



IPOGEA

IMAGES AND SHEETS

a glimpse at Ipogea's projects



Works in progress in Adrar, Algeria.



COUNTRY	THEME	EXAMPLE	SOLUTION
UAE	Project to develop	Hili Oasis	Creation of Oasiscape Project



High Level Concept Design:

Hili Oasis project in Al Ain

AIMS OF THE PROJECT

The aim of the project is to communicate, interpret and open to visitors of the Hili oasis part of the site of the Al-Ain WHL. The oasis is interpreted in the context of the unifying vision of all the different components for UNESCO enrollment within which it takes a specific connotation offering an original experience to the visitor.

GENERAL MASTERPLAN

The project envisages the creation of a visitor's route connecting various places of interest, along the due West - North-East itinerary, from the Bin Rayeh Tower to the North plaza, with new attractions. These consist of: Recovery and enhancement of existing structures, landscaping, new reversible structures, tourist services and illustrative exhibitions. The Interventions consist of: the recovery and the enhancement of existing structures, landscaping, new reversible structures and explanatory exhibitions.

Interventions are designed to illustrate the general theme of the Hili magnifying and presenting the story, highlighting the monuments, the sites and the landscape. We will create an eco-museum extended to the territory enabling to travel from from the origin of the oasis through the contemporary evolution and the archaeology, architecture, gardens, history, and culture the natural environment and traditions.

MAIN ATTRACTIONS

Omphalos, High Aesthetic Quality plant nursery with local techniques and traditional view point tower; Oasis funnel gardens; Majlis and Multifunctional great hall; Majlis Plaza; Multifunctional Majlis ramp; Falaj and shareeat; Bin Hadi House Exhibit: the immersive experience in the life of an ancient oasis house; light & sound experience in Bin Rayeh Tower; Restaurant in Bin Rayeh Tower.



The Hill Tower lights & sounds experience



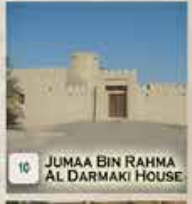
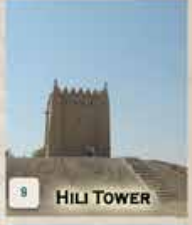
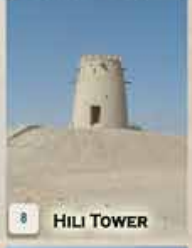
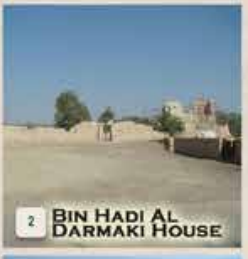
Hili Bin Hadi al Damaki House Exhibition



DATA ON UNITED ARAB EMIRATES



Region :	Middle East
Capital :	Abu Dhabi
Total Surface:	83,600 km ²
Population :	9,400,000
Child mortality rate :	
Fertility rate :	
Population growth rate :	1.53%
Life expectancy ♀-♂:	
Average temperature (min/max) :	0/45 °C

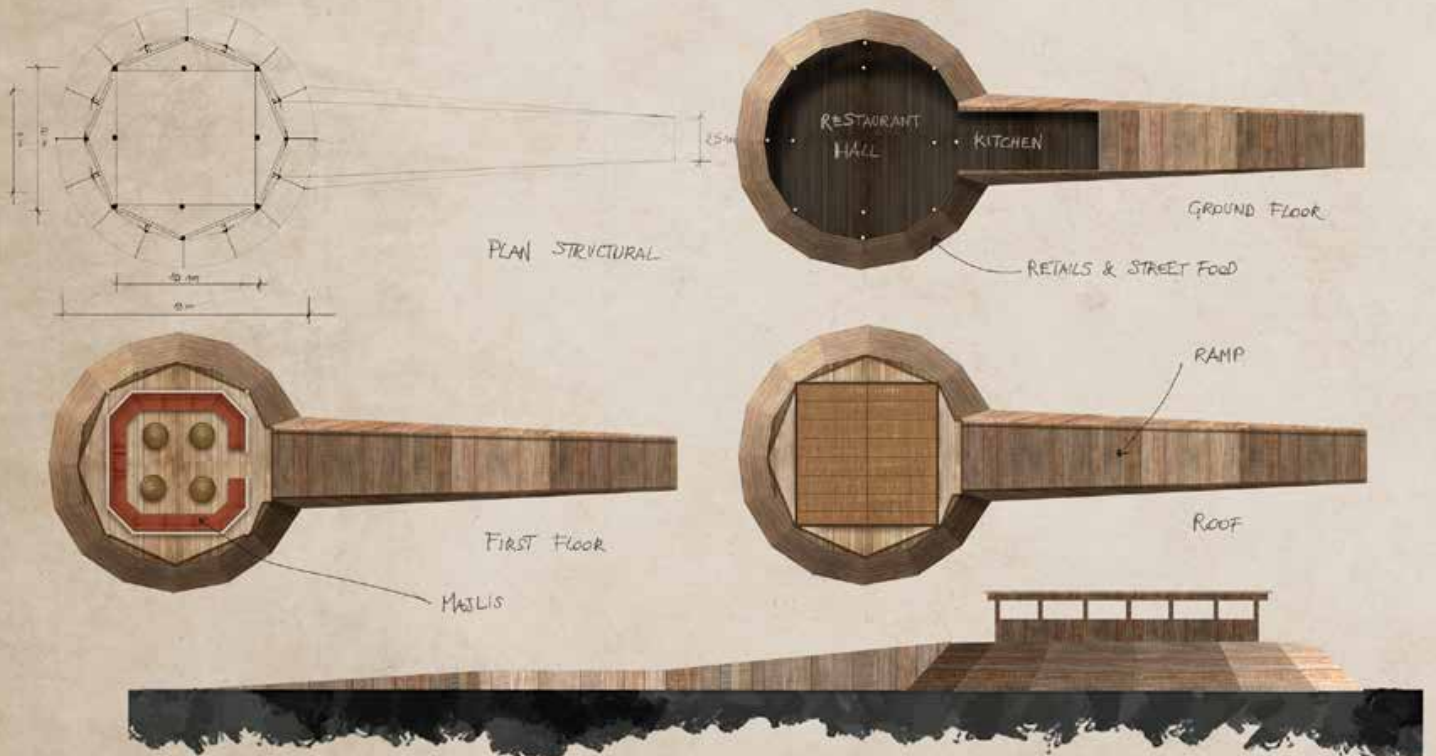


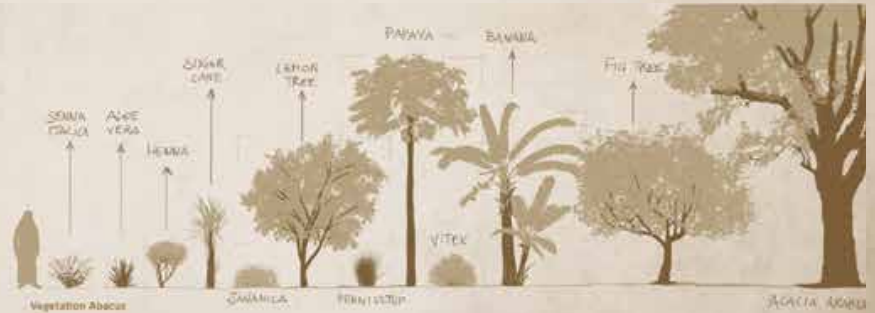
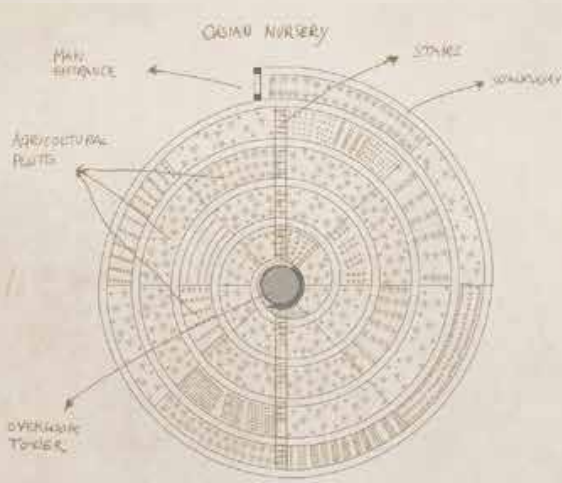
- Landscaps
- Living Area
 - Cemetery
 - Orchard
 - Village
 - Cultural Structures
 - Field Area and Orchard
 - Field Estate
 - Field Estate





PROPORTION & FUNCTIONAL LAYOUT





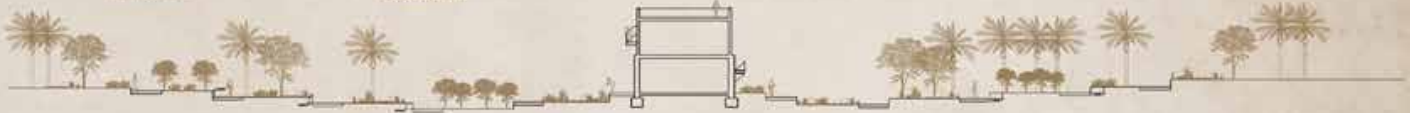
References - Materials



Walkway Stabilized Earth



Walkway Alternative Wooden boards



References



Minaret of Samarra
Samarra, Iraq



Labyrinth of Villa Pisani
Vicenza, Italy





COUNTRY	THEME	EXAMPLE	SOLUTION
UAE	Project to develop	Qattara Oasis	Creation of Oasiscape Project



High Level Concept Design: Qattara Oasis project in Al Ain

AIMS OF THE PROJECT

The aim of the project is the communication, interpretation and the opening to visitors of the Qattara oasis, part of the site of the Al Ain WHL. The oasis is interpreted in the context of a unifying vision of the different components for UNESCO enrollment within which it has a specific connotation offering an original experience to visitors.

GENERAL MASTERPLAN

The project organizes a route along an East-South-West axis, which from the ancient souk against the flow of water channeled into the falaj, reaches the South West exit, where the Oculus is located. This is the point of arrival of the water where the underground tunnel becomes superficial channeled by the scarf. The Oculus enables to visit the underground canal where there is a narrative display.

The route is organized by the linear architecture of a new Souk that creates a shaded, multifunctional space, with openings and points of view that guides the visitor, combining the various places of interest on which new attractions are being introduced. From the main route two itineraries run through the main archaeological and monumental interesting remains. The interventions envisage: the recovery and enhancement of existing structures, landscaping, new reversible and modular structures, tourism services and illustrative exhibitions.

