



2016 On Site Review Report

by Gökhan Karakuş

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Royal Academy for Nature Conservation

Ajloun, Jordan



Architect

Khammash Architects

Client

Royal Society for Nature Conservation

Design

2009-2011

Completed

2014

Royal Academy for Nature Conservation

Ajloun, Jordan

I. Introduction

The Royal Academy for Nature Conservation in Ajloun, Jordan, by Khammash Architects, is the continuation of the environmental and socio-economic programmes of Jordan's Royal Society for the Conservation of Nature over the past 50 years. The Academy, built over an abandoned limestone quarry next to the Ajloun Forest Reserve, reclaims this scarred landscape for environmental education and eco-tourism. The architectural strategy by architect Ammar Khammash was to continue the exposed surfaces of limestone in masonry cladding composed of limestone from the quarry to create a union of man and nature. The bold 11-metre cantilevers in limestone and the dramatic entrance through a 30-metre bridge supported by a masonry structural arch show the expressive and architectonic possibilities of limestone building techniques. Forcefully thrusting vertically from the quarry, the design highlights the important role of the Academy as a symbol of ecological consciousness for the local populace and visiting eco-tourists.

A. *Brief historical background*

The Academy is part of the Royal Society for the Conservation of Nature (RSCN), Jordan's oldest nature-conservation organisation. As such, the groundwork for the Academy is based on the policies and strategies of the RSCN over the past 50 years. These policies and activities, focusing on the protection of wildlife, preservation of natural areas, development of education and socio-economic programmes all lead directly into its programme for the Academy.

Amar Khammash's architecture practice has been deeply involved in the RSCN's development since the 1990s, facilitating and realising many of the RSCN's policies into architecture. Khammash as an architect and also with expertise in ethnography and botany was able to bring a combination of skills to the environmental and social issues the RSCN faced in deploying its programmes in different natural reserves and rural communities that they were actively involved in.

The RSCN dates back to its foundation in 1966 by a small group of game hunters whose main concern was the marked reduction in numbers of animal species due to illegal hunting and poaching, combined with a general indifference to the preservation of the natural environment in Jordan. Trying to create awareness on environmental preservation, this group of pioneers initially began working with the Jordanian government to establish ground rules to control and regulate hunting. As a result of their activities, by 1973 the RSCN was officially given the responsibility of issuing hunting licences and establishing hunting patrols to enforce hunting laws in Jordan. The impetus for this set of regulations and standards became a legacy that was carried through to 1995, with the formulation of the first Jordanian environmental protection law and the establishment of an environmental police unit in 2006.

The RSCN was also responsible for the beginnings of natural preserves in Jordan. In 1975, the first nature reserve in the country, located in Shaumari near Azraq, was established as a preserve for breeding threatened species such as Arabian oryx, gazelles, ostriches and Persian onagers.

In this 40-year period since 1975, the RSCN has gone on to establish seven of these protected areas throughout Jordan, covering over 1'200 km² in the most important natural landscapes in the country that are today home to a wide-ranging mix of wildlife, flora and biodiversity. Shaumari, Azraq, Dana, Wadi Mujib, Ajloun and

Dibeen are established as nature reserves while the RCSN also supports the management of the historical desert and Bedouin homeland in the Wadi Rum Protected Area.

The RCSN has also focused on public environmental-education efforts, starting in 1986 with the establishment of Nature Conservation Clubs in schools to educate school-age children to understand the significance of environmental issues while also promoting conservation projects amongst youth. In this context, it has collaborated with the Jordanian Ministry of Education to include several key conservation concepts within Jordan's educational curriculum while also providing educational programmes in the reserves themselves.

In the 1990s, the RCSN started to focus on social development in coordination with their programmes in natural preservation. In 1994, this new phase of nature conservation in Jordan began with the establishment of the Dana Biosphere Reserve in south-central Jordan as a model for the synthesis of conservation and socio-economic development. By working to start up nature-based businesses in handicrafts and organic food production, the RCSN created job opportunities in poor rural areas. These economic initiatives continued with the establishment of eco-tourism programmes that provided jobs and raised awareness of the economic benefits of natural environments amongst the local populace, expanding conservation efforts.

It was in these eco-tourism efforts that Ammar Khammash first started to work in collaboration with the RCSN. In 1996, his design for the Dana Guest House, a small hotel that served eco-tourism in the Dana Biosphere was completed. Set in the cliffs of Dana, the Guest House fused the stone masonry walls with the natural geological formations in the rocky canyon conjoining man and nature into a common morphology of an eroded cliff. Later, in 2010, Khammash would complete the Dana Village Restoration project, a community-based hospitality project with the goal of renovating the traditional stone houses of the village to accommodate tourists and visitors that was managed by the locals themselves. In 2002, Khammash continued his work in Dana with the Feynan Eco-Lodge that sits on the lower entrance of the Dana Biosphere Reserve in Wadi Araba. Sited in the lower end of the Dana Reserve, the lodge was built in the wadi (dry riverbed) where a previous campsite existed. The Feynan Eco-Lodge's architectural features integrate climatic solutions from local architecture, such as courtyards for ventilation along with double-shell domes and stone chips embedded into the concrete walls to reduce solar gain on the volume of the building. Khammash would use these design features in his later architecture projects for the RCSN including, importantly, the Academy. Khammash's building for the RCSN and environmental projects in Jordan also continued with the Azraq Lodge at the Al-Azraq Wetland Reserve, 2003, and the Jabal Ajloun Master Development Plan, 2008, for the Royal Hashemite Court, tying his trajectory in architecture very closely to environmental causes in Jordan.

