He oversaw reinforcing the structural frame and substituting defective pieces and rotted wooden components in order to provide a solid framework for the installation of the panels. One of the principal, recurrent tasks was that of assembling the pieces of the panels that are part of the *minbar* body. In a number of cases, particularly for the railing of the *minbar*, turned pieces of wood had to be produced to substitute missing or defective ones. Similar techniques were required to restore the *mashrabiya* screen that separates the exterior courtyard from the prayer hall.

The work of the carpenter was complemented by the project inlayer who devoted his attention to the individual panels where small pieces of ebony and

bones cut in the designed pattern were integrated into the wood base to form geometrical shapes and decorations. The general geometric composition of each of the sides of the minbar consists of 'repeat units' of large stars inscribed into multisided polygons interlaced with smaller units formed by a central octagon surrounded by four smaller hexagons. The ebony and bone inlays are distributed within the composition to highlight the individual geometric figures formed by the interlaced shapes that result from the combination of the individual units. Within this general composition, each piece was inlayed with the desired design and then placed in its position prior to refining the finishes of the individual panels. The wooden inlays were installed using the traditional interlocking system without the use of adhesives, nails or screws. Interlocking is based on the click- or lock-wood method that makes use of wedge-shaped wood cotters for fastening together the various components of the panels. This method allows the different parts of the panel assembly to move and adjust in response to changes in temperature, thus impeding the different wood pieces from bending and cracking. Once interlocked, the panels were protected with a natural shellac finish (*gommalacca*), a hand-applied polish that lightens the wood grain and creates a lustrous patina.



Above: Manufacturing the individual inlaid pieces to be mounted on the panels *(AKTC Conservation Team, 2020).*

Below: Re-integration of missing frame components and inlaid infill pieces combined into large stars and interlaced polygons *(AKTC Conservation Team, 2020).*

Above: Advanced stage in the repair and installation of the inlaid infill elements on the west side of the *minbar (AKTC Conservation Team, 2020)*.

Middle: Shellac finish applied to the ebony and bone inlaid elements of the *minbar (AKTC Conservation Team, 2020)*.

Below: Fine arts conservators participated in the conservation of the decorated and inscribed pinnacle above the *minbar*'s baldaquin *(AKTC Conservation Team, 2020)*.

Conservation of the *minbar* was not limited to woodwork repairs and the reinstatement of the panels and intarsia decorations. Fine art conservators were involved in the preservation of the painted and gilded surfaces and the inscribed bulb-form pinnacle atop the flat roof of the *minbar's* baldachin. Restoration of these elements called for skills similar to those required for the painted wooden ceilings of the prayer hall (see 4.2.3).

The complexity of forms, geometric patterns and the varied materials found in the *minbar* required considerable individual concentration and coordination of efforts between the two key craftsmen. Much effort was spent on defining the general sequence of their interdependent tasks, assigning responsibilities to their respective assistants, and determining a precise and mutually acceptable implementation schedule. Despite or perhaps because of the many challenges it presented, the rehabilitation of the *minbar,* with the recovery of the lost paneling and re-introduction of the original manual techniques employed in carpentry, turnery, inlaying and interlocking, represents a significant project achievement. It resulted in the setting of an effective method and attainment of high standards in the recovery of a most valuable example of the Mamluk art of woodworking and marquetry.

4.2.3 Conservation of the painted ceilings

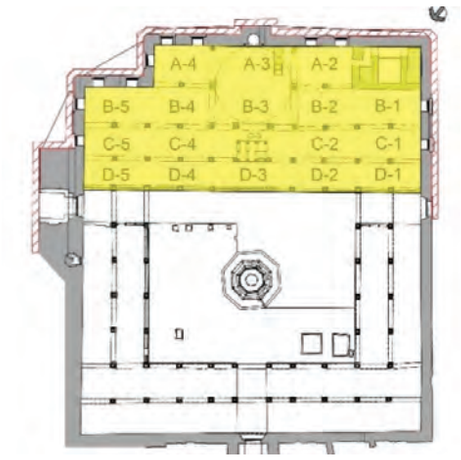
The quality of the painted wood ceiling in the prayer hall and its very poor condition made their conservation a labour-intensive activity, involving the mobilization of a dozen skilled fine art conservators for a period of two years.

As first reported in the Bulletins of the "Comité de Conservation de l'Art Arabe", significant challenges were already encountered in 1903 and 1904 when the first restoration of the ceilings took place. At the time, considerable losses were noted in the decorated ceilings, in part due to the partial reconstruction of sections of the plafond. A decision was then made to keep the extant painted decorations in their existing condition with few, very limited interventions. Where parts of the ceiling had been rebuilt, the Comité decided to leave the plain wood unpainted with the only exception of the northernmost part of the hall where a re-decoration was attempted based on a conjectural re-interpretation of what the original paintings might have looked like.

When the project started in 2018, the existing conditions in the decorated sections of the ceiling had worsened considerably. However, it became apparent that the painted decoration dated from the fourteenth century, with only limited alterations as a result of the conservation work carried out by the Comité. In particular, the painted ceilings along the qibla wall retained most of their original decoration, including those on the upper section of the upright wall that presented richly decorated koranic inscriptions.

A dedicated team of fine arts conservators was recruited exclusively for the conservation of the painted ceiling. Following the installation of elevated platforms to provide direct access to the ceiling, an analysis of the original

Above: View of the decorated ceiling of the prayer hall showing the combination of painted and plain coffers, the latter having been left intentionally undecorated by the Comité *(AKTC Conservation Team, 2020).*



Above: Identification of the ceiling's subsections earmarked for cleaning and conservation *(AKTC Conservation Team, 2019).*

materials and techniques was carried out, together with a detailed assessment of their condition. The findings confirmed that the multi-colored, and partially gilded geometric decorations were executed with a tempera technique applied on a base of chalk bound with glue. The pigments, as expected for the time, were composed of a wide range of organic and inorganic materials, mixed with Arabic gum, glues, and egg white or yolk acting as binding media. Pigments included white, red, yellow, green and blue colors whose original composition was respected in the conservation process to ensure compatibility with the original paints and avoid chromatic alterations or colour disparities over the long term.