MAIN ATTRACTIONS

Multifunctional Souk, reconnects the ancient Souk with the context structuring a sheltered itinerary leading to the Souk plaza and to the oasis entrance; Visitor Souk Route with studied view points on archaeology, monuments, landscape and with interpretative halting points in the oasis; Souk Plaza structuring the access to Qattara Art Center, Bin Hati Fort orientation Center reconnecting these buildings with the Souk Route; Open theatre; The Bin Hati Fort orientation Center; Oculus: the first fullimmersion experience in an underground Falaj.





DATA ON UNITED ARAB EMIRATES



Region :	Middle East
Capital :	Abu Dhabi
Total Surface:	83,600 km ²
Population :	9,400,000
Child mortality rate :	
Fertility rate :	
Population growth rate :	1.53%
Life expectancy ♀-♂:	
Average temperature (min/max):	0/45 °C



- Landscape
- Street/Kulubing
 - Greening
 - Open field
 - Wetland
 - Cultural landscape
 - Special landscape
 - Other landscape
 - Other landscape
 - Other landscape
 - Other landscape

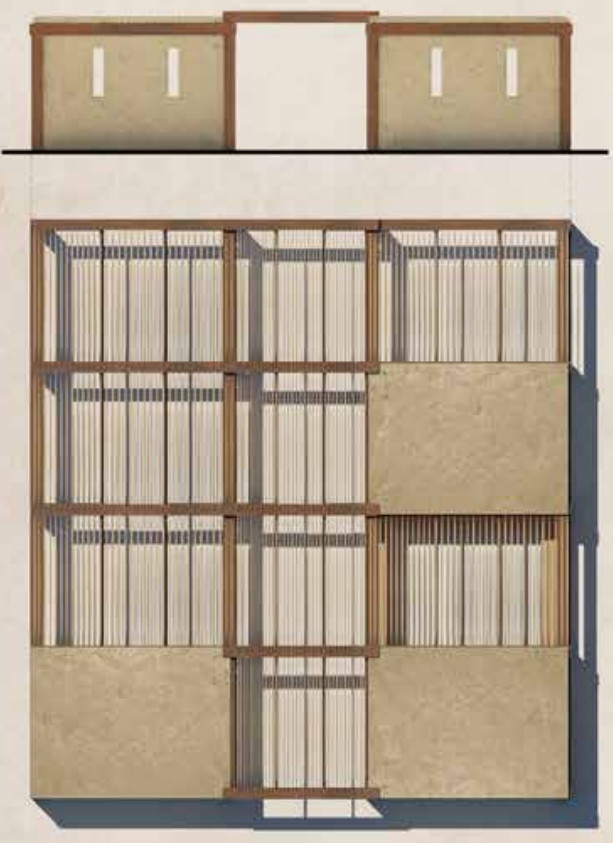




References - Materials



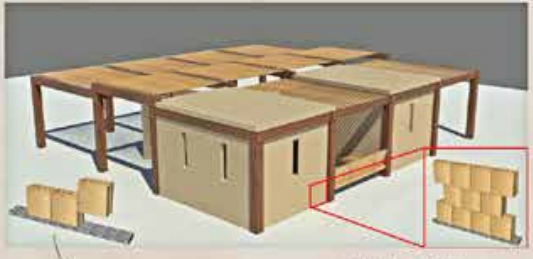
Entrance Elevation



References - Materials



OPEN	Possibility of views	
CLOSE	Retails & Services	
BENCH	Resting places	
MIX	Assembling	

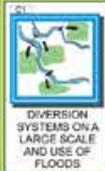
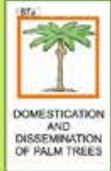


- EXCELLENT ISOLATION
- EASY ASSEMBLY
- SUSTAINABLE MATERIAL
- REVERSIBLE MATERIAL

- GOOD ISOLATION
- FAST ASSEMBLY
- SUSTAINABLE MATERIAL
- REVERSIBLE MATERIAL



COUNTRY	THEME	EXAMPLE	SOLUTION
Saudia Arabia	Tentative List UNESCO	Al-Ahsa Oasis	Unique Cultural Landscape



Nomination for UNESCO World Heritage List: Inscription of Al-Ahsa Oasis

CONCEPT: A SCIENTIFIC CHALLENGE

The challenge of this nomination lies in the fact that the attributes “proving” the Outstanding Universal Value of the property are not immediately evident to the general public or to the specialists. Not only because al-Ahsa oasis is today a large urban site that contains only traces of its historic past, but also because the very concept of the nomination, the “evolving oasis landscape”, is an innovative approach for UNESCO and the international scientific community. It is therefore essential that the “model” of the great oasis of al-Ahsa is not only clearly presented in the Nomination but is also supported by accessible sites materializing these very attributes.

AL-AHSA SUSTAINABLE DEVELOPMENT: A PRELIMINARY LIST OF ACTIONS

We consider that in order for this nomination to have the best chances of success, the Saudi Arabian Authorities should launch a series of actions for the management of the property. Only if these steps are taken, there will be good chances to convince UNESCO and ICOMOS that the development of the oasis of al-Ahsa will be sustainable, and that the site deserves being included in the UNESCO World Heritage List.

CONCLUSION: SUBMISSION STRATEGY

The design and implementation of a serious strategy for al-Ahsa Oasis requalification and sustainable development is inevitably a long process. To act as an “incentive” awarding the efforts being paid, we believe that the submission of the Nomination of al-Ahsa oasis should not wait until everything is set, but should take place while the process is developing. We consider that it should not take place before such efforts have been agreed, planned, and funded by the different national authorities concerned.





DATA ON SAUDIA ARABIA



Region :	Middle East
Capital :	Riyadh
Total Surface:	2,149,690 km ²
Population :	33,000,000
Child mortality rate :	
Fertility rate :	
Population growth rate :	3%
Life expectancy ♀-♂:	
Average temperature (min/max):	0/54 °C

MANHATTAN NY, USA



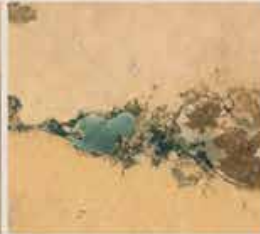
AL HASA OASIS, SAU



AL AIN OASIS, UAE

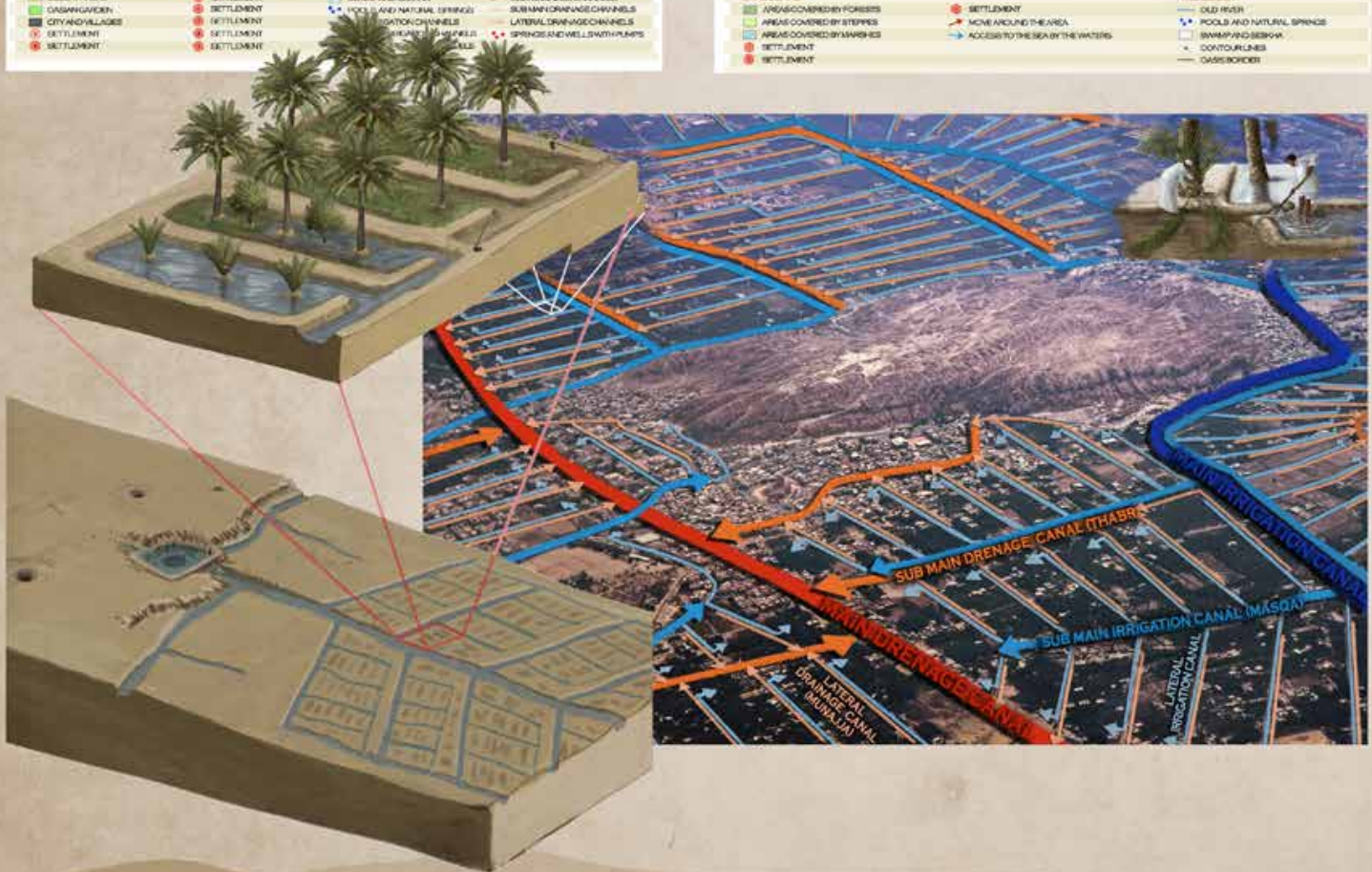


SIWA OASIS, EGY



FIGUIG OASIS, MAR









COUNTRY	THEME	EXAMPLE	SOLUTION
UAE	Project to develop	Al Ain Oasis	Creation of an EcoMuseum



Historic Environment World Heritage Cultural Sites Of Al Ain: Oasiscape project in Al Ain

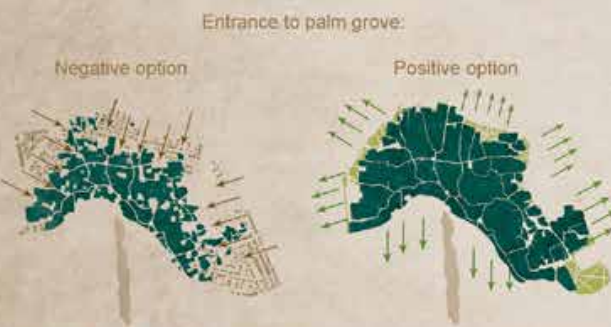
OASISCAPE

The oases of the World Heritage Site of Al Ain, in the Arabian Desert in Abu Dhabi, are among the world's oldest continuously inhabited oases for over 8000 years, including spectacular archaeological remains from over 5,000 years ago and still has wonderfully lush palm groves.