Building on impetus of these eco-tourism initiatives, a new brand and programme, Wild Jordan, was created as the business interface of the RCSN to develop similar socio-economic programmes in all of Jordan's nature reserves. And again it was Ammar Khammash who was picked from a closed competition to design the Wild Jordan Nature Centre Headquarters in Amman, completed in 2001. The Wild Jordan building is set on a sharp slope on top of thin, reinforced-concrete columns in the Jabal Amman Al-Balad district of Amman, drawing on the proportions and material textures of the traditional Ammani houses in the area for reference. Sitting above the slope, the almost-zero footprint allowed the natural topography to breathe with an abundance of light and sun, flora and vegetation below the building, allowing the natural environment to grow and develop. The building houses Wild Jordan's many functions including a craft shop, organic shop, café, lecture halls to support and promote eco-tourism, in addition to offices and exhibition spaces. The building has become a magnet drawing visitors to its rooftop terrace and many exterior spaces with views of downtown Amman and the surrounding topography. Wild Jordan has become a local success story and today manages a number of income-generating programmes that build on the skills of local people to create products and on the tourism potential of the nature reserves.

Following these years of activity in nature conservation, the RSCN became aware of the need to transfer its acquired knowledge to other nature protection efforts in the Arabic-speaking and developing world. In 1999, RSCN inaugurated its first regional training programme, providing training and capacity-building to environmentalists and institutions throughout Jordan and the Middle East with the goal of enabling others in their efforts to preserve and defend the natural environment. What began in 1966 as a small group of committed hunters and conservationists, had now transformed into the multi-faceted organisation that makes the RSCN today recognised locally, regionally and internationally as the leading institution in the conservation of nature in Jordan.

It is in this context of the RSCN's educational programmes that the architect Amar Khammash, with his long-term involvement with the RSCN as their "go-to" architect, was commissioned to design the Academy.

B. *Local architectural character*

The Academy is located on the outskirts of the Umm Al-Yanabi village in the Jabal Ajloun area of North Jordan, adjacent to the Ajloun Forest Reserve managed by the RSCN. The Umm Al-Yanabi village is composed of a number of reinforced-concrete homes from one to three storeys spread over this hilltop location of the Ajloun highlands, an area of rolling hills covered by small pocket-farming plots between forests of oak, interspersed with pistachio, carob and wild strawberry trees. In Umm Al-Yanabi and neighbouring villages, traditional village architecture in the local Anjara Ajlouni limestone has been largely replaced by these reinforced-concrete village homes most half-finished, in low-quality materials and with little architectural distinction. Some of the homes utilise decorative applications of the Anjara limestone as tiles on their facade, but traditional architecture in limestone has largely disappeared in Umm Al-Yanabi and environs.

C. *Climatic conditions*

The climate and flora in the Ajloun Reserve is unusual for Jordan as it is quite cool in the winter and forested areas account for only 1% of Jordan's geography. The topography of this highland site contains mostly rolling hills and valleys as well as some springs. This Mediterranean-like hill country, ranging from 600 – 1'100 metres above sea level with a series of small and medium winding valleys has been affected by desertification and deforestation for the past 200 years. The Ajloun hills receive a few snowstorms every year usually in the winter season from December to March when the average daytime temperature of 8°C makes it one of the coolest locations in Jordan.

D. *Site and surroundings*

The Academy is located dramatically on a hilltop location, just outside the Ajloun Forest Reserve and the Umm Al-Yanabi village, above an abandoned limestone quarry. The building juts up from the quarry as a series of angular volumes with a dramatic protruding cantilever. The quarry is roughly a 30-metre-wide by 100-metre-long gash cut into the hill to reveal the limestone underneath. The Academy sits on the northwest long side of the quarry continuing the rough craggy surface up into its main facade. The transition between the quarry face and the limestone facade of the Academy is not very clear from a distance, appearing as one volume. The distinction between the two only becomes apparent when one arrives at the building.

The site is accessed through a village road leading up to a 50-vehicle-capacity, unpaved parking lot. From this parking area, the entrance to the Academy is through a dramatic, arched, masonry bridge straddling the quarry to direct visitor circulation towards the entrance vestibule and the main lobby. The building's facade of tan/pink Anjara limestone dominates the site as the only visible material apart from a series of small

windows. The Academy, rising forcefully up from the quarry dominates all aspects of the immediate context and is visible far into the distance from the south and east.

The southwest side of the building jutting up from the quarry is composed of a series of angles formed by the rough texture of limestone. The other northeast side also contains this rough limestone cladding, but is broken up by a series of terraces in steel and timber that protrude from the building, breaking up the rough stone massive effect of the building's facade. The service road is located on this side of the building which has been restricted by building limitations on adjacent plots owned by government agencies. The forest comes directly up to this northern side of the building, allowing views of the trees, forest and natural landscape from the classroom buildings and restaurant.

The RSCN Ajloun Forest Reserve Nature Centre, with its wooden bungalows and campsite, sits directly opposite the down the hillside from the Academy.

E. *Topography*

The Academy sits on a peak of the Ajloun highlands in the north of Jordan. To the west, the hills lead down to Palestine, Israel and the Mediterranean that can be seen on a clear day. To the north and east are Jordan's second largest city Irbid, and Syria beyond. The topography is hilly with shallow valleys, occasional stone outcroppings and small plots for agriculture that includes olive trees, grape vines and fruit-tree orchards.

The hills at 600 – 1'100 m above sea level are covered by forests with a mix of different tree types, dominated by the short Evergreen Oak trees that are typical of the northern highlands of Jordan. These woodlands also support a wide range of plant and animal biodiversity including wild boar, marten, jackal, fox, squirrel, wolf and many bird species. A wide variety of wild flowers thrive in Ajloun Forest including the Black Iris, several orchids and wild tulips.

The Academy sits at the periphery of the Ajloun Nature Reserve, between the Ajloun Nature Visitor Centre and the village of Umm Al-Yanabi.