The assessment of conditions determined that surfaces had been covered with airborne deposits from different sources over a protracted period. This had caused the formation of a thick film that obscured and dimmed the tone of the original colors. Significant deterioration had also resulted from the infiltration of water and moisture that had caused the blistering and detachment of the painted surfaces from the wooden base. Finally, fungal attack had affected parts of the decoration, causing aesthetic and structural damage.

In the case of fungal microorganisms, the formation of black crusts could be noted. After a detailed review of the condition of each area of the ceiling, a conservation strategy was formulated based on a minimum of invasiveness and maximum conservation. Accordingly, the approach taken aimed at preserving the original traces of the painted decorations together with the work implemented by the Comité, while introducing those up-to-date techniques and conservation measures that had proven effective over the long-term.

Conservation work progressed from east to west as shown in the schematic diagram above, first covering section A and then progressing to section B, C and D.

Sub-sections A2 to A4 along the *qibla* wall contained the highest and most varied number of painted decorations as they also included koranic inscriptions on the upper cornice of the upright wall. They were also the ones in poorest condition with a thick accumulation of dirt on the surfaces, detached and flaking fragments of paint and considerable losses, particularly along the band of inscriptions near the flat roof's structural timber, which had been damaged by humidity and rainwater.

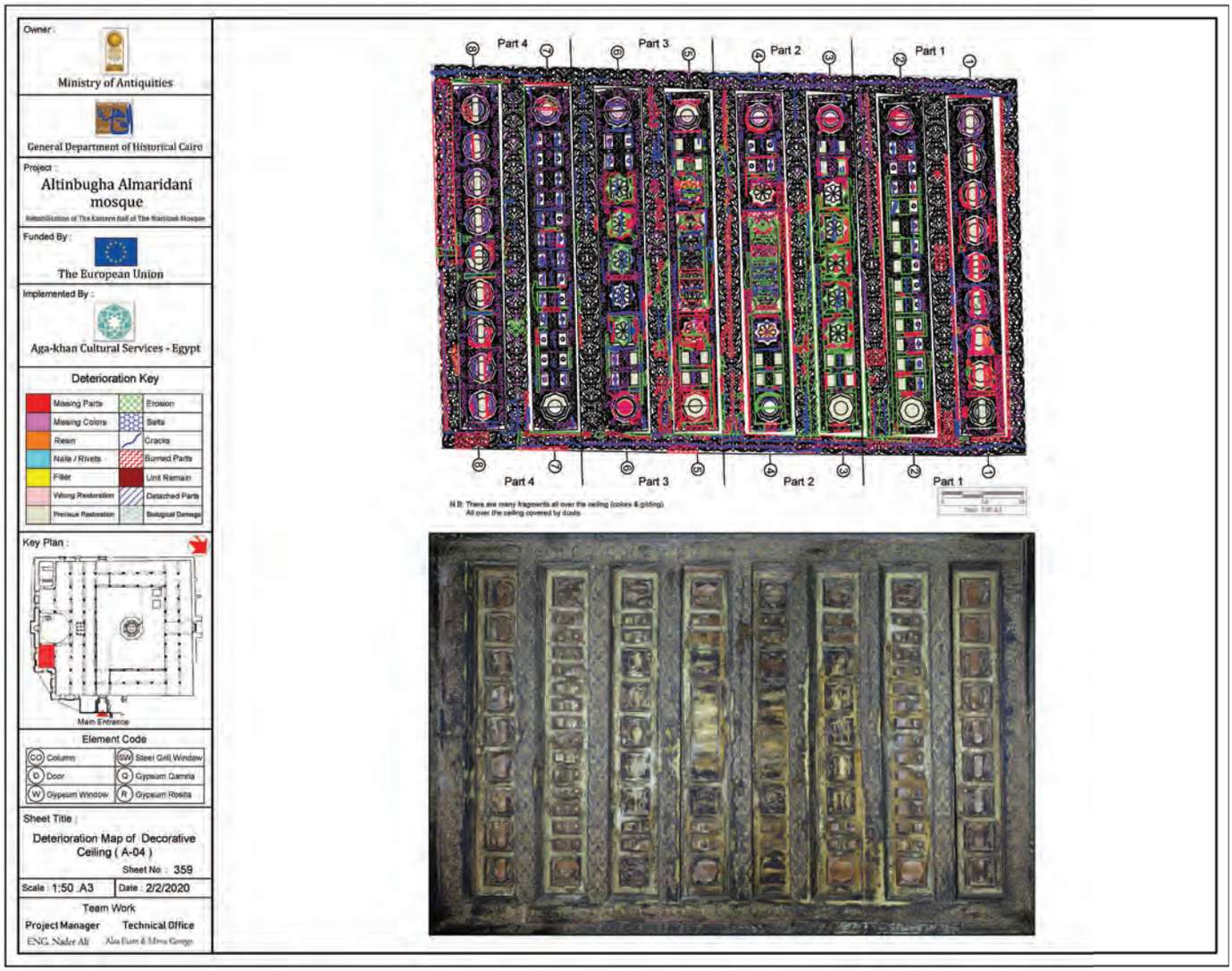
The ceilings in sections B and C presented a mix of relatively well-preserved decorations and plain wood coffers that had been installed and intentionally left unpainted by the Comité. The evidence confirmed the approach followed during the conservation of the ceiling at the turn of the last century. An 1899 report issued by the "Comité de Conservation de l'Art Arabe" stated the intention of "retaining the ancient parts in their actual state except for retouching where necessary". After cleaning, the conservation work carried

out one hundred and twenty years ago was still well preserved with minimum interference of the original. This work was not altered during the present conservation campaign, but simply cleaned and left as found. At the same time, the parts of the painted ceiling that had not been the object of previous restoration work and still retained their original character were cleaned and consolidated without any attempt at reintegrating the existing lacunae. The only exceptions were small, demonstrative samples of redecoration modelled after the original patterns, respectively in section B and C. Ceilings in section D had been entirely replaced at the beginning of the twentieth century and left undecorated by the Comité. In this and other cases, the undecorated wood coffers were repaired and protected with a layer of shellac finish.