The Oasiscape project shows what an oasis is and why it is important to know it today, for the benefit of the planet and all mankind.

Al Ain today is a large modern desert city based on a rational plan, which during its development incorporated both archaeological sites and palm groves. The archaeological sites of Al Ain for their outstanding values have been recognized from the UNESCO as World Heritage. The World Heritage Site property as inscribed consists of 17 components within and around the modern city of Al Ain. Each of these components has an extraordinary cultural, environmental and monumental value with various historical and cultural types, periods, geographic and physical characteristics all interrelated and forming four assemblages: Jabel Hafit, Bidha Bint Saud, Hili, The Oases.

From the 1970s many of the settlements around the oases were abandoned. However, due to Sheikh Zayed's care and foresight, the palm groves of Al Ain were protected. Today, they are dense irrigated date palm gardens surrounded by bustling modern city streets. They are very well preserved having retained the same extent and character as they had acquired by the 1970s.





DATA ON UNITED ARAB EMIRATES



Region :	Middle East
Capital :	Abu Dhabi
Total Surface:	83,600 km ²
Population :	9,400,000
Child mortality rate :	
Fertility rate :	
Population growth rate :	1.53%
Life expectancy ♀-♂:	
Average temperature (min/max):	0/45 °C





ECO CENTER

The architectural honeycomb style reminds us of bees' eyes and the Arish matting used by Gulf peoples on traditional boats. Its fully eco-friendly aluminium structure is easy to assemble, and the double skin and ventilation system make it suitable for the local climate. A combination of tradition and innovative technology helps to blend its organic form into the landscape; its advanced architecture seems to come from the future but we can see the distant past in its inspiration. Visitors find a fully immersive and curated experience inside the Eco Centre, with multimedia installations telling us all about the oasis, and educational games explaining its creation. The Eco Centre is a place of knowledge, where we can learn both the history of oases and what they mean for the future. Its message could help save our entire planet.





COUNTRY	THEME	EXAMPLE	SOLUTION
Italy	Casafaidate	Sustainable Building	House for water and energy recycling



Close the Circle: CASAFDAIDATE

THE HOUSE FOR WATER AND ENERGY RECYCLING

The proposed home is organized with devices to reduce water consumption, so that it can save up to 50% of average consumption until it reaches full autonomy through capture and recycling; passive and active energy saving systems; recycling systems up to full autonomy in waste management to achieve a zero waste model. The home is accompanied by a user guide and guides manual, in order to guide you in choosing the most suitable devices for your specific needs. The devices are both integrated in the architectural structure, which can be proposed for new buildings and can be installed in new homes with low-cost DIY or through qualified operators. They work as a prototype for all reconstruction work that will be characterized by:

- Homes with autonomy, energy independence and zero emissions to help solve problems such as water, energy and waste collection and disposal.
- Creating job opportunities through technological innovation and local production.
- Promotion of local businesses through certification and visibility on the ITKI-UNESCO portal.

The proposal is geared to a strategy that, taking into account the immediate needs of affected populations, does not give up actions based on sustainability and the recovery of identity patrimony. The choice is to provide people with immediate housing without compromising recovery and return to the original places that remain the ultimate goal. These homes are already organized according to the principles of saving water, energy and recycling. They can be assembled with simple assembly, also made possible by 3D printers, recycled materials, reversible and easy to assemble, dismantle and reuse, and are suitable for emergency and temporary situations. They are part of an overall strategy geared towards reconstruction not only of artifacts but of the participation system, sustainable restoration and ecological reconversion.

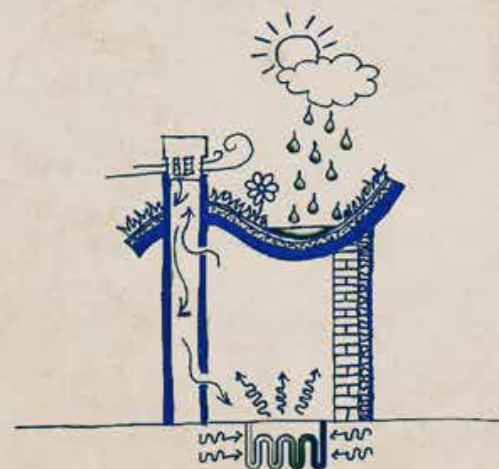
APPROVIGIONAMENTO E RISPARMIO DI ACQUA

BASATO SU SISTEMI SCALARI CHE SI INTEGRANO L'UNO CON L'ALTRO (LOOP)

Loop 1 - SCALA TERRITORIO: vasche-piscine-giardini-orti

Loop 2 - SCALA ABITAZIONE: copertura-cisterna-distribuzione interna

Loop 3 - SCALA INTERNI: doccia-lavandino-wc



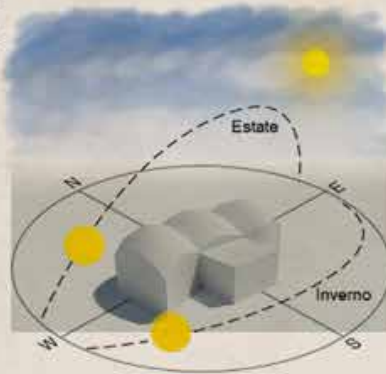
DATA ON ITALY

Europe

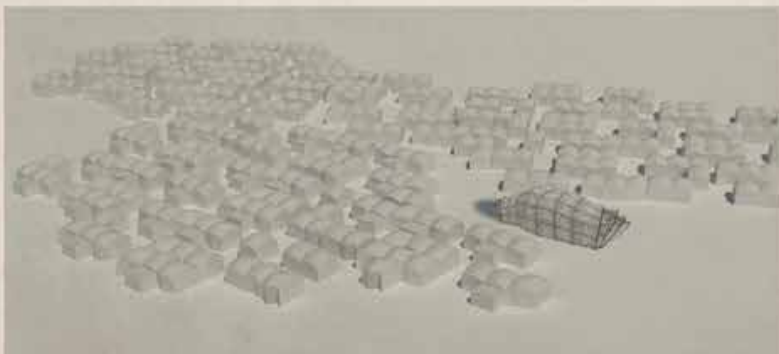
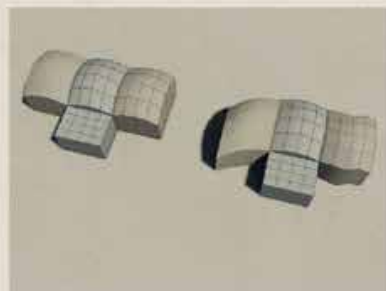
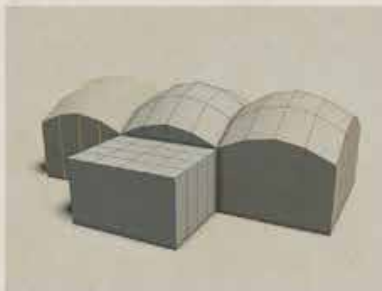
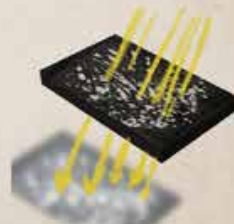


Region :	Europe
Capital :	Rome
Total Surface:	301,318 km ²
Population :	57,343,000
Child mortality rate :	7/1000
Fertility rate :	1.2
Population growth rate :	0.0%
Life expectancy ♀-♂:	81-75
Average temperature (min/max) :	-1.9/28.9 °C

Struttura portante è in alluminio riciclato.
La forma a cupola distribuisce meglio i carichi, comportando un sottodimensionamento delle travi. Gli elementi sono componibili e distribuibili in modo da ottimizzare l'esposizione solare.















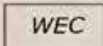



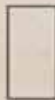



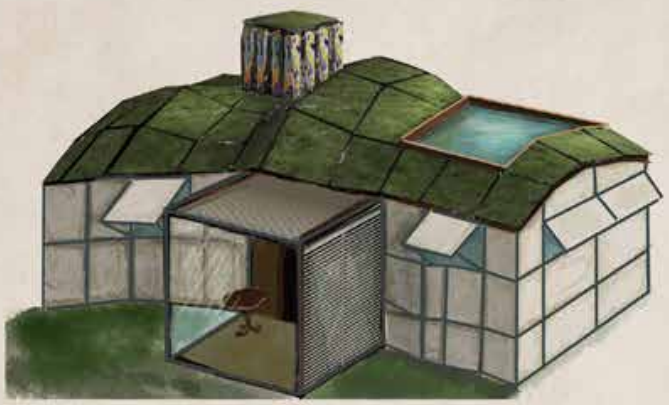
Pannelli personalizzabili per i tamponamenti esterni verticali e della copertura.