III. Programme

A. *History of the inception of the project*

The RSCN had become a success story in nature conservation and eco-tourism in both Jordan and in the Middle East by the late 2000s. Increasing visibility of their activities spurred on efforts to build out capacity for training and eco-tourism. As discussed earlier, Ammar Khammash has designed a series of buildings for the RSCN, dating back to the Dana Guest House, 1996, including the highly visible Wild Jordan Nature Centre building (2001) in downtown Amman. Through his relations with the RSCN leadership, Khammash became a vital part of the decision-making processes in construction projects, albeit in an informal manner.

B. *How were the architects and specialists chosen?*

The director of conservation of the RSCN in the 2000s, Chris Johnson, and Khaled Irani, director of the RSCN from 1996-2005, were instrumental in coordinating development efforts combining nature preservation, socio-economic programmes with an architecture sensitive to the environment and vernacular culture that Khammash had become expert in during his work in Jordan. The choice of Khammash arose

from conversations between the RSCN management and the architect regarding the programme and object of an educational facility in Ajloun. In earlier projects for the RSCN, Khammash had won competitions, but for the Academy a committee was formed that chose him. Initial concept studies at a site inside the Ajloun Forest Reserve commenced in 2008.

The contractor, Sami Al-Hafi was chosen based on his bid for a tender that was announced in a newspaper.

C. General programme objectives

At the beginning of the process, the general objective for the Academy was an education and training building physically linked with the Ajloun Forest Reserve and its tourism facilities, to create a single integrated eco-tourism complex to use for real-life training situations. The types of educational programmes in nature preservation and ecotourism to be offered at the Academy were extensive, including training for ecological, nature and adventure guides; survival skills, search and rescue skills, eco-lodge management, sustainable tourism practices, eco-business development, 4 x 4-wheel driving, outdoor catering, menu creation, first aid and emergency treatments in remote locations, ranger training, environmental policing and inspection, customer services, forest-tourism package development, wildlife identification, geology and landscape, nature conservation and local community development.

In parallel with classrooms, libraries and offices for education and training, the Academy would also include restaurant and kitchen facilities for both on-site training and eco-tourism functions serving the needs of visitors to the Ajloun Reserve.

To sum up, the initial objectives as outlined by the RSCN were:

“To construct an international-standard academy and ‘centre of excellence’ in Ajloun for eco-tourism and environmental ranger services in order to meet the national and regional requirements of the tourism industry and environmental agencies and create significant career opportunities and socio-economic benefits the people of the Ajloun.”

Expected outcomes

- Minimum of 100 people trained each year to meet market demands in eco-tourism and environment-related disciplines, including: eco- and nature guiding, ranger services, search and rescue, field craft and survival skills, eco-lodge management environmental good practice for hotels and campsites, environmental monitoring and policing, environmental planning for tourism facilities, etc.
- A range of eco-tourism experiences and facilities created in the Ajloun District to support the Academy’s training programmes. These would include hiking and biking routes throughout Ajloun and beyond, camping and cultural experiences, bird-watching facilities and archaeology programmes. All these facilities and services would be used by the trainees in the Academy to develop their knowledge and skills in relevant eco- and adventure tourism operations; and, as viable commercial enterprises, they would also provide jobs and revenue for local people.
- At least 60 jobs created for Ajloun people directly from the operation of the Academy and support services. These jobs would include the staff of the Academy – service staff, trainers, additional staff in the lodge, tour guides, drivers, food suppliers, etc. – and also people employed in the management and servicing of the desert experiences and facilities mentioned above.

- A yearly programme of seminars, short courses and mini-conferences, bringing in visitors to Ajloun who will contribute to the local economy through the use of local services and amenities.
- National and international recognition for the Ajloun Academy as a centre of excellence for eco-tourism and environment-related services, giving the area a much needed boost in prestige and local community morale.

Employment opportunities

- The Academy was conceived on the basis of a clear, perceived need for new and better-trained employees in the eco-/adventure-tourism fields and in environmental monitoring, ranger services and policing.

D. Functional requirements

The architect's brief at the beginning of the process was for a 3,000 m² facility that incorporated training and eco-tourism facilities and, specifically, a restaurant.

- Training rooms to accommodate a maximum of 60 students at any one time
- "Search and rescue" facility for training in handling tourism emergencies in the field, including climbing wall and practice hall
- Medical clinic for teaching in-field first aid and survival training
- Small conference hall with audio-visual facilities
- Library and resource room, with computer suite and small research rooms
- Management offices and staff room
- Canteen and restaurant, plus outdoor food-preparation area for practice in outdoor catering
- Hotel-style kitchen
- Storage and service rooms
- Bathrooms – and a small spa – using recycled treated water, for use by Ajloun Nature Centre Lodge guests
- Staff accommodation of high standard
- Trainee accommodation, designed to for up to 20 students, two per room, with common room for out-of-hours recreation.
- Access road and car parking

IV. Descriptions

A. Building data

Total Site Area:	156'780 m ²
Total Project Area:	3'600 m ²
Building Footprint Area:	1'950 m ²
Outdoor Terraces Area:	320 m ²
Entrance Bridge Area:	210 m ²
Driveway to Service Entrance:	250 m ²
Parking Area:	900 m ²

B. *Evolution of design concepts*

Architect Amar Khammash based the design concept for the Academy on a series of readings of the site over a period of two years. The initial concept dating from 2008 for the Academy was for a design for a location inside the Ajloun Nature Reserve. This site required the cutting of existing forest land that became an issue for the architect, leading to a search for alternatives. The uncertainties of the architects regarding the need to destroy forest land for the building led him to propose the use of abandoned limestone quarry outside the Reserve as suitable to the concept. The RSCN management accepted this and plans were made to use the quarry. The abandoned quarry, like many similar quarries in Ajloun, was used to mine the Anjara limestone used throughout Jordan as a building material since pre-modern times. These quarries were excavated using a combination of dynamite and hand tools, leaving uneven traces on the landscape.