Overall, in varied combinations depending on the condition and history of the individual sections of the prayer hall's ceiling, remedial actions included:

- Manual tracing of the painted decorations and inscriptions for the preparation of base drawings.
- Mechanical cleaning with soft brushes and scalpels in the case of persistent crusts.
- Chemical cleaning with organic solvents with the use of cotton swabs.
- Carpentry repairs to re-integrate missing parts of the wood coffers.
- Filing of joints between the planks with soft wood fillers shaped *in situ* by the conservators, including gaps along the band of koranic inscriptions. Minor gaps were filled with wood dust mixed with Paraloid B72, an acrylic resin with adhesive and consolidating properties.
- Application of biocides against the presence of fungal microorganisms.
- Stabilisation of the detached or peeling fragments of paint with the use of a mechanical hot spatula to return the detached flakes to their original position. Adhesive injections were also used to re-attach destabilised paint layers.
- Limited retouching, mostly to provide visual continuity to the inscriptions and areas of the ceiling that presented gaps or lacunae. This was done using reversible water colour of a similar, undertone colour to distinguish the partial re-integrations from the original paint layers.
- Consolidation and cleaning in the areas intentionally left as plain wood by the Comité.
- Application of a protective coat to the inscription bands and ceiling surfaces made of a solution containing five percent of Paralloid B72, an acrylic resin that is also resistant to the effects of light and aging.

Above: Manual tracing of the inscription band for the preparation of base survey drawing *(AKTC Conservation Team, 2019).*



Above: Condition survey of the ceiling above the *qibla* portion of the prayer hall *(AKTC Conservation Team, 2019).*

Right: Manual cleaning of the inscription and decorated ceiling to remove dust and accumulated dirt *(AKTC Conservation Team, 2020).*

Above: Manual cleaning with the use of a small scalpel to remove black crust *(AKTC Conservation Team, 2020).*

Middle: Application of organic solvent with a cotton swab to remove persistent dirt and grease from the painted surfaces *(AKTC Conservation Team, 2020).*

Below: Stabilising loose wood boards in the recessed panels between structural beams *(AKTC Conservation Team, 2020).*

Above: Strengthening the base of the inscription band in the upper register of the *qibla*'s upright wall *(AKTC Conservation Team, 2020).*

Middle: Inserting balsa wood strips to fill the gaps between the inscriptions' timber planks *(AKTC Conservation Team, 2020).*

Below: Filling the minor gaps between timber planks with wood dust mixed with acrylic resin with adhesive properties *(AKTC Conservation Team, 2020).*

Above: Injections of adhesive to reattach peeling paint complement the use of a hot spatula to return the detached flakes to their original position *(AKTC Conservation Team, 2020).*

Middle: Limited retouching with reversible watercolour was necessary to provide visual continuity to gaps and lacunae in the painted decoration *(AKTC Conservation Team, 2020).*

Below: Detail of the koranic inscription. Note the elegant flower pattern behind the letters *(Christophe Bouleau, 2019).*

Above: Advanced retouching and gilding of the inscription band following the stabilisation of the timber planks and filling of gaps *(AKTC Conservation Team, 2020).*

Middle: Applying a protective coat resistant to light and aging to the restored koranic inscription *(AKTC Conservation Team, 2021).*

Below: View of the ceiling above the *qibla* portion of the prayer hall after conservation. Note the koranic inscription visible at the top of the image *(Adrien Buchet / AKTC, 2021).*

5.0 | LESSONS LEARNED

The Maridani mosque has important lessons to offer both as a repository of social, cultural and historical significance and as a manifestation of Islamic Cairo's artistic values and technological achievements that date back more than seven hundred years. These lessons continue to teach us about the resilience of traditional building materials and their applicability to other monuments and sites in Cairo. They are doubly relevant in the case of monuments that, as in the case of al-Maridani, continue to serve an important social function as places of religious gathering and community interaction, as well as providing opportunities to develop local capacities in traditional industries and tourism-related activities. As such they are an important source of economic and social development and contribute to improving the general well-being of the residents and the inherent sustainability of historic Cairo.

Three aspects in particular characterise the Maridani initiative and make it a significant case study for the opportunities it has offered: (1) to learn more about conservation practices and their implementation in the context of Cairo; (2) to contribute to capacity building and to the training of professionals well-versed in much needed traditional building techniques and crafts; and (3) to raise awareness of the role of culture in uplifting the historic context, the quality of life and the economic development of the historic neighbourhoods.

5.1 HIGHLIGHTS IN CONSERVATION PRACTICE

The principal output of the project was the physical conservation and indeed rescue of the severely neglected fourteenth-century Maridani mosque, one of the most significant monuments of the Bahri Mamluk era. By applying international conservation standards and by adapting them to local expectations and uses, the project offered durable solutions in securing the building envelope and saving the historic mosque's valuable interior decorations and furnishings from partial or total loss.