Modular Dry Toilet System - DTS

	Already realized for UNESCO		To be designed with "Reinventing the toilet challenge (Round 2)"	To be designed
	Type A	Type B	Type C	Type D
1 - Cabin				
<i>Suggested in</i>	Rural context	Parks and protect areas	Urban context	Motorhome, boat, train, airplane
<i>Water</i>	Waterless	Waterless	Waterless	Waterless
<i>Grid (energy and water)</i>	No grid	No grid	No grid	No grid
<i>Storage</i>	On site	No storage	No storage	No storage
<i>Processing</i>	Natural on site	Out of site	Direct transformation	Direct transformation
<i>Energy and fertilizer production</i>	Yes	Yes	Worth Energy Capsules (WEC)	Worth Energy Capsules (WEC)
<i>Technology</i>	Low	Low	Low, mechanical	Medium
<i>Cost</i>	Low	Low	Low	Medium/High
2 - Toilet				
3 - Solid container				
4 - Cleaning and sterilizing system				
5 - Dispenser				





COUNTRY	THEME	EXAMPLE	SOLUTION
Algeria	Irrigation	Algerian Oases	Foggaras



AATO Laguna di Venezia

Projet O.A.S.I. , Ksar Amguid, Adrar :

Using the Foggara System to Irrigate Algerian Oases

Algeria's Saharan oases illustrate marvelously how humans have managed to survive under hostile conditions. Down through the centuries an effective and sustainable irrigation system has been put in place that enables the inhabitants of the oases to live under the conditions of extreme aridity by respecting the special properties of these unstable ecosystems. Over the last few years, however, the Saharan oases have seen substantial demographic growth and increasingly intense agricultural production.

The inhabitants of the oases have tended to forget the traditional knowledge of this particularly fragile environment, principally as it concerns water resources. Modern methods of pumping groundwater, in particular, dry up the water table in an irreversible manner. This is why the restoration of the *foggaras*, traditional irrigation systems, is foreseen for the oasis of Touat, in southeastern Algeria.

The Saharan Oases

Most of the southern Algeria's Saharan oases are marginal spaces. The climate is extremely arid, as there is no more than 50mm of rainfall annually.

Over the last few years, marked demographic growth has been accompanied by an intensification of agriculture, and the oases have been broadly affected by degradation of their water resources. The level and the rate of flow are diminishing from one day to the next. Most of these ruinous phenomena are the consequences of ill-conceived human practices that endanger the biodiversity of the Saharan regions.



Causes and Effects of Misguided Modernization

The intensification of irrigated farming in a fragile environment contributes to the improper use of natural resources. Cultivating increasingly large plots, the inhabitants of the oases have dug deep wells, introduced industrial products (such as chemical fertilizers) and, little by little, abandoned traditional knowledge.

In concrete terms, immense agricultural surfaces have been created for the production of cereals for export. These surfaces necessitate sprinkler systems, which are hardly suitable to the desert environment, as the degree of evaporation is very high. The level of the water table dangerously diminishes because of the direct pumping of water from great depth and in great quantity. The phenomena linked to modern, intensive use of water resources, the climatic extremes and the abandonment of traditional practices have upset the ecosystem's complex and fragile balance. The water crisis is causing residents to leave the region; many oases have suffered desertification and invasion by sands; and ancient techniques used to catch water in catchment tunnels (*foggaras*) have been given up. The digging of modern wells to meet water needs has shrunk the water table.



Kesrias make it possible to distribute water in the oasis.





Africa	Algeria	Oasis of Touat	Africa																	
DATA ON ALGERIA																				
<table border="1"> <tr> <td>Region :</td> <td style="text-align: right;">Africa</td> </tr> <tr> <td>Capital :</td> <td style="text-align: right;">Algiers</td> </tr> <tr> <td>Total Surface:</td> <td style="text-align: right;">2,381,741 km²</td> </tr> <tr> <td>Population :</td> <td style="text-align: right;">33,354,000</td> </tr> <tr> <td>Child mortality rate :</td> <td style="text-align: right;">37 /1000</td> </tr> <tr> <td>Fertility rate :</td> <td style="text-align: right;">2.5</td> </tr> <tr> <td>Population growth rate :</td> <td style="text-align: right;">1.5 %</td> </tr> <tr> <td>Life expectancy ♀-♂:</td> <td style="text-align: right;">72 – 70 years</td> </tr> <tr> <td>Average temperature (min/max) :</td> <td style="text-align: right;">11/23 °C</td> </tr> </table>				Region :	Africa	Capital :	Algiers	Total Surface:	2,381,741 km²	Population :	33,354,000	Child mortality rate :	37 /1000	Fertility rate :	2.5	Population growth rate :	1.5 %	Life expectancy ♀-♂:	72 – 70 years	Average temperature (min/max) :
Region :	Africa																			
Capital :	Algiers																			
Total Surface:	2,381,741 km²																			
Population :	33,354,000																			
Child mortality rate :	37 /1000																			
Fertility rate :	2.5																			
Population growth rate :	1.5 %																			
Life expectancy ♀-♂:	72 – 70 years																			
Average temperature (min/max) :	11/23 °C																			



Possible Solutions

The Adrar region of the Algerian desert (Willaya de Adrar) possesses numerous oases in a natural context that is unique in all the Sahara for its beauty and its excellent state of conservation. In this area, the presence of hundreds of thousands of palms, multiple systems of oases and ksurs (the traditional habitat), raw-earth villages and fortresses, make it possible to maintain a high degree of agricultural and cultural vitality.

The project, O.A.S.I., *Ottenimento di Acqua nel Sahara Interno attraverso il restauro delle tecniche tradizionali delle gallerie drenanti e la valorizzazione delle conoscenze degli antichi maestri locali* (Harvesting Water in the Inner Sahara by reinstating the traditional techniques of catchment tunnels and assessing the knowledge of local craftsmen) has been undertaken by Ipogea, with funds allocated by *AATO-Laguna di Venezia* to the “Fondo ABC” call to tender and in partnership with the Algerian Company *Sud Timmi* and the association for the protection of oases.

The project calls for the provision of water to an area subject to desertification via the restoration of a foggara, or catchment tunnel. The operation has been carried out with the participation of the farmers’ associations and their traditional Saharan water masters and is permitting local populations to return to the cultivation of palm trees and gardens and to reorganize a desert oasis that is now completely abandoned. The project shows how to assure the sustainable provision and use of water in the Sahara by bringing together the knowledge and traditions of local populations. The project a high-impact action in the Sahara and is replicable in other arid and semi-arid regions.

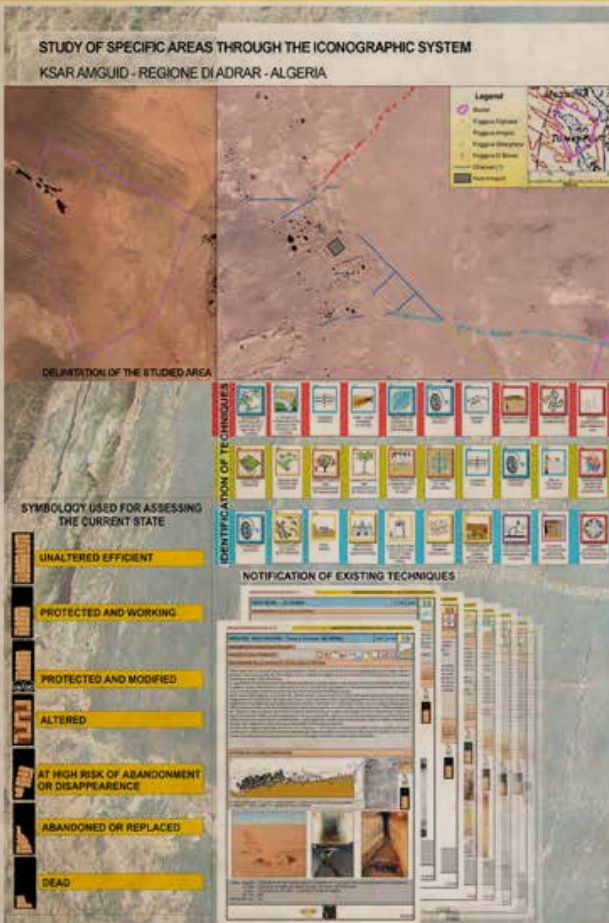
Activities are:

- identifying situations that are critical in terms of water shortage and ecosystem degradation;
- organizing a participatory approach through existing partnerships and the promotion of the participation of the local community and local associations.
- analyzing traditional knowledge and techniques and developing innovative, sustainable and locally manageable procedures;
- training local actors with the aid of traditional craft associations;
- putting in place a pilot project for the restoration of catchment tunnels and traditional water-management systems;
- making innovative use of traditional techniques to solve the problems connected with waste waters and the management of water in cultivations and the rural habitat;
- documenting and publicizing experiences and reinforcing practices thanks to the participation of concerned local action groups (in projects termed “South to South”).



Foggara.

Using the Foggara System to Irrigate Algerian Oases



Foggaras catch water from the aquifer and bring it to the oasis, where it is shared out in accordance with a complex water-rights system. Oasis near Adrar.



Restoration Work



Restoration of foggaras. Photos by Benhassane Abdelkrim (Project manager, Sud Timmi)



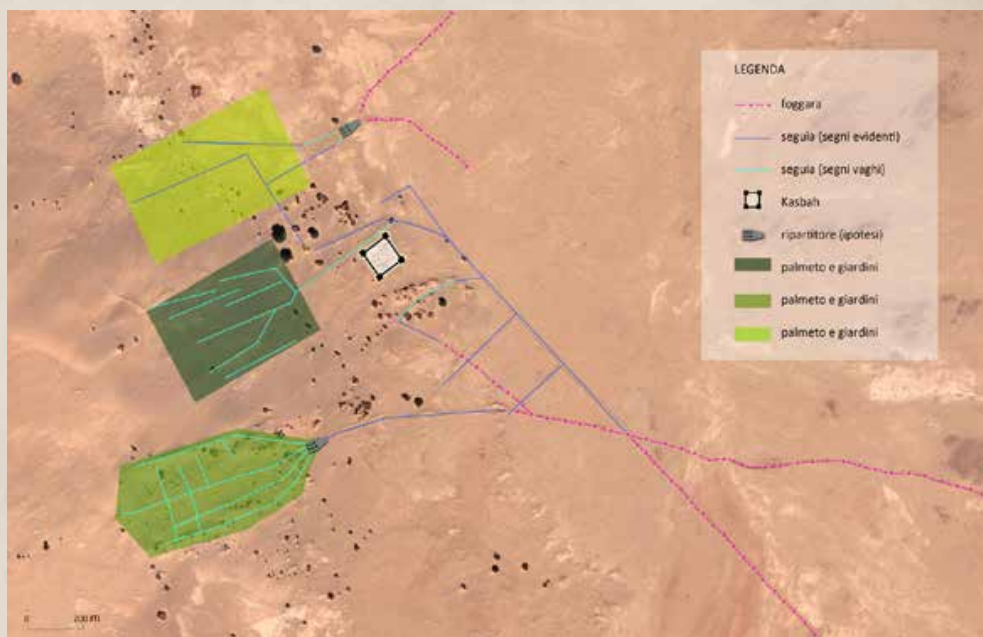
Foggara, kasbah, palm grove.