Khammash proposed the site as a way to reclaim this man-made “scar” to further efforts towards nature preservation. The site, however, belonged to other governmental organisations, requiring a process for appropriation by the Academy that lasted until 2009, requiring a change in concept for the project. This process was completed by 2010, resulting in changes to the project brief that focused the programme primarily on classrooms and educational spaces for the Academy with a high-end restaurant and kitchen facilities for education as well as eco-tourism purposes. This reduction in programmatic functions as a result allowed the architect to shift the architectural emphasis to a more symbolic register.

Khammash’s design concept for the Academy explored the architectonic and symbolic possibilities for the quarry and contemporary architecture in stone. The exposed limestone cliff became in this way an aesthetic and symbolic basis for the design that continued its form vertically to create a monumental volume as the dominant elevation for the building. The reinforced-concrete building would be clad completely in limestone, mostly from the existing quarry and nearby limestone quarries, as a way to physically and symbolically patch the landscape. Khammash extended this symbolism through the projection of the building over the existing landscape. When viewed from the main road, the eastern section of the building is embedded into the landscape. The linear movement of the building horizontally towards the west is continued over the exposed quarry highlighted by the entrance and arched bridge bringing together the dominant horizontal and vertical thrusts of the architecture. The horizontal movement across the landscape is completed by the two cantilevering volumes on the west side of the building that hang over the downward sloping hillside, increasing the visual impact of the hanging stone masses.

The design’s integration with the land, reading the location as text, territory and texture, feeds the function of the Academy as a protector of nature while opening up the architectonic and spatial possibilities of the limestone. Notably, Khammash determined the perimeter of the southwest principal public side of the building based on the outline of the quarry. The irregular design of the facade follows the limit of the quarry, emphasised during construction by Khammash’s dramatic design intervention of personally drawing a line on the edge of the quarry as a guide to the builders during the construction phase of the project. This almost painterly interaction with the landscape, indeed, Khammash is a painter, shows the extent to which the architect engaged the natural materials and textures of the site. We can see clearly that the main volumes interact with the natural environment, engaging the stone quarry and forest as design elements that also carry symbolic importance.

On the north facade of the building this symbolic aspect of spatial experience is felt more acutely, as this side of the building hangs over the landscape projecting the building towards the forest. Views from the interior and outdoor terraces unite the experience of the architecture with the experience of the forest, adding visual impact to the RSCN’s programmatic objectives.

Actually, this union of space, experience and symbolism in the experiencing the Academy starts earlier as , in the entrance scenario, visitors are projected forward over the arched masonry bridge towards the main door. Walking along the 30-metre bridge over the quarry and the large void underneath, they are acutely made aware of how man can eliminate nature. The impressive architectural feat of building a hybrid masonry-concrete bridge of such a wide span serves to highlight the void and its lightness directly before entering the massive stone edifice of the building in a contrast of formal effects. These formal effects, light vs. heavy, space vs. mass, horizontal vs. vertical, combined with the architectonic variance of a stone-masonry architecture and a reinforced-concrete one are elegantly brought together in Khammash's design concept.

Design strategies used by Khammash in previous projects for RSCN were used here, including a unified natural-stone and masonry facade, natural ventilation, stone/concrete louvers to mitigate solar gain, and furnishings and finishing using vernacular building techniques.

C. *Structure, materials, technology*

Structural systems

The building is constructed from reinforced concrete comprised largely of a series of load-bearing walls and columns with concrete slabs. These structural walls are predominantly found on the perimeter walls of the building and are at their thickest in the two cantilevered projections on the northwest end. On the south principal facade, the load-bearing walls are inserted directly into the bedrock and project directly up from slightly behind the quarry face, in an interesting combination of stone and reinforced concrete.

On the other side of the building, the structural effort was aimed at reducing the impact on the forest. Here, on the northeast facade of the building, diamond-shaped columns in exposed, reinforced concrete are angled 45 degrees over the trees in order to create voids under the terrace areas while reducing construction in the forest. In interviews, the architect and contractor were proud of that fact only two trees were cut down during construction.

The other remarkable structural feat in the Academy is the 30-metre stone bridge, one of the longest structurally stone arches built in the region, one that is composed of interlocking courses of limestone integrated with a steel-reinforced concrete brace above. The slender hybrid stone/reinforced-concrete bridge is secured directly into the bedrock via steel dowels with epoxy that takes the lateral load from the steel bars threaded through the concrete from end to end. The walkway on top, again in reinforced concrete, is also through steel bars as a plate to ensure against lateral thrusts and buckling. While the bridge could probably have been built completely in structural stone, as the necessary scaffolding work was in place, the time and effort taken would not have been as valuable in light of the fact that this hybrid structure is more sustainable and a practical model for future development of hybrid architectonics in stone and reinforced concrete around the world. This hybrid model for traditional masonry architecture working with modern architectural materials, here in reinforced concrete, presents opportunities to create ideal combinations of the two for structural and expressive purposes, advancing traditional masonry techniques as a hybrid, vernacular/modernist architecture.

Materials

There is a fairly simple application of materials, consisting largely of limestone cladding onto a structure of reinforced concrete. Glass and stone-clad concrete walls are used to separate volumes and indoor/outdoor relations. The limestone walls of the building are clad in rectangular stone blocks of uniform height about

20 cm in various lengths, using cement. The uniform yet rough texture of the limestone facade in bands of blocks is only interrupted by a few windows, thereby dominating the appearance of the Academy. Smaller chips and irregular stone pieces are used to fill in spaces between blocks and in corners to emphasise the uniformity of the limestone in its continuation of the face of the quarry.

Infill materials

The infill materials consist primarily of concrete walls and blocks that are mostly exposed while some are plastered over. In the main conference room, rows of exposed concrete blocks are used for acoustic buffering as well as insulation. Between the exterior walls of the building and the interior concrete blocks is a cavity space filled with straw providing insulation, an important, environmentally sensitive feature of the building's architecture.