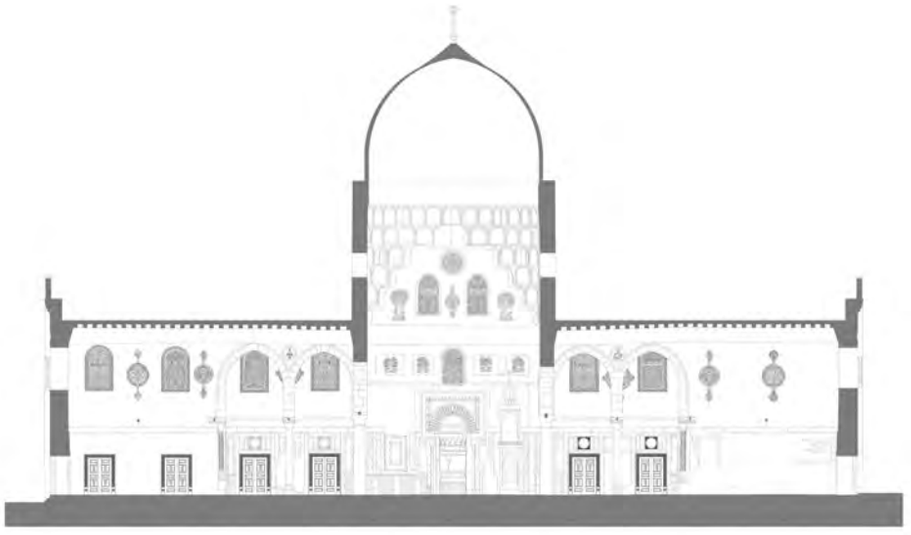
Because al-Maridani continues to be in full use and has religious and social relevance for the local community, it was important to strike a balance between two extremes: on the one hand, an uncompromising 'archaeological' approach that bans any form of replacement and re-integration; and, on the other, a course of action aimed at 'modernising' the monument through 'stylistic' renovations and the introduction of conjectural reconstructions. Instead, the approach followed sought to preserve the original fabric and carry out only limited re-integration and, where necessary, substitutions to provide continuity in the use and appreciation of al-Maridani as a living, functioning monument.

The need to return the monument to full community use in good time helped with the advancement the conservation work, first by finalizing all pre-construction activities before September 2018, when work effectively started on site, and then by completing work on the exterior envelope of the building.

By early 2019, the minaret's conservation and roof renovation had already been achieved. Even after March of 2019, when the COVID-19 pandemic erupted, work continued apace: health precautions were factored in, and contingency plans put in place to introduce social distancing measures and the rotation of manpower to avoid excessive crowding in the prayer hall. By June 2021, the greater part of construction activities, amounting to approximately seventy percent of conservation work, had been fully implemented.

The relatively fast pace of implementation can be attributed to various decisions and actions taken early in the conservation process. These ensured the effectiveness and quality of the results and are worth mentioning for their methodological implications.

- ***The importance of detailed survey work and effective forward planning.*** The relevance of this initial phase of activities cannot be underestimated. A thorough process of architectural documentation is essential to provide a reliable record of the structure and its condition prior to starting conservation works. Understanding the priorities and the sequencing of the works, as well as identifying the logistical implications and personnel requirements are all fundamental in planning the work ahead. This practical side must go in parallel with the gathering of essential information about the history and past transformations of the building through a process of data collection and critical interpretation of information from various sources, including archival material, past reports, previous architectural surveys and old photographs. Material analyses and archaeological investigations are also necessary for a fuller understanding of the building's constitutive elements, dilapidation phenomena and earlier transformations. This entire process is per force multidisciplinary in character and demands the participation of different professionals, including architects, engineers, historians, archaeologists, materials specialists and quantity surveyors. In the Maridani case, much up-to-date documentation and information was assembled at an early stage, perhaps to a greater extent than in other cases. What may appear at first as an excess of pre-construction analysis and information gathering,

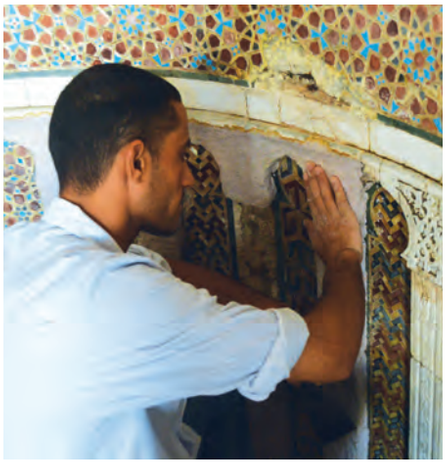


Above: An early 20th century photograph of the mosque's interior courtyard documents the placement of the Ottoman water tank from Sultan Hassan *(Postcard c. 1905).*

Right: Example of survey drawings completed prior to the inception of works showing a section of the monument with the dome and marble panels of the prayer hall *(Tariq al Murri / AKTC, 2018).*

pays off at a later stage because the cross-referencing of data facilitates decision-making, and the availability of reliable baseline information helps in establishing priorities and organizing the works.

- ***The need for preliminary testing and prototyping to identify the most effective technical solutions.*** Each conservation site is different due to many factors including the nature of the original materials, the orientation and exposure of the building, particular conditions contributing to the degradation of individual components, as well as specific man-made issues, such as in the case of the *minbar* panels stolen from the Maridani mosque. Even though general standards and conservation techniques can be applied, it is always advisable to test them under specific conditions to ensure that they will work and produce the desired results. For this reason, a fair amount of time was spent at the beginning of the project to test specific applications in the cleaning of surfaces, effectiveness of mortar mixes, selection and compatibility of matching stones, efficacy of biocides, stabilisation of flaking paints and so on. These tests occurred at specific locations, often the most critical ones, to gauge the actual effectiveness of particular applications. Both material and aesthetic results were evaluated to ensure the harmonious integration of the proposed treatments within the general context of the mosque. The final selection required adjustments in the selection of products and materials and in the actual execution. Once specific techniques and proposed solutions had been tested and were considered satisfactory, the team sought the concurrence of the Antiquities inspector. In some cases, actual full-scale prototypes were prepared to test and determine the viability of a particular method and the quality of the ensuing aesthetic results. Especially critical in this respect was the preparation of prototypes for the planned interventions on the *qibla* wall and *mihrab* niche, as well as the mock-up for the inlaid panels of the *minbar*.