Conclusion

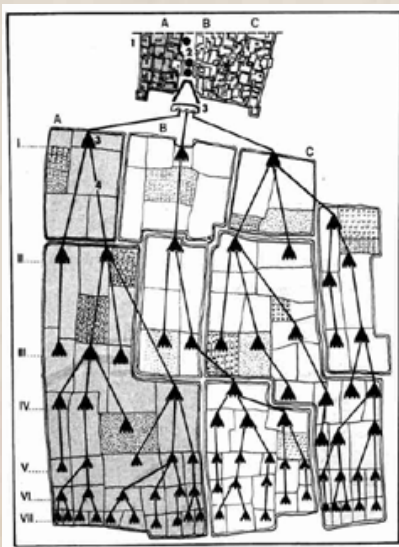
A barren and neglected desert area is producing a palm grove and cultivated fields. The experience of oasis inhabitants has shaped a sustainable, self-created model that can be proposed to the whole planet as an example for the management of ecosystems and the harmonious and non-destructive use of resources.



Deterioration due to desertification.



Satellite detection of abandoned traditional water systems and paleo gardens.



Organization of gardens and water distribution in an oasis.



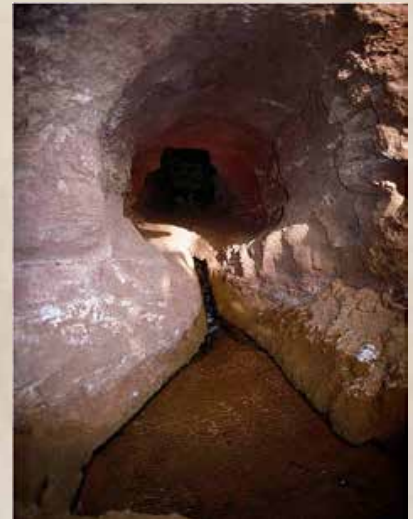
The Beni Issguen carpet with a representation of a water-sharing system.



The hair of an adult woman is divided into braids, signifying that she is fertile like the farmland over which water flows in irrigation canals.



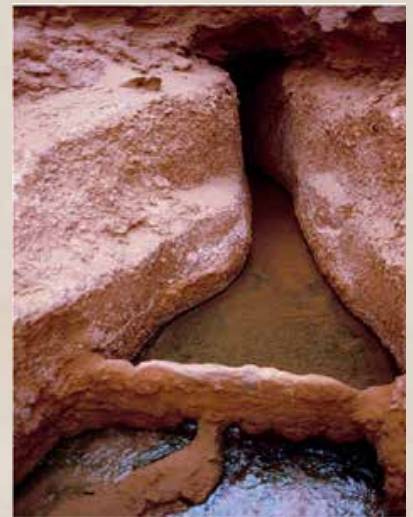
On-site identification of ancient water catchment structures.



Water issuing from a catchment tunnel.



Inside a catchment tunnel.



Water flows abundantly from a catchment tunnel.



A complex water sharing system.



A kesria water sharing system.





Rendering of the organization of gardens and water distribution in an oasis (plan, surface channels, water sharing).



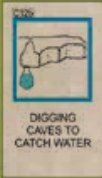
Oasis gardens are typically planted on three levels: shade trees (here, palms), fruit trees (like the fig in the foreground), and grain or vegetables.



Reconstruction of three-level gardens.



COUNTRY	THEME	EXAMPLE	SOLUTION
Italy	Water collection	The Sassi of Matera	Rehabilitation of traditional systems



A judicious system of water collection: The restoration of ancestral techniques in the Sassi of Matera



Matera. A town carved entirely from limestone. Sassi means "stones" in Italian.



Matera, the Ofra valley.


Matera is a town famous for its traditional urban system. Located in the heart of the Basilicate in southern Italy, it owes its celebrity to its exceptional historical center called the 'Sassi'. The Sassi, meaning literally 'stones', make up a town carved out entirely from limestone. The traditional dwellings are formed from the actual sloping wall of a deep ravine. The techniques used to hollow out the limestone plateau and to collect water, employed up until contemporary times, appeared in the Neolithic era. The ingenious arrangement of 'stones' helped create natural ventilation systems and collect water from humidity. The evolution of archaic structures for the collection of water in towns is responsible for the Sassi of Matera as they appear today.

The Sassi of Matera

Over the centuries, the low water levels in rivers and groundwater reserves, alternating with violent and intense rain, has rendered the practice of conservation of underground sources of water and water collection indispensable. The case of Sassi of Matera is a perfect example of how the regional natural topography favours this type of dwelling. The town is constructed on the edges of profound ravines, the Gravine. The inhabited areas are not situated at the foot of the canyon as might be expected, but on their steep flanks and at its summit. In fact, water coming from rain and frost is collected by the drainage system and in caves, unlike water used for drinking and cooking, which comes from river sources.





Europe			Italy		Matera			
						DATA ON ITALY		Europe
						Region :	Europe	
Capital :	Rome							
Total Surface:	301,318 km ²							
Population :	57,343,000							
Child mortality rate :	7/1000							
Fertility rate :	1.2							
Population growth rate :	0.0%							
Life expectancy ♀-♂ :	81-75							
Average temperature (min/max) :	-1.9 / 28.9 °C							

To maximize the use of rainwater, dwellings are constructed around a courtyard. Here, a large tank for the community is dug out that collects water from the roofs, the edges of which never go beyond the walls of the houses. Because then roof is part of the stone work, not a single drop of water is lost. It is channeled directly to the tank by means of descending terracotta conduits. Galleries radiating from these central wells maintain a constant temperature throughout the year and constitute an ideal refuge for people and livestock as well as serving as perfect storage places for wheat and water. Another type of dwelling and method of collecting water is formed from simple piles of stones or created by vaults carved from the rock. These structures form tumulus, and fulfill their function during the day as well as at night. During the day, the high-humidity winds percolate into the spaces between the numerous stones. The inner wall, not exposed to the sun, remains cooler than the outside. The drop in temperature brings about condensation of the droplets that fall into a cavity. The water accumulates, providing humidity and a cooler environment, which enhances the effectiveness of condensation. At night, the process is reversed, the exterior is cooler than the interior and condensation occurs, producing similar results. The humidity condenses and produces frost on the exterior of the dwellings. The following day the frost melts and filters down between the spaces into the cavity.

The system of dwellings in the Sassi of Matera has been constructed with prehistoric techniques combining various principles for the collection of water—its capture, percolation and condensation—and is thus adapted to its surroundings. During violent rains, the terraces and the system of water collection protect the slopes from erosion. During the dry season, the hollowed-out cavities work like an “inhaler” of atmospheric humidity.



The Sassi of Matera.



Illustration of the vertical structure.



The restoration of ancestral techniques in Sassi of Matera

Europe



Causes and Effects of Abusive Modernisation

During the 1950s the Sassi of Matera was closed due to their neglected condition, and the 20,000 inhabitants were moved to other neighbourhoods. The abandoned houses became the property of the state and a wall was erected to prevent them from being occupied.

The Sassi of Matera was transformed into a ghost town, the greatest historical troglodytic centre in the whole of Europe was completely abandoned.



Possible Solutions

In 1986, largely thanks to the motivation of individuals involved in cultural activities, the Italian Government allocated 100 billion lire to restore the Sassi and to undertake the work necessary to improve its sanitary conditions and urbanization, and to encourage private individuals to take up residence there. All the state properties were entrusted to the Mayor of Matera, responsible for financing the project.

The turning point in the management of the Sassi came about with their inscription in 1993 as a UNESCO World Heritage Site. The Sassi's UNESCO registration and the successful rescue of the area are largely due to the efforts of Ipogea, which was founded under the auspices of UNESCO and ICCROM to monitor their restoration and to establish in the Sassi an enterprise specializing in stone architecture and traditional techniques. Ipogea, in fact, means "underground" or "within the earth." The strategy that helped Matera win a place on the World Heritage List, and that made the experiment in restoration a success, was to interpret the Sassi, according to the oasis model, as an ecological city that can provide guidance in the ongoing search for urban systems based on resource conservation and social and community life. Today about 5,000 people have returned to the Sassi to live, and the site has achieved world renown, becoming an increasingly popular destination for domestic and international tourism. The restoration of the Sassi was made possible thanks to the recovery and revitalization of self-driving and self-regenerating forces through the use of traditional and local knowledge and the training of technicians and establishment of small businesses capable of managing the rehabilitation strategy without outside help.



The Restoration of Traditional Systems of Water Collection

The Sassi of Matera illustrate the natural resource management capabilities (water, sun and energy) that were once perfectly employed but are so often neglected today.

The international debate on urban development makes this problem current and relevant. It is necessary to maximize the potential of a town at a local level to assure its harmonious and sustainable development. It is for this reason that the Ministry of the Environment chose Matera as an urban rehabilitation model within the framework of the Rio Conference and the United Nations Convention to Combat Desertification (UNCCD), in its directives and action plans.



The hypogea.

Conclusion

The objective of the international campaign to restore the Sassi of Matera was to revive innovative traditional methods:

- the restoration of tanks for the use of rainwater;
- the use of terraces supported by walls to prevent landslides and land degradation;
- the rehabilitation of hanging gardens to provide green urban spaces;
- the reutilization of caves and cavities for natural ventilation.

These measures do not imply that modern techniques should be ignored, but that these traditional techniques can also present sustainable solutions for the future.





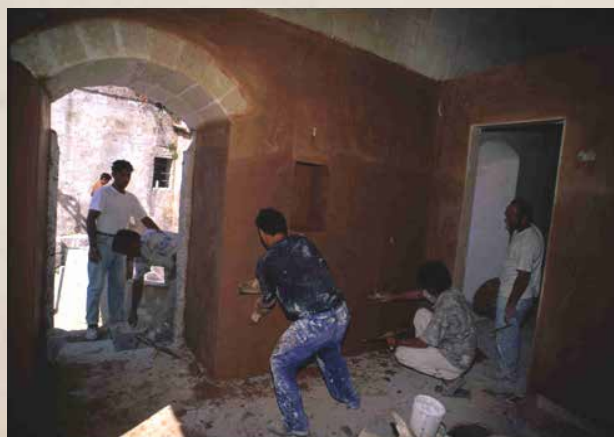
Training and restoration of cisterns.