Glass windows and sliding doors complete the more permeable surface of the northern facade leading out to the terraces.

The tapered stone blocks inserted above the main circulation corridor in education wing are the most intriguing infill material. The skylight above this corridor throws sunlight down over these blades of stone, creating a play of light and stone that heightens the spatial experience as well as repeating the rough textures of the quarry outside. These tapered stone blades are smaller versions of the tapered concrete louvers inserted into the exterior windows. This design was also used previously in Ammar Khammash's design for the Dana Guest House, where tapered stone blocks were inserted directly into the facade to reduce solar gain on the building.

Renderings and finishes

Limestone, limestone terrazzo and ceramic tiles along with the exposed concrete surfaces are the primary finishing materials of the walls and floors of the public areas of the school and restaurant. The limestone floors of rectangular tiles continue onto the walls with more square tiles creating a continuous stone surface. These smooth stone surfaces contrast in sections with views of the rough stone exterior of the facade, especially in the views through the slits on the south facade that is most dramatic from the bathrooms. Window casings, in stone tiles with their interior surface smooth and their exterior rough, act as a transition between the inside and outside finishing styles of the stone-clad building. In some windows, exposed tapered concrete louvers are inserted to produce the same effect between smooth and rough surfaces. In classrooms, terrazzo tiles containing chips of limestone continue the presence of limestone in the flooring. Square ceramic tiles in a cream and white colour coordinated with the tones of limestone can be found in the service areas. Plaster-painted walls are also present in the classrooms, storage rooms and some of the offices.

The interior ceiling and additional surfaces especially in the terraces, staircases and service areas are exposed, roughcast concrete textures retaining the texture of the horizontal wood planks to vivid effect. This unfinished handmade industrial aesthetic can also be found in the doors of exposed oriented strand board (OSB) and the wrought-iron and steel balustrades of the terraces. The outdoor terraces of the restaurant, with a mixture of steel and timber pergolas, continue this industrial aesthetic that is a favourite design idiom of Khammash in his union of craft and modern materials.

Construction technology

The construction technology of the building employed a reinforced-concrete system found throughout Jordan, the Middle East and the developing world. This universal building technology was applied by the Academy's general contractor, who has done extensive public works in Jordan using reinforced concrete to build schools, police stations and public parks. The architect's aesthetic of leaving exposed rough-cast concrete walls, jagged tapered concrete louvers and handmade metal balustrades all produced by hand gives the construction technology a structurally expressive role in the architecture and points to the handcraft culture in Jordan used to produce it.

This expressive display of construction and materials is also apparent in the stonework, most visibly in the masonry bridge but also in stone cladding of the building and the interior finishing. The stone masonry is rough but regular, requiring expertise in formally assembling a wall over the long broken surfaces of the facade. The most difficult part of the stone-masonry process is the attachment of smaller stone blocks underneath the two cantilevered volumes requiring great effort and skill in interlocking the irregular stone blocks and coordinating these bands with the bands of stone on the facade. All this stonework was done by skilled Jordanian masons, some from the Ajloun area, who were engaged by the general contractors. Also it would be correct to assign the role of these stone workers as skilled labourers rather than traditional artisans, as, today, in the construction sector in Jordan, traditional artisanal stone construction in vernacular architecture has largely disappeared.

Building services, site utilities

The Academy uses an advanced geothermal system from ClimateMaster of Oklahoma City, Oklahoma, U.S.A., that required the boring of up to 100 wells. The model Tranquility® Modular Water-to-Water (TMW) Series 340 (28 tons, 98.5 kW) is used to provide heating, cooling and hot water to the building with blower units placed in rooms and corridors. There is also a provision for solar heating at a small scale to give the building as minimal a carbon footprint as possible.

The architect has also employed the prevailing westerly winds in his design, especially from west to east through ventilation of the large windows between the cantilevering consoles, feeding air through the narrow canyon-like corridor of the main floor of the education section of the Academy into the lobby and restaurant.

Building interior lighting is a fairly simple system of locally produced surface-mounted fixtures with plastic covers and bulbs. Exterior lighting currently is minimal and only used to light entry areas.

Water tanks are placed in the basement and roof, with provisions for rainwater collection.

D. *Origin of*

Technology

All of the building technology is sourced from local producers except, notably, the geothermal system that was manufactured in the U.S.A. Limestone blocks and tiles were processed in a factory in the Ajloun area.

Reinforced concrete work was done on site with cement, and construction steel procured from local distributors.

Materials

Most of the Anjara limestone originated from the existing quarry on site, with additional stone secured from nearby quarries in Ajloun.

Concrete blocks, terrazzo tiles, ironwork, insulation straw, cement, aluminium and glass windows/doors are from Jordanian manufacturers.

Wood and timber used especially in the pergola of the restaurant terrace and the interior doors were imported, as Jordan does not have domestic timber production.

Labour force

Construction labourers in total during construction numbered 60. Many of these were temporary Egyptian labourers used for carrying construction materials, especially concrete and stone, but there was also another significant group from the Ajloun area.

Of the six skilled construction workers throughout construction process: two were from the local Ajloun area, two from Amman and two Egyptian.

There were two on-site engineering supervisors representing the contractor and the architect, as required by Jordanian law.

Professionals

Client: Hasan Osama, Construction Manager
Royal Society for the Conservation of Nature, Amman, Jordan

Contractors: Sami Al-Hafi
Sami Al-Hafi Establishment for Contracting, Amman, Jordan

Architects: Ammar Khammash
Osama Odeh
Deema Assaf
Khammash Architects, Amman, Jordan

Engineers: Mohammed Halawani
Mohammad Odeh
Al-Arabi Group Consulting, Amman, Jordan

Geo-thermal System: GEO contracting company, Amman, Jordan.