Above: Testing poulticing methods on the marble surfaces of the *mihrab* niche *(AKTC Conservation Team, 2021).*

Left: Full-scale prototype of an inlaid panel for the minbar presented during the visit of the EU delegation *(AKTC Conservation Team, 2020).*

- ***Limits and advantages of up-to-date conservation techniques and new services.*** The Maridani mosque is an illustration of the risk of introducing untested new materials and techniques. Today we know that the use of reinforced concrete at the beginning of the last century was fundamentally flawed. Despite the Comité's best intentions, it resulted in the mosque's accelerated decay and loss of material evidence, consequences that could have been avoided and could only be partially rectified a hundred years later. But al-Maridani is not an isolated case. The history of conservation is littered with failed attempts at the introduction of substitute modern materials that turned out to be illusory or faulty because of a limited understanding of their long-term performance. To avoid similar unfortunate outcomes, the project made a determined effort to rely almost exclusively on traditional construction methods and well-tested applications, while rejecting novel materials that lacked a verified 'pedigree'. Top-down, autocratic decisions about materials and techniques were avoided in favour of wide consultations at various levels and a sustained dialogue with the craftsmen in charge of the works. Their advice, often based on decades-long practical experience, was invaluable and given maximum consideration. Such an approach, however, did not preclude the introduction of proven technical improvements or services deemed essential for the present-day use of the monument. A case in point was the introduction of expansion joints to prevent cracking and the installation of effective barriers against the penetration of water in the mosque's roof cover. Also, the introduction of adequate sanitary provisions and electrical works was considered necessary to respond to present-day expectations. This was done as unobtrusively as possible by concealing pipework and cabling, rationalising the routing of distribution lines, and locating discreetly the access panels necessary for inspection and maintenance.

Above: Installation of concealed pipework below the main entrance of the mosque *(AKTC Conservation Team, 2021).*

Right: Sustained consultations with conservators and craftsmen regarding intervention methods and techniques occurred throughout the life of the project *(AKTC Conservation Team, 2021).*

- ***The necessity for direct management of the construction process and conservation works.*** In recent years, well-established contractors in Cairo have taken an interest in the heritage field, however their knowledge of conservation practices and their ability to carry out a conservation project from start to finish are limited. Adequate qualifications and expertise are lacking both among professional and skilled workers. Specialists who are well-versed in traditional construction and conservation methods are few and scarcely appreciated. This has to do with the organisation of the construction industry in the country where new building and modern construction systems occupy the lion's share of the construction sector, and where the conservation and upgrading of historic buildings is considered an unlucrative niche activity. In view of these limitations, the project's response to implementing construction works on the Maridani mosque was the establishment of a dedicated team made up of local craftsmen, conservators, apprentices, trainees and workers under the supervision of national specialists and visiting international consultants. The conventional distinction between project architect and main contractor was thus resolved in favour of a more flexible organisation where the project team retained control over the entire development of the construction and conservation activities and acted as advisor to the responsible authorities, taking over the combined responsibilities of supervision architect and main contractor. Such responsibilities also included the planning and scheduling of works, the coordination of labour and trainees, the procurement of materials,

Above: The al-Maridani team assembled to monitor and implement the project consisted of a selected group of local craftsmen, conservators, apprentices, trainees and workers under the supervision of national specialists and visiting international consultants *(AKTC Conservation Team, 2021).*

and the supervision of the works. Work was split into a series of separate components and implemented either through the direct recruitment of experienced local craftsmen and workers or by entrusting discrete packages to specialised sub-contractors selected for their competence and track record, as in the case of the sanitary and electrical installations. The combination of these different modalities of implementation made it possible to maintain flexibility and control at all stages, thus enabling the project team to ensure the quality of the results, monitor costs and facilitate a close integration between the different specialists and consultants who participated in the project.

- ***The significance of project documentation.*** Documenting all the activities and works involved in the project was emphasized from the very beginning to ensure that a thorough record of the preparatory activities and works implemented would be left behind at the end of the project. The documentation consisted in presenting the condition of the monument prior to implementation, documenting the work done, and finalising as-built drawings upon completion of works. Its long-term aims were the facilitation of future research on the building, as well as the provision of reliable information for the implementation of future maintenance and additional works that may be conducted on the same building at a later stage. The completed documentation on the Maridani mosque conservation project contains explanations regarding the rationale for the decisions made, the actual sequence of operations and the techniques employed in preserving and rescuing the monument and its various components. This information was assembled and shared with the inspectors of the Islamic and Coptic Monuments Sector on a quarterly basis in soft and hard formats and made available through a central data bank accessible on the web. Paramount was the deontological belief that the results of the work should be accessible to prospective users and shared with the professional community for purposes of research and for the future preservation and upkeep of the monument.

5.2 TRAINING AND CAPACITY BUILDING

The introduction of traditional construction and conservation skills was a critical aspect of the project. The restoration of the Maridani mosque constituted an important addition to the work carried out by AKTC in Darb al-Ahmar towards the conservation of Cairo's Islamic heritage, and the development of practical training and future employment opportunities in conservation work.

As in many other parts of the world, Egypt is not unique in having lost the continuity of practice and knowledge in the use of traditional materials and techniques due to the advent of modern construction systems. To be sure, valuable experience in traditional construction and craftmanship still exists is Cairo, and the project took full advantage of the opportunity to enlist the participation of master builders and craftsmen in the Maridani works. But they belong to the older generation of artisans who are struggling to keep

their crafts alive and pass on their knowledge to the younger generations. This potential discontinuity in the intergenerational transfer of knowledge, updated to reflect state-of-the-art approaches and techniques applicable to conservation, must be forcefully addressed if the country's heritage is to be preserved and enhanced in the years to come.

To this effect, in keeping with the experience matured in other AKTC restoration initiatives, the project took direct responsibility for the continued on-the-job training of young professionals and the recruitment of technicians and apprentices who, together with the master builders and craftsmen enlisted for the Maridani initiative, could be assigned to the various conservation specialties and tasks necessary for the conservation of the monument. Furthermore, AKTC ensured an efficient transfer of knowledge between international specialists and local professionals to establish a solid foundation for future conservation practice in Cairo. This interaction reinforced the capacities of the local crew by discussing different approaches and solutions to specific conservation problems, reviewing up-to date treatments, and more in general, offering the international expertise in a rapidly evolving field.

The conservation of the Maridani mosque would not have been possible without the combined efforts of the older master builders and craftsmen, the younger generation of professionals and conservators trained by AKTC in its restoration projects or recruited directly from the Faculty of Archaeology at the University of Cairo, and the presence of international specialists who joined the project for short periods during the critical stages of work. Quality supervision proved to be one of the most challenging issues. In particular, the Maridani mosque project benefitted from the presence and commitment of a very a competent project manager, who had worked during the period 2004-2012 in the same capacity as the manager of other AKTC conservation projects.