Training and restoration of the terraced slopes.



*Restoration of the Laureano home (before and after work).
The recovery as an example of the creation of a sustainable city capable of mitigating the effects of climate change.*



Restoration of the Laureano home during work.



Restoration of the Laureano home (after work).



COUNTRY	THEME	EXAMPLE	SOLUTION
Ethiopia	Traditional Knowledge	Lalibela	Cleaning Drainage Systems and Terracing



WATER HARVESTING IN POOLS AND CISTERNS



TERRACING SYSTEMS



PLANT SPECIES TO COMBAT EROSION

Combating Desertification Through Traditional Knowledge: Two Pilot Projects in Lalibela

The Site of Lalibela

Lalibela is one of the most remarkable hypogean monuments in the world. It is universally celebrated for its highly decorated monolithic churches hewn out of basaltic rock. The most imposing monuments date from twelfth and thirteenth centuries, when King Lalibela, from whom the city takes its name, called for it to be hewn out of the rock in the image of a Celestial Jerusalem.

As it was hitherto unclear how such vast hypogean systems could be made in such a short period of time, religious tradition came to attribute the feat to divine intervention.

In the framework of a joint UNESCO, UNCCD and WMF project, Ipogea undertook a comparative study of rock-hewn building types and an analysis of water catchment and drainage systems, and reconstructed the long-term history of the city of Lalibela from the remote troglodyte past through the hypogean period to the Axumite and the medieval, in which most building consisted of reworking earlier structures.

Architect Pietro Laureano declared: "The monuments of Lalibela are just the visible part of a complex architectural and environmental system to which they are closely connected. The network of trenches and channels for conveying water, and the sunken courts where the churches of Lalibela are found, constitute a whole that, only if confronted in its totality, will enable one to respond to the factors that are causing its deterioration."



Lalibela. The Eastern Group.



Biet Giyorgis



Africa

Ethiopia

Lalibela



DATA ON ETHIOPIA

Africa

Region :	Africa
Capital :	Addis Ababa
Total Surface:	1,127,127 km ²
Population :	85,237,338
Child mortality rate :	90 / 1000
Fertility rate :	5
Population growth rate :	2.23 %
Life expectancy ♀-♂:	48 – 50 years
Average temperature (min/max) :	9/25 °C

Water drainage and harvesting systems

The erosion of these monuments has been contrasted using traditional methods, first of all by identifying and cleaning an ancient trench that had been abandoned and blocked by tons of debris. Restoration work therefore has not been limited to the twelfth- and thirteenth-century monuments on the UNESCO World Heritage List: the excavations aimed at restoring the old water system have also served to drain excess water and to turn it to irrigation. This water is collected in the trench and stored in an open cistern built in a spot where traces of old walls have been found. Here the present inhabitants of the village, which is intermixed with the ancient ruins, have returned to draw the water they need, as they had done centuries ago.



The Cleaning Work of the Trenches

This trench was cleaned by Ipogea under the UNESCO project because it was filled with debris and appeared to have no drainage capacity. Once the cleanup was completed, it became clear that the trench was inclined to the north, permitting the water to drain into the main waterway, called the River Joerdan. Today local people can fetch the water collected in the western trench.

The UNESCO project yielded significant results. These actions should be extended to all the drainage trenches and tunnels.

The monuments of Lalibela are in danger because the work of draining, channeling and otherwise protecting them from water, has ceased over time. The churches exist together with their overall ecosystem; if the latter is not protected, they run the risk of vanishing forever.

The restoration of ancient techniques for catching and holding water has revitalized the ancient site of Lalibela, Ethiopia, a UNESCO World Heritage property. The discovery and cleaning of a trench that had been abandoned for hundreds of years, and the retrieval of a large cistern, have brought villagers to draw water once again in the center of this remarkable African archeological site, thanks to a joint UNESCO, UNCCD and WMF project.



The western trench and cisterns with water after the cleaning works.



In the trench walls are openings in the walls made of large cavities in the shape of rock-face cisterns to increase water storage capacity; slots for wooden control bulkheads are clearly visible.



Combating desertification through traditional knowledge

Africa

The Rescue of Lalibela Primary School:

A restoration of the hillside using traditional knowledge to stem the erosion, secure the area and restore its environmental properties.



The hillside in front of the school, before the restoration work.



The Slope Degraded by Erosion

The geological and geomorphological survey conducted on the hillside in front of the Lalibela Primary School showed a general deterioration of areas exposed to the northeast and northwest. This phenomenon was due to a lack of regimentation of surface water and to a shallow sliding of land in areas having a western exposure. This in turn was due to erosion at the foot of the slope, which caused niches of detached soil to deepen.



The hillside in front of the school, after the restoration work.



The Terraces

To stem the erosion, secure the area and restore its environmental properties, the hillside has been restored using traditional terraces that break the gradient of the slope. These terraces have been replanted with original species typical of the region, such as junipers, pines and sycamores. The vegetation is now luxuriant.



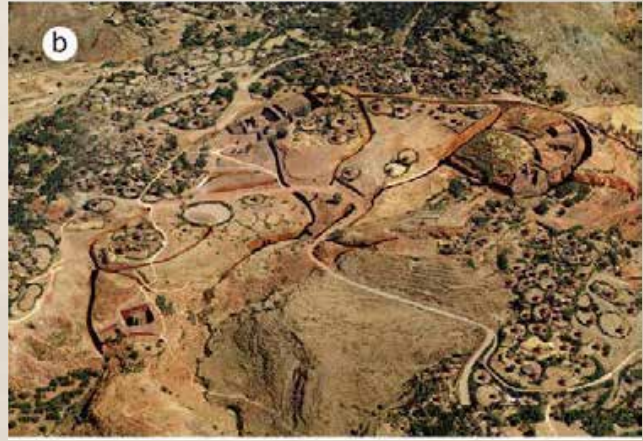
The terraces and the luxuriant vegetation.



Conclusion

The project has permitted the rescue of a school in the new part of the village, which was destined to slip because of the deforestation of the slopes on which it stands. The Ipogea team and local staff have introduced thousands of plants indigenous to the area, reinforcing the slope and effectively creating a small forest well suited to the extreme climate of the Ethiopian highlands.



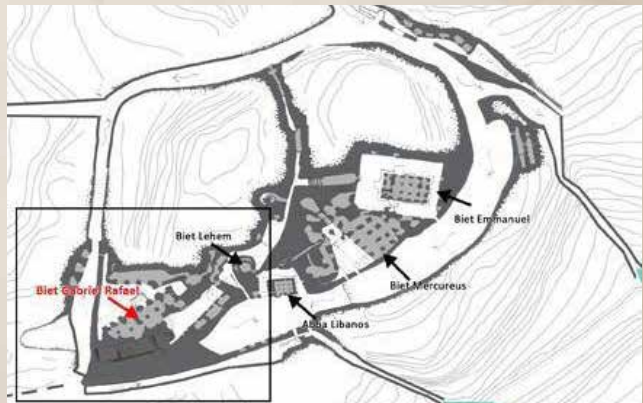


5. V Urban structure

UNESCO - World Monuments Fund
 CONSERVATION ACTION PLAN
 FOR THE ROCK HEWN CHURCHES IN LALIBELA
 Team Leader Pietro Laureano
 IPOGEA - June 2008



— STREET	MONUMENTAL SITE	ENTRANCE AREA	CARVED TRENCH
— STREAM	LALIBELA CHURCHES	BRIDGE	CARVED TRENCH - FULL/FILL
--- CRAMPTERY	WALL TRACE	CONNECTION	PARTIALLY CARVED TRENCH
--- MARKET PLACE	WALL	FALL	EXCAVATED SOIL TRENCH
● CAVE	DOOR	STAR	EXCAVATED SOIL TRENCH PARTIAL/FILL
● WATER POINT	STAIR	CROSS	SEMI-NATURAL TRENCH
● WATER TANK			UNDERGROUND TRENCH
			HYDROTHERMIC TUBES





An appeal form Morocco for the protection of oasis

The Kingdom of Morocco has made extensive studies of oases in the *Strategy for the Planning and Development of Oases in Morocco* hammered out by the Ministry of Territorial Planning, the Environment and Water as the implementing agency of the UNDP's *Programme Oasis Sud* (POS). In this context Ipogea has been entrusted with the dual task of producing a book to launch a global appeal and an alliance of Arab countries for the protection of oases, and of creating an ecomuseum in the Tafilalet Oasis (southwest Morocco).

The concept of the Ecomuseum is based on the presentation of *khettaras* (catchments tunnels) as a symbol of the appropriate use of resources and the relationship between cultural heritage and sustainable development. The Living Museum of Khettaras is a hands-on museum organized on a regional scale and experienced through an itinerary of travel and discovery. The visitor undertakes a journey of learning through various types of catchment tunnels, water-management systems and oases with the aid of screens presenting information and documentation, encounters with local people, art, folklore, music and traditions.

Spaces will be organized for leisure activities, hospitality and reception in certified family-managed structures and hotels. Local associations, the Jamâa, and artisans will be involved in the management and organization of the Museum.

The Ecomuseum, the visitors' itinerary, details of the visit and information regarding accommodation, directions and contact with communities and host families, complete with Google Earth geo-reference points, will be available for consultation on the Internet and, via wi-fi, throughout the on-site visitors' itinerary.



Site location.





ROYAUME DU MAROC

PROGRAMME DE DEVELOPPEMENT
TERRITORIAL DES OASIS DU TAFILALET

ROUTE DU MAJHOUL - ÉCOMUSÉE KHETTARAS

Étude réalisée par
IPOGEA
www.ipogea.org

Contexte

Les khettaras sont une œuvre exceptionnelle, historique, artistique et culturelle témoignant de l'ingéniosité de l'homme pour faire face à l'aridité climatique tout en respectant les ressources. Leur importance reste aujourd'hui encore d'actualité car elles permettent de garantir l'approvisionnement en eau dans des zones de plus en plus arides en assurant une utilisation appropriée de cette ressource précieuse. Une des plus grandes concentrations au monde de khettaras est celle de la région du Tafilalet, au Maroc. En vue de valoriser ces systèmes en cours de dégradation et de sensibiliser aussi bien grand public que spécialistes, le Programme de Développement Territorial Durable des Oases du Tafilalet (POT), mis en œuvre par la Direction de l'Aménagement du Territoire, le PNUD et d'autres partenaires, projettent la réalisation d'un Ecomusée des Khettaras au sein de la région du Tafilalet.