Electric: Energy Management Services (EMS), Amman, Jordan

V. Construction Schedule and Costs

A. History of project design and implementation

Design: 2008 – 2010
Construction: 2011 – 2013
Completion: 2013

B. Total costs and main sources of financing

Contributors:

Employment, Technical and Vocational Education Training (E-TVET) Fund, Jordanian Government	1'100'000 JOD / 1'550'060.27 USD
USAID	1'676'320 JOD / 2'362'179.12 USD
Total:	2'776'320 JOD / 3'912'239.39 USD

C. Comparative costs

Jordan construction costs:

Rural construction:	150/200 JOD / m ²	(211 USD)
Construction with stone cladding:	500 JOD / m ²	(704 USD)
Average cost of school building construction:	1'000 JOD / m ²	(1'409 USD)

It should be noted that the geothermal system at the cost of 400'000 JOD (564'000 USD) would not normally be utilised in school-building in Jordan, and represents a not-common cost item in the building.

D. Qualitative analysis of costs

771 Jordanian Dinars (JOD) / m² (1'086 USD)

E. Maintenance costs

Heating cooling is provided by on-site geothermal system

Electricity	1'000 JOD / (1'401 USD)
Water	1'117 – 1'500 JOD / month (1'575 – 2'114 USD)
Cleaning	500 JOD / month (750 USD)

F. Ongoing costs and “life performance” of building

Security for building: 750 JOD / month (1'057 USD)

VI. Technical Assessment

A. *Functional assessment*

The Royal Academy for Nature Conservation has been completed but, due to the fact that it has not entered full operational mode as of March, 2016, it is difficult to completely assess the functionality of the building. The most important aspect of the Academy is its classrooms and educational facilities that seem to be fully in line with international standards for conference or meeting facilities. The classrooms are equipped with ample seating, audio-visual systems and adequate light and ventilation. The library and other technical training rooms have yet to be put into full operation.

Looking back at the original project brief from 2008 and the current building, we can see that the Academy has lost some of the more technical aspects of its training facilities such as the “search and rescue” facility, medical clinic and on-site accommodation. It is more of a meeting facility than a school. In the place of these educational features, the restaurant area has gained importance although that also, as of the time of the site visit, was not in complete operation. The operation of the restaurant has been given to the same operator as the Ajloun Forest Restaurant in the Ajloun Forest Reserve, who has embarked on a plan to turn it into a more high-end restaurant facility.

In operation but not part of the original brief were workshop facilities for soap and cookie production by local village women under the RSCN brand, “Orjan”. Located in what were originally office and storage spaces on the southeast tip of the building, the Soap House, as it is called, is a small workshop for the production of olive-oil soap that, along with organic cookies of the “Tasali” brand made in another workshop, is sold in Wild Jordan stores. Additionally also not part of the original programme is a branch of the Wild Jordan store in the lobby of the Academy that was active with guests from the Ajloun Forest Reserve bungalows and day-trippers from Amman. The store was well-appointed and designed, reflecting the commercial strategies at work in the Academy now and in the future in the vision for Wild Jordan.

B. *Climatic performance*

Climactic performance criteria have been important in the design solutions applied by Ammar Khammash to the Academy. These include double-wall construction with an internal air cavity filled with hay, concrete louvers inserted into windows, deeply inset windows with wide cases inserted deep into the facade and cross-ventilation strategies. Of these solutions, the double wall infilled with hay presents an ideal mix: a simple design using local materials to limit the transfer of heat from the exterior of the building to the interior. The transfer of heat from the primarily hot climate of the exterior in the thermal bridge towards the interior is broken by the cavity and its hay infill.

The 90-cm southern facade absorbing most of the sunlight is fairly uniform in its stone skin broken by a few deeply cut windows and vertical incisions. The two most dramatic cuts are located near the main entrance as ventilation for the public bathrooms, but do not allow sunlight to penetrate into the building. In general, the southern facade severely limits the amount of sunlight entering into the building; this is in contrast to the extensive glass openings, windows and terraces of the permeable north facade of the building that receives very little sunlight and the large glass window between the two cantilevered volumes holding classrooms at the end of the corridor on the main floor.

C. *Response to treatment of water and rainfall*

The Academy has an extensive rainwater collection system with a 500 m³ tank located in the basement to collect rain water in the rainy and snowy winter months to be used throughout the year. A smaller, 230 m³ tank is used for water from the utility grid that also takes the discharge water from the building.

D. *Environmental response*

The building's central architectural premise is based on its adaption to the natural environment. The patching of the exposed limestone quarry is through an architectural intervention that uses the existing limestone of the quarry as the continuation of the geology of the site, unifying man and nature. The long-term erosion of the stone of the building and the quarry unite the destiny of the natural environment with that of man in a powerful existential design statement. Here it is also important to understand that there were aesthetic choices made where the proportions of the quarry are matched in the proportions of the building, 2/3 quarry and 1/3 building, to unify the quarry and the Academy visually as one monolithic mass. On the northern side of the building, every allowance was made to ensure that the forest was not touched. The service road and parking lot are also built on existing parts of the quarry now regularised in design with their surfaces stabilised.

E. *Choice of materials, level of technology*

The choice of reinforced concrete for the structure and Ajloun limestone for exterior and interior cladding and flooring represents an ideal union of local materials with a universal and accessible technology. The limitation of reinforced concrete's environmental performance in heating and cooling have been met with a uniform application of stone cladding to limit solar gain and heat entering into the interior of the building. The contractor's use of local materials including aluminium/glass windows, cement blocks, stone and tiles allowing for construction by skilled workers from the Ajloun area and Amman contextualise the building in the local building culture.

F. *Response to, and planning for, emergency situations*

The major natural disaster facing the Academy would be a forest fire or earthquake. As the building is primarily stone and concrete, except for the timber restaurant terrace, the risks for a forest fire entering the building are minimal. The danger posed by a fire engulfing the terrace spreading into the building does exist and is alleviated somewhat by the concrete slab the timber sits on top of that separates it from the forest.