Training at the Maridani mosque focused on those aspects of construction and the skills required to competently address the principal tasks entailed in the works on the building envelope and the conservation of the prayer hall with its various decorative components. Professional training concentrated on architectural documentation, conservation philosophy and practice, and project management. On-the-job training for apprentice builders, craftsmen and technicians included practicums in roof repairs and construction, conservation and replacement of stone masonry, traditional mortars and renders, decorative plasterwork, marble and mother of pearls intarsia, and wood working and marquetry.

As in previous 'on-the-job' activities carried out by AKTC in al-Darb al-Ahmar, training was structured around the works on site under the supervision of the project managers and the skilled builders and craftsmen in charge of the different aspects of the work. The constant exchange of information and know-how that occurred between and among the AKTC specialists, the most experienced and capable local masters and the trainees themselves

characterised the Maridani training experience. This synergy proved very effective and fruitful as it combined the best of the local expertise with the highly committed AKTC staff and consultants.

Overall, the project provided the trainees with hands-on experience as site works advanced. In this respect, the philosophy of training mirrored that prevailing in traditional societies where knowledge is transferred from one generation to the next by engaging the apprentices in all aspects of construction. Through constant presence on site and participation in all stages and details of building works and craftmanship, trainees learned about materials and construction techniques through repeated exposure and the repetition of simple, interconnected tasks whose mutual relation would eventually become evident to the trainees as the work advanced. Construction work and training were thus integrated into a single process that allowed trainees to internalize the process of construction and carry out increasingly complex tasks with confidence and ability.

Above Right: Apprentices grouting the exterior façade of al-Maridani *(AKTC Conservation Team, 2020).*

Right: Master woodworker and apprentices at the carpentry workshop in the nearby Khayer Bek Complex *(Matjaz Kacicnik / AKTC, 2007).*

5.3 PRESERVING HISTORIC CAIRO'S HERITAGE AS AN ENGINE FOR ECONOMIC DEVELOPMENT

A profound awareness and belief in the catalytic role of culture and cultural heritage is at the heart of AKTC's approach and understanding of economic development in historic urban contexts. This is based on three tenets: first, investment in cultural assets can provide a springboard for socio-economic development; second, culture itself plays a transformative role by reversing urban decline and strengthening local identities; and third, successful projects of cultural significance bring communities together, foster the development of organisational and institutional capacity, and enhance local skills through training and practical on-site experiences in traditional construction and tourism-related services.

The Maridani project brings together these key prospects and aspirations

Above: Master craftsman at work on a stained-glass gypsum window *(Matjaz Kacicnik / AKTC, 2007).*

Below: Cleaning and applying the final protective coat to the polychrome marble floor in the Tarabay al-Sharif Sabil *(Matjaz Kacicnik / AKTC, 2007).*

and illustrates the potential of heritage projects in generating long-lasting development in historic Cairo. In fact, AKTC's multi-year presence in the Darb al-Ahmar district, south-east of central Cairo, confirms that, provided residents are aware of opportunities and participate themselves in the rehabilitation process, heritage preservation can have a beneficial impact on the betterment of local communities and improvement of living conditions. The district, fairly marginalised when compared with other parts of historic Cairo, is in fact rich in monuments and very significant historic buildings dating back to the Mamluk era. In addition, al-Darb al-Ahmar presents an extraordinary variety of crafts and traditional enterprises that are unparalleled elsewhere in the old city.

The evaluation survey conducted by AKTC in June 2021, as the Maridani project was being completed, showed that most residents in Darb Al-Ahmar understood the value and the importance of the monuments in the area. Members of the local community viewed favourably the work carried out at the mosque and were proud of the quality of the results achieved. Moreover, the community understood well the potential economic returns to be generated by cultural tourism, as well as the direct and indirect benefits on small and medium size workshops and enterprises.

Eighty-two percent of the Darb-al-Ahmar residents responded positively to the suggestion that building up local capacities in the tourism sector is critical to creating employment opportunities and raising income levels. They see that a well-founded strategy of tourism development creates a positive climate for all types of traditional craft shops, coffeehouses *(qahwa)* and food and retail outlets, as well as businesses that offer hospitality services. The training of tour guides from among the Darb al-Ahmar residents and the identification and interpretation of itineraries linking the restored monuments to areas of heritage significance in the district, funded through the present EU grant, raised considerable interest and has had an impact on neglected and scarcely frequented areas of the district, thus also increasing economic opportunities for existing commercial outlets.

Above: Outdoor coffeehouses in Darb al-Ahmar serve as centres of social life and community interaction *(Mezala / AKTC, 2020)*.

Right: Woodworking workshop in al-Darb al-Ahmar, one of the many small-size craft industries active in the district *(Mezala / AKTC, 2020)*.

Above: Wood storage chest, carved and inlaid with ebony, bone and mother-of-pearl under production in one of the local workshops supplying the nearby Khan al-Kalili tourist market *(Mezala / AKTC, 2020)*.

Middle: Young apprentice assembling brass lanterns, a local craft tradition that dates back more than eight hundred years *(Mezala / AKTC, 2020)*.