En savoir plus

Les khettaras sont des galeries drainantes permettant de capter et de produire de l'eau. Ces œuvres souterraines connues dans d'autres pays sous le nom de *qanat*, *foggara*, *kareez* et autres dénominations locales, suscitent un intérêt considérable notamment de la part des chercheurs, car elles permettent l'alimentation en eau potable et l'irrigation de zones arides et semi-arides souvent totalement dépourvus d'eaux superficielles.

Elles exploitent habilement les phénomènes complexes de capillarité, de filtrage, et de condensation et peuvent de ce fait constituer un exemple important pour répondre à l'urgence mondiale par rapport à l'eau.

Un exemple d'une approche durable de façonner et d'organiser un territoire survécu au fil du temps, malgré les profonds changements.

Un exemple extraordinaire montrant que la maîtrise des connaissances traditionnelles pourraient être utiles pour développer de nouvelles stratégies visant le progrès humain.



Un Musée Vivant organisé sur le territoire

Les étapes dans les 4 territoires touristiques de la province d'Errachidia: Errachidia, Goulmima, Erfoud, Rissani.



Le concept de l'Ecomusée repose sur la présentation des Khetarra comme un symbole d'une utilisation appropriée des ressources et du rapport entre le patrimoine culturel et le développement durable. Il se veut un projet territorial qui se distingue des autres projets architecturaux par:

- son caractère diffus. Un noyau central et des rayons d'activités enclenchant une dynamique territoriale et atteignant une multitude de composantes de l'écosystème oasisien tout en faisant partie intégrante de la cohérence globale de l'écomusée;

- son effet miroir valorisant les approches conceptuelles du POT en tant que vitrine des principales actions entreprises pour un développement durable et intégré. Cet effet se déclinera à travers le concept même de réalisation du projet mais également à travers les choix des modes de construction et des équipements du projet.

L'Ecomusée des Khetarra est un Musée Vivant organisé sur le territoire et vécu à travers l'itinéraire, la découverte et le voyage. Le visiteur accomplira un parcours de connaissance à travers les différents types de tunnels et de systèmes de drainage et des oasis avec l'aide d'écrans d'information et de documentation, de rencontre avec la population locale, l'art, le folklore, la musique et les traditions locales. Des espaces et des activités seront organisés pour la détente, l'hospitalité et l'accueil dans des structures familiales et hôtelières certifiées. Les collectivités locales, la Jamâa, les associations, les artisans, seront impliqués dans la gestion et l'organisation du musée. L'Ecomusée, l'itinéraire, les détails de la visite et l'information touristique sur l'hébergement, les orientations et les contacts avec les communautés et leurs familles d'accueil seront consultables sur internet avec géoréférences sur google earth, et pendant tout le trajet avec liaison sans fil.

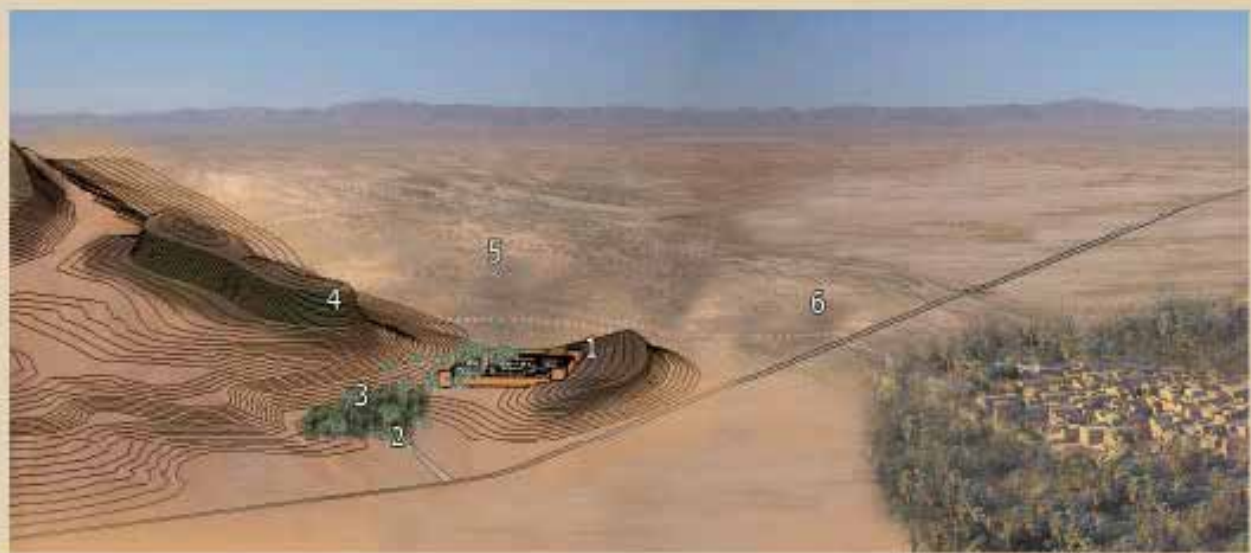
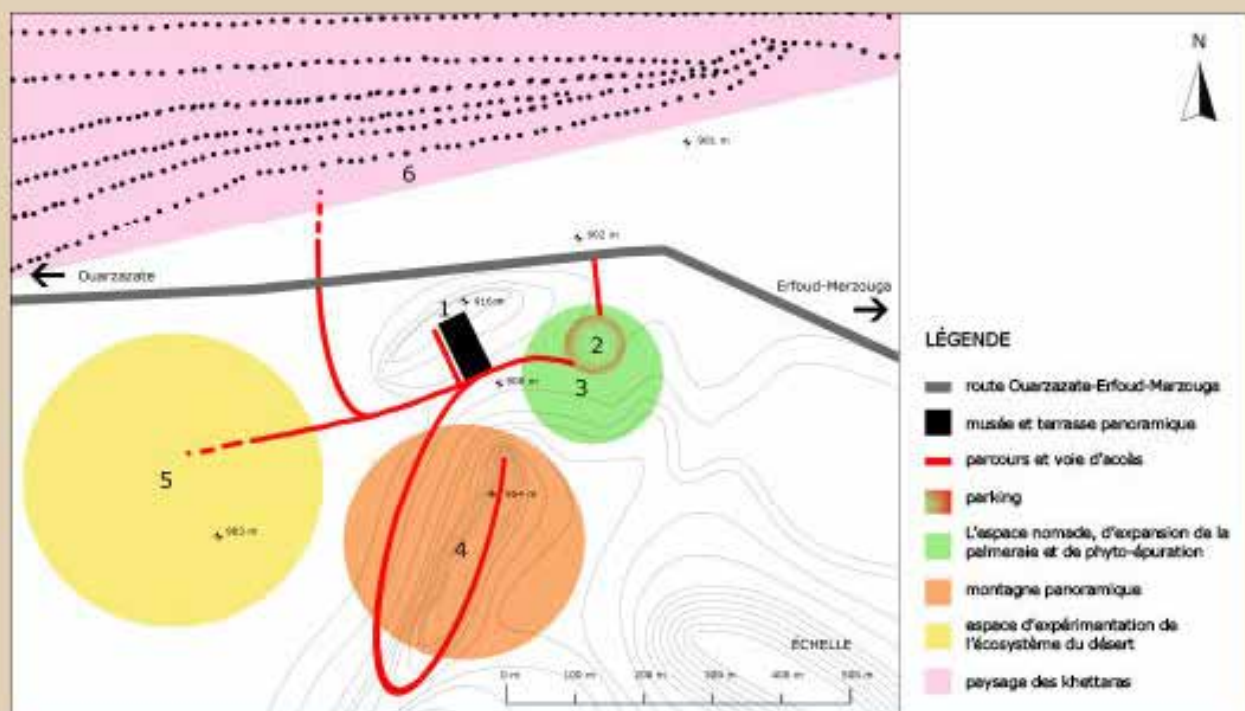


Le noyau de l'écomusée

Le pôle muséal est localisé à Fezna, au croisement des différents espaces paysagers qui permettent d'appréhender et de faire l'expérience de l'écologie du désert. Au sud-ouest du musée s'étend l'aire du désert qui permet de découvrir les phénomènes environnementaux qui le caractérisent: la formation des dunes, la salinisation, la captation de l'eau. A l'est, entre le musée et le parking, on trouve une aire destinée à la palmeraie grâce à l'utilisation de l'eau provenant du bâtiment du musée. Cette zone hébergera un espace nomade, qui consentira l'implantation de tentes et de toitures, ainsi que les systèmes de recyclage et d'écoulement des eaux usées sur des terrassements. Au sud, se trouve l'espace de la montagne, un relief qui atteint 950 mètres et qui offre une vision complète de l'écomusée qui l'entoure.