The other potential danger is earthquake, as Jordan is in a seismic zone. The structure of the low two-storey building in reinforced-concrete walls and columns connected directly into the bedrock of the quarry and hill with additional support metal rods and epoxy mitigates the danger of earthquake. Also, the placement of some of the structural columns towards the interior of the building away from the potential danger of cracks in the quarry face reduces the potential of damage to the building's underlying structure.

G. *Ageing and maintenance problems*

The building in durable reinforced concrete and clad in stone moderates the long-term degradation by environmental forces. One can see the building existing for hundreds of years to due this combination of hard materials. The most acute maintenance problem would probably be due to the long-term maintenance of the expensive (400,000 JOD / 564,000 USD) geothermal system imported from the U.S.A.

H. Design features

The Academy sits in a prominent position on a slope on the Ajloun highlands. It is at a distance from the residential buildings of the neighbouring village, the closest being the two or three houses directly across from the parking entrance. And it is also removed from the forest, visitor centre and guest houses of the Ajloun Forest Reserve to the northwest.

The building's prominence on the site is central to its architectural concept yet highly contextual, like other public buildings in Jordan including the nearby Ajloun government centre, also clad in a similar limestone denoting importance to the local populace. The Academy can also be compared to the nearby medieval Ajloun Castle, a popular tourist destination, a stone building that also projects an image of power on top of Mount Ajloun.

The Academy's monolithic appearance with a rough, stone surface and dramatic cantilever commanding its location project an image of power and strength was a direct design strategy that extends the brief given the architect by the RSCN. This image of strength directly ties into and reinforces the building programme mission as the physical representation of conservation efforts of the RSCN in Ajloun and Jordan.

The building's separation into two zones, one wing for education and the other wing for eco-tourism in the restaurant efficiently organises spaces for both operations, unifying them in the central entrance lobby. The newly assigned soap and cookie workshops on the service side in the east section of the building grouped in a number of blocks cascading down the slope also serve this purpose well providing discrete working spaces for the primarily female work force and their children.

I. Impact of the project on the site

The Academy has, in its current operational situation, not made a major impact on the site. The previously derelict limestone quarry has been cleaned up and secured from further mining and destruction, representing progress in the environmental management of the wider Ajloun area. The neighbouring Ajloun Forest Reserve facilities have been given a valuable neighbour for tourists visiting the Reserve, who can now use the shop and, in the near future, the restaurant located in the Academy. In future, when more student accommodation is to be built at the Reserve and on site in the parcel of the Academy, along with a small farm, this activity between the Reserve and the Academy will increase.

J. Durability and long-time viability of the project

The Academy's durability seems assured because of the use of simple and sturdy materials such as stone and concrete and the high-construction quality of the building. One can see this building lasting for many centuries, similar to the 1,000 year old Ajloun Castle in the distance.

In terms of socio-economic viability, this issue is connected to the long-term sustainability of eco-tourism in Jordan and the region, and the way these environmental policies are managed by the Royal Society for the Conservation of Nature. Looking at its 50-year history of success, the RSCN seems poised to continue to build out its nature preservation and eco-tourism efforts to be a model for other nations. The RSCN is slowly building capacity in educational programming at the Academy and seems to be well on its way to using this newly constructed facility to meet this goal.

K. Interior design and furnishing

The lobby area desks and seating area contain examples of timber furniture designed by Amar Khammash and are in tune with the overall design aesthetic of the Academy. The standard restaurant seating, office furniture, classroom seating and furnishings are less so.

VII. Users

A. Description of those who use or benefit from the project

The primary users who benefit from this are:

- Students of the Academy, primarily from Jordan and the Middle East, who have the opportunity to work and train on natural preservation and eco-tourism in a modern facility
- Visitors to the Ajloun Forest Reserve who can take advantage of short-term events, workshops and children's educational programmes
- Residents of Umm Al-Yanabi and the surrounding villages, who will have job opportunities in the Academy and its associated activities
- RSCN management and staff who have the opportunity to use modern facilities to advance their educational efforts in nature preservation and eco-tourism
- Visitors to the restaurant, especially higher income day-trippers from Amman, who want to interact with nature and use the restaurant in a short foray into Jordan's natural environment.
- Architecture students in Jordan who have an example of advanced design in stone with new architectonic forms of expression to guide future architectural projects

B. Response to project by clients, users, community, etc.

What do architectural professionals and the cultural "intelligentsia" think about the project?

The building has yet to be published in newspapers or magazines. As it is newly opened, it has yet to be visited by those in local or international architectural circles or the intelligentsia. As a blanket statement, Ammar Khammash's work is widely and highly respected in Jordan's architectural culture where he is valued for his dedication to Jordanian culture and environment.

What do neighbours and those in the immediate vicinity think about the project?

The immediate neighbours in the Umm Al-Yanabi village see the building as a government investment in their community. Currently the facilities manager of the Academy is from the village and there is a desire, that is also a part of the policy of the RSCN for the Academy, for continued local participation in its operations. This is especially true for residents of Umm Al-Yanabi who are keen to have more villagers employed there in the future, similarly to the women running the soap and biscuit workshop and retail shop. In this way, the Academy is set to maintain good relations with its social context as well as its relations in the wider Ajloun region. This became apparent in interviews with villagers such as the women of the workshop, the elderly and children in the village who understood the governmental and RSCN investment into nature and their livelihood as a common and unified goal. Most poignantly, a neighbourhood child responding to my question on what the Academy was, responded with the answer, "A castle to protect nature", clearly showing the symbolic and functional impact of the architecture.

As a last note, intriguingly, a tourist group from Europe visiting the Ajloun Forest Reserve saw the building as too massive and modern for its location.