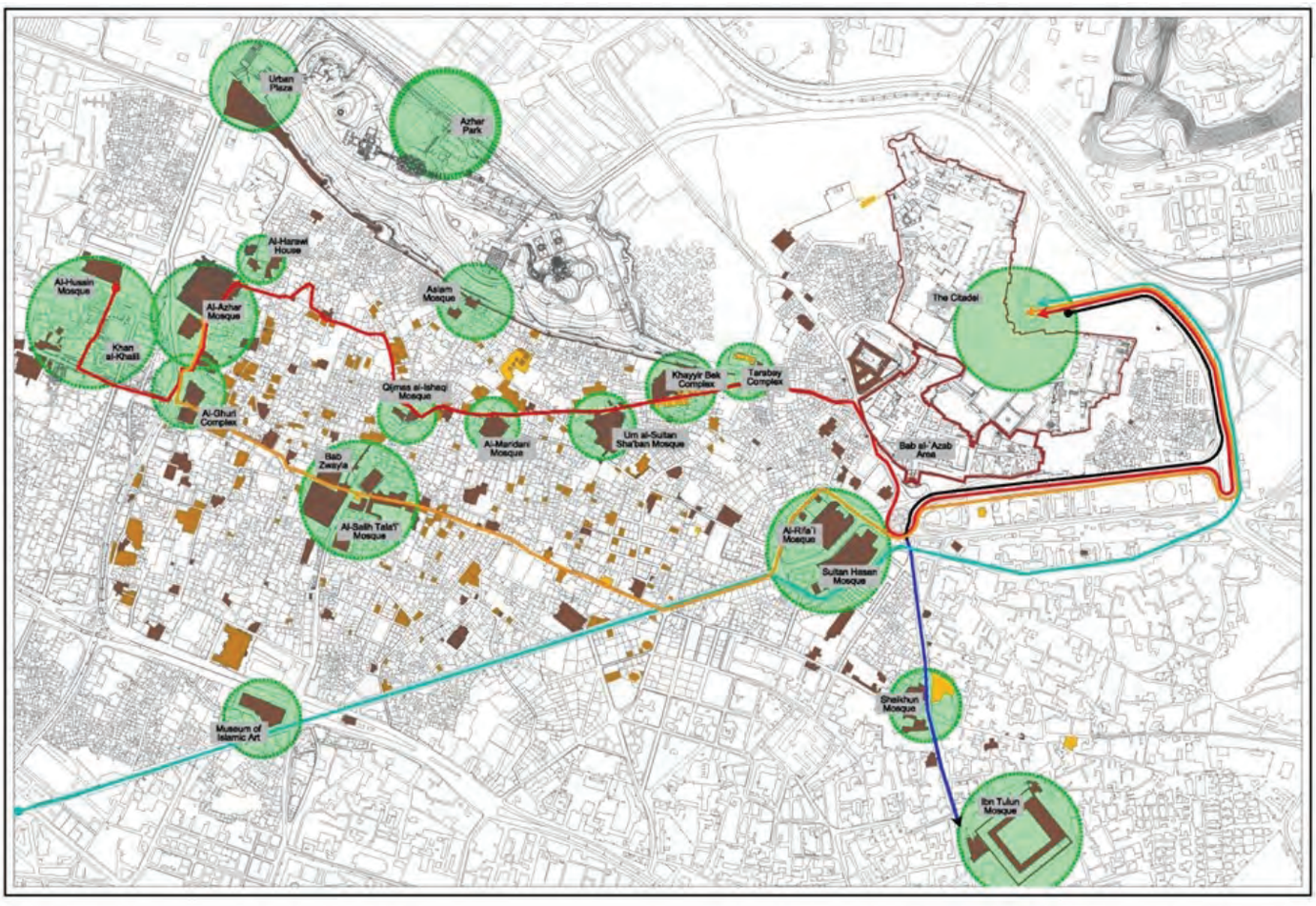
Below: Cordwainers at work making shoes for the local market *(Mezala / AKTC, 2020)*.

Left: Studying tourist itineraries and the location of monuments on a large plan of the district during the training course for tour guides organised as part of the EU project *(AKTC Conservation Team. 2020).*

Right: Visiting and illustrating the mosque of al-Maridani as part of the course for tour guides *(AKTC Conservation Team. 2020).*

Below: Map showing the principal tourist routes and nodes of visitor interest, as well as the locations of monuments and significant buildings within historic Cairo *(Kareem Ibrahim, Takween Integrated Project Development, 2014).*

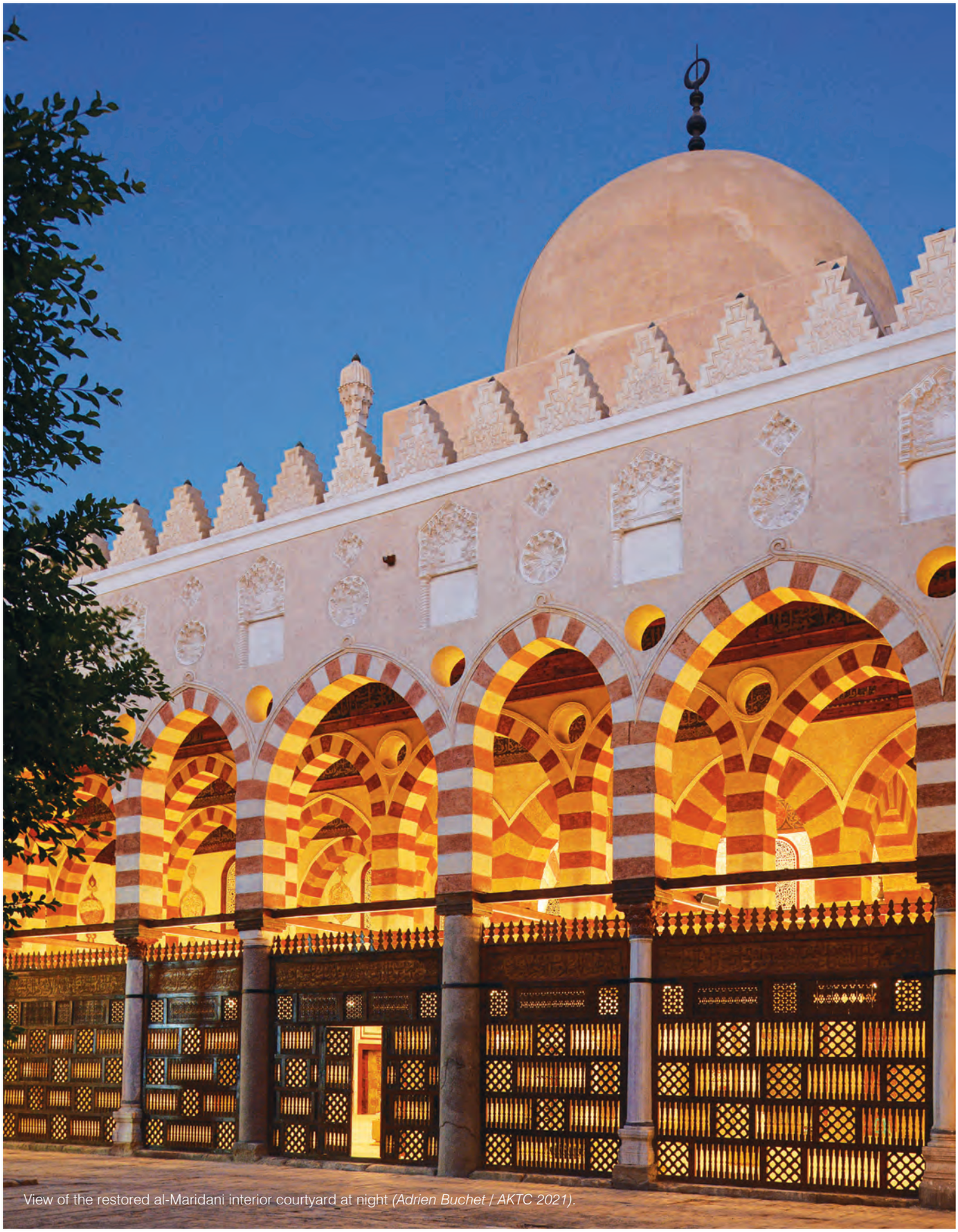
In addition, the opening of monuments to the public and their inclusion in the visitation circuits opened the way for the involvement of local groups, from school children to secondary school and university graduates, who are being exposed to these educational opportunities for the first time. Finally, the Maridani initiative has been instrumental in establishing a closer partnership with the Ministry of Tourism and Antiquities through site inspections, periodic meetings, workshops, and presentations. These events offered valuable opportunities to share knowledge and experience in the conservation of monuments in historic Cairo and promoted a fruitful exchange of knowledge about documentation standards and appropriate conservation approaches, methods, and techniques.