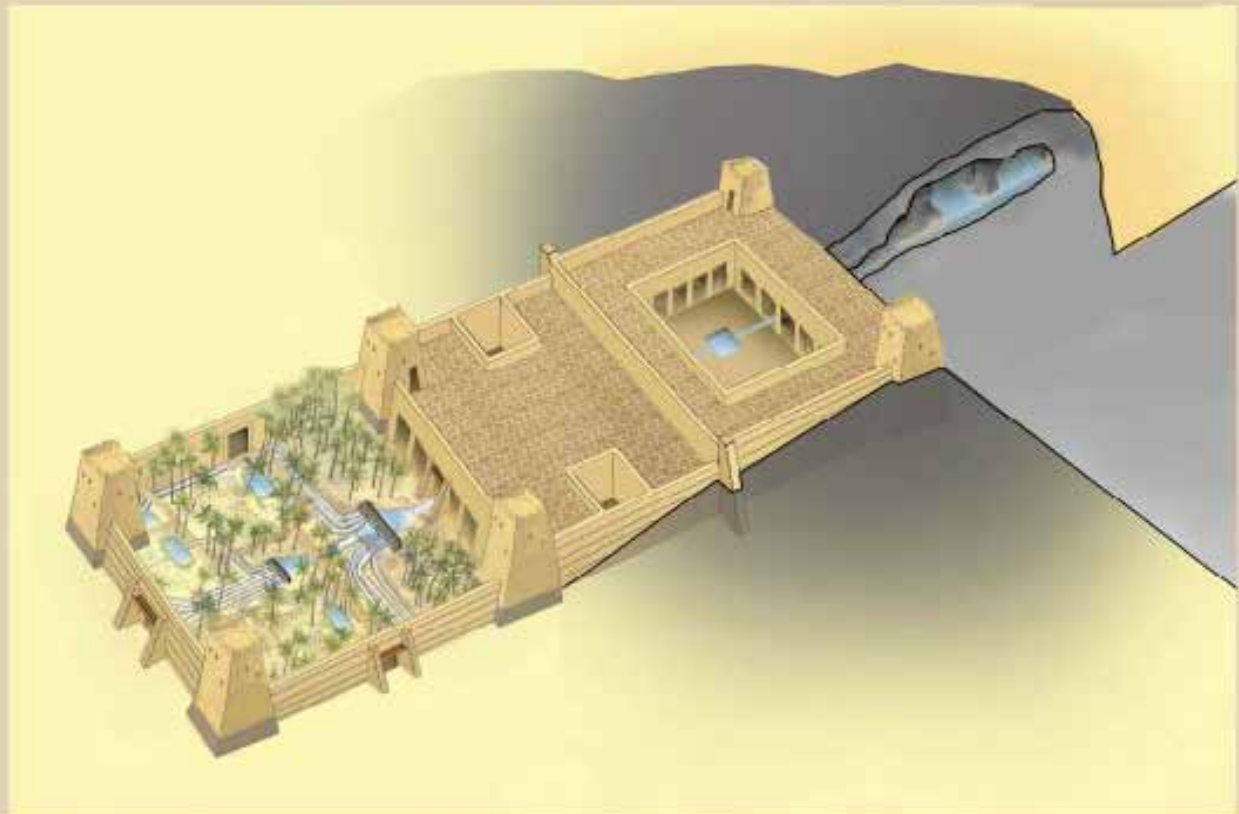
L'espace du musée comprend:

- 1) Le musée et la terrasse panoramique;
- 2) Le parking;
- 3) L'espace nomade, d'expansion de la palmeraie et de phyto-épuration;
- 4) La montagne panoramique donnant sur l'écomusée, le désert et les khetaras;
- 5) L'espace d'expérimentation de l'écosystème du désert;
- 6) Le paysage des khetaras.





Plan architectural et programme muséographique du noyau de l'écomusée



La planimétrie du musée rappelle le style de l'architecture locale, bien qu'il soit un bâtiment moderne et fonctionnel à l'activité qui doit y avoir lieu. Sa forme est celle d'un ksar, bâti avec des murs épais en terre crue et des tourelles à chaque angle. Le plan se compose d'espaces bâtis et d'autres consacrés aux jardins et aux cours. La trame générale est formée par des modules géométriques disposés le long du parcours de gravitation des eaux qui descendent de la colline-grotte au nord-ouest jusqu'au jardin oasis au sud-est. Le périmètre est complètement fermé à l'extérieur ; l'éclairage ainsi que la ventilation se font par le haut et par les ouvertures des pièces donnant sur la grande cour intérieure et sur les patios.

Le plan est divisé en trois grands secteurs: la zone du jardin (1200 m²), la zone des services et des bureaux (1290 m²), l'aire du parcours muséal, conçue autour d'une cour carrée (1290 m²).

Le parcours à travers ces trois secteurs est guidé par la trame des eaux. Un quatrième secteur, complètement intégré à la morphologie naturelle, est constitué par l'espace souterrain de la grotte et par la terrasse rocheuse panoramique.

Thèmes des salles du musée

"Cycle de vie de la khattara: construction, fonctionnement, restauration"

"La khattara, le système hydraulique filalien et la gestion communautaire de l'eau dans les Oasis et le Désert du Tafilalet"

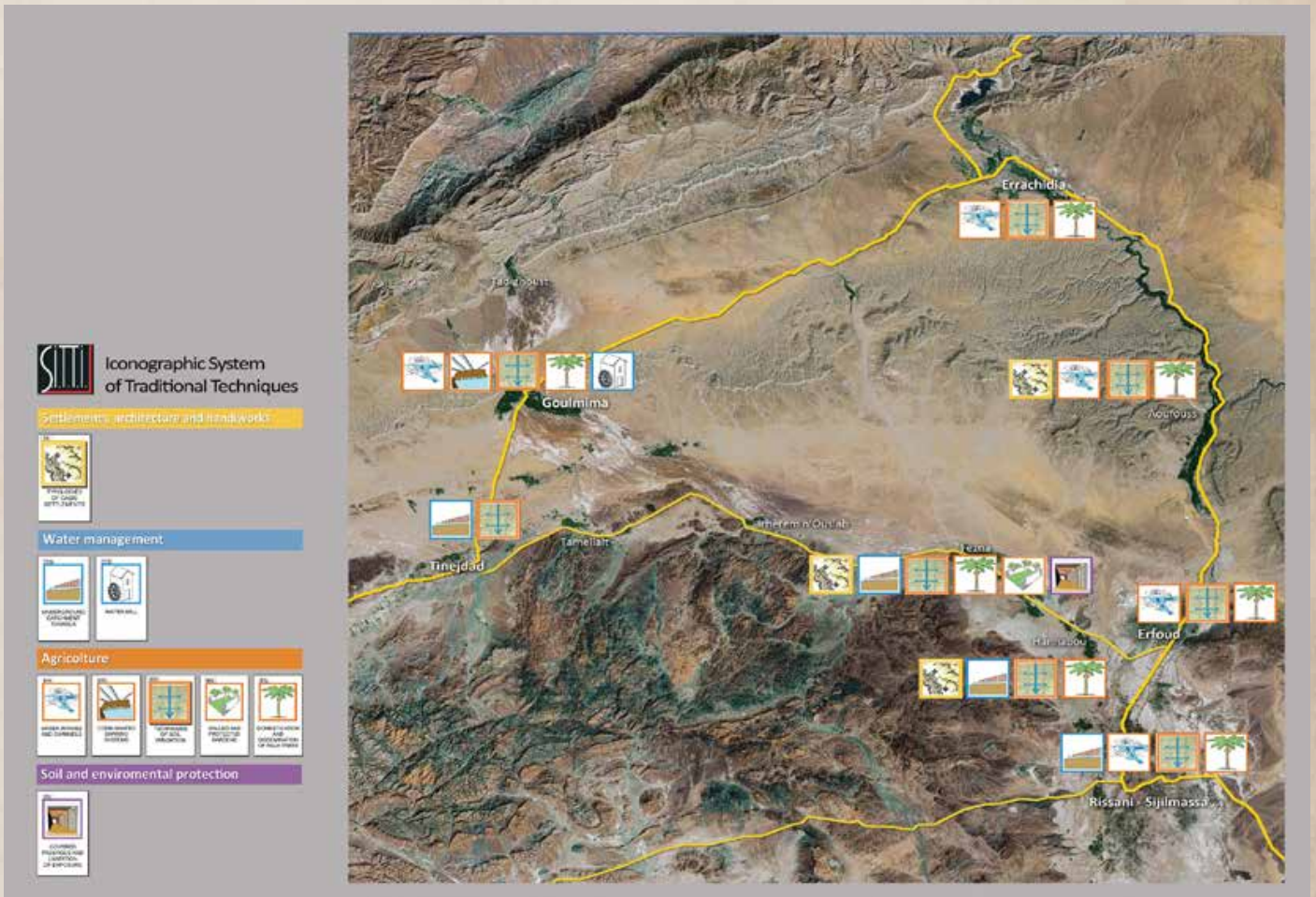
"L'Ecomusée Khettaras: un model de gestion intégrée de l'eau et de l'énergie dans le Tafilalet".

"La Route du Majhoul et les sites satellites de l'Ecomusée Khettaras".

Estimation budgétaire

Noyau de l'écomusée	
Bâtiment	6.500.000 Dh
Installations	3.000.000 Dh
Equipement des salles d'exposition	2.000.000 Dh
<small>(définition, sélection et mise en œuvre des objets, des panneaux, des présentations vidéo, du matériel informatique et des ambiances spéciaux)</small>	
TOTAL	11.500.000 Dh





The traditional techniques existing in the area, identified with the SITTI system.



Satellite view of the scenario of the Ecomuseum.

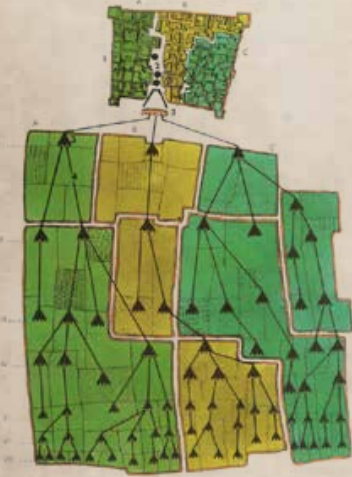


The scenario of the Ecomuseum.

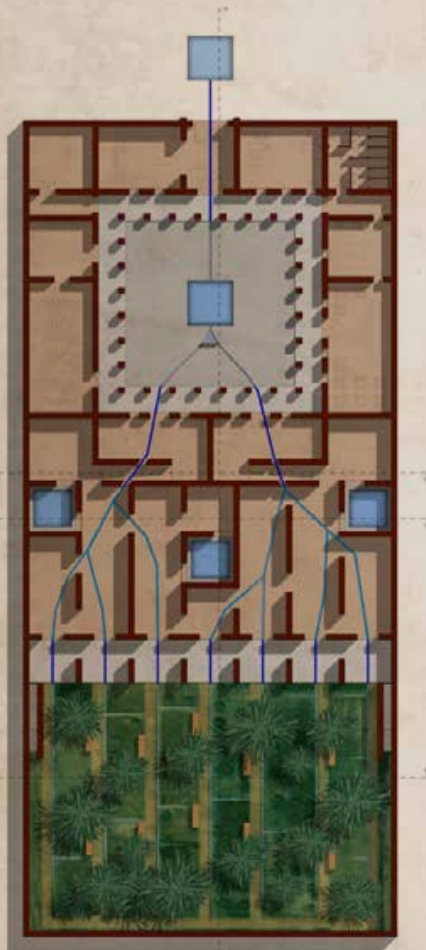


The core of the Living Museum

A learning