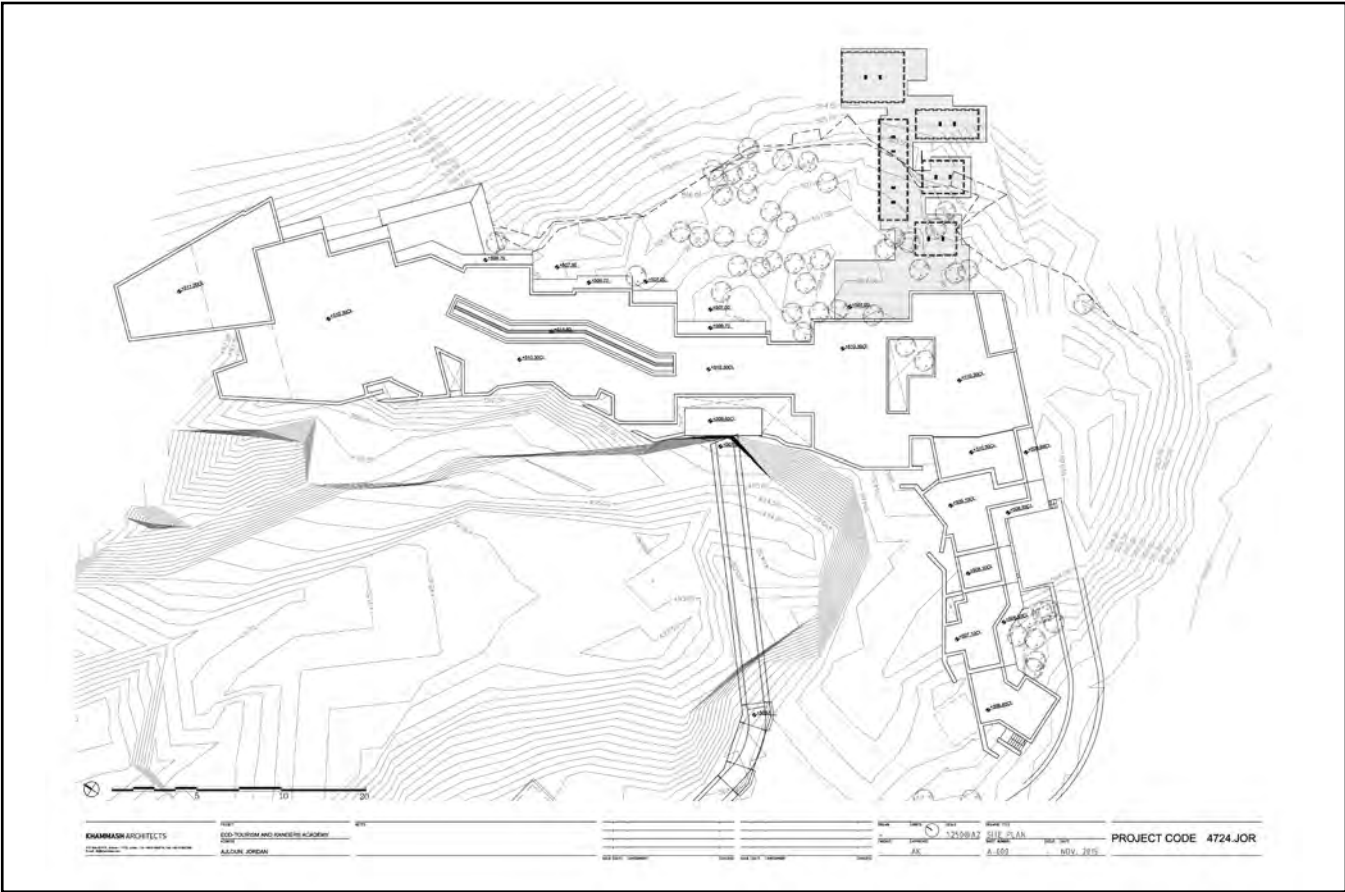
VIII. Persons Involved

Client:	Hasan Osama, Construction Manager Royal Society for the Conservation of Nature, Amman, Jordan
Contractors:	Sami Al-Hafi Sami Al-Hafi Establishment for Contracting, Amman, Jordan
Architects:	Ammar Khammash Osama Odeh Deema Assaf Khammash Architects, Amman, Jordan
Engineers:	Mohammed Halawani Mohammad Odeh Al-Arabi Group Consulting, Amman, Jordan
Geo-thermal System:	GEO contracting company, Amman, Jordan.
Electric:	Energy Management Services (EMS), Amman, Jordan

IX. Bibliography

See: <http://www.herskhazeen.com>

Gökhan Karakuş
May 2016





The Academy is located dramatically on a hilltop location, just outside the Ajloun Forest Reserve and above an abandoned limestone quarry.

The Academy sits on the northwest long side of the quarry continuing the rough craggy surface up into its main facade. The transition between the quarry face and the limestone facade of the Academy is not very clear from a distance, appearing as one volume.





The linear movement of the building horizontally towards the west is continued over the exposed quarry highlighted by the entrance and arched bridge bringing together the dominant horizontal and vertical thrusts of the architecture.

The southern facade absorbing most of the sunlight is fairly uniform in its stone skin broken by a few deeply cut windows and vertical incisions. In some windows, exposed tapered concrete louvers mitigate solar gain





The forest comes directly up to the northern side of the building, allowing views of the trees, forest and natural landscape from the classroom buildings and restaurant.

The outdoor terraces of the restaurant, with a mixture of steel and timber pergolas, continue this industrial aesthetic that is a favourite design idiom of Khammash in his union of craft and modern materials.





The most important aspect of the Academy is its classrooms and educational facilities. The classrooms are equipped with ample seating, audio-visual systems and adequate light and ventilation.

The tapered stone blocks inserted above the main circulation corridor in education wing are the most intriguing infill material. The skylight above this corridor throws sunlight down over these blades of stone, creating a play of light and stone that heightens the spatial experience as well as repeating the rough textures of the quarry outside.