The expected handing-over of the restored Maridani mosque to the Waqf administration in 2021 will celebrate the beginning of a new life for one of Cairo's most distinguished monuments. At the same time, al-Maridani will continue to serve its religious and community purposes as a neighborhood mosque. This decision must be welcomed: lack of use, too often accompanied by protracted absence of maintenance, inevitably undermines the long-term viability of significant historic structures. A course of action similar to the one now proposed for al-Maridani, aimed at bringing back to life these exceptional buildings and extending their viability under an orderly maintenance programme, should be extended to all public monuments and heritage structures. This is essential to better integrate their use into the life of the community whose members should actively participate in their upkeep and benefit from the transformative role they can play in the development of the economic, social and cultural revitalisation of historic Cairo.

Above: The Minister of Tourism and Antiquities and representatives from the Islamic and Coptic Monuments Sector visit the Maridani site *(AKTC Conservation Team. 2020).*

Below: The Project Manager illustrates the ongoing restoration of the painted ceilings to a member of the EU delegation *(AKTC Conservation Team. 2019).*



View of the restored al-Maridani interior courtyard at night *(Adrien Buchet / AKTC 2021).*

ANNEXES

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SCOPE OF SURVEYS AND PROJECT STUDIES

- ***Existing condition survey (Tariq al-Murri and Muhammad El-Essawy)***
  The architectural surveys were carried out in stages using 3D scanning technology to provide a high level of accuracy and good results. The outcome included plans, sections and elevations showing the monument as it appeared in 2017. A set of existing-condition photographs organized by building section and cross-referenced with the plans provided a valuable baseline for further documentation, investigations, and archival purposes.

- ***Building Materials analysis and characterisation (Hanaa Ghorab)***
  The analysis and characterisation of the principal materials employed in the original construction of the mosque was critical in providing a fuller understanding of existing conditions. The results enabled the AKTC Conservation Team to identify remedial solutions for the purpose of repairs and intervention. Especially important were the findings regarding the performance of materials over time to better protect them from future deterioration. New materials were also analysed to establish their compatibility.

- ***Conservation assessment (Josephine d'Ilario)***
  A specialized international conservator performed a 6-day field visit to review the condition of the building's exterior and interior surfaces. The specialist discussed the application of alternative technical solutions with the local professional staff and conservators, and recommended specifications and methods of intervention for the conservation of the deteriorated marble mosaics and the painted ceiling of the prayer hall. The first mission was followed by a second one to review work in progress and discuss potential areas of technical improvement.

- ***Structural and geotechnical Investigations (Nile Consult / Sherif Mourad)***
  Local test pits were set up to assess the nature and quality of the foundations supplemented by boreholes to investigate soil composition and the water table level. A visual inspection of the building was also carried out to identify structural issues and potential problem areas. The findings confirmed the good condition of the foundations. Also, the water table, at more than 15m below ground level, did not constitute a threat to the monument. Moreover, the structural analysis concluded that the range of stresses affecting walls, columns, arches, dome and minaret was low, generally contained well below critical levels for similar traditional structures. The verticality of the various structures, including walls, columns and the minaret were considered satisfactory and corrective measures unnecessary. Overall, the evaluation confirmed that the monument was in good condition and fundamentally stable from a structural point of view.

- ***Historical study (Ingy Wakeed)***
  An historical study was commissioned to provide an overview of the monument's history, a biography of Altinbugha al-Maridani and the sultan's role as a patron during the mosque's construction. The same study also contained an analysis of the work carried out by the "Comité de Conservation de l'Art Arabe" through a study of the reports and publications detailing the monument's first restoration campaign between 1895 and 1906.

- ***Photographic documentation***
  - Pre-conservation photography by Christian Richters (September 2017).
  - Work in progress pictures and videos documenting the advancement of the work by the AKTC Conservation Team between 2017 and 2021.
  - Post-conservation photography by Adrien Buchet (July 2021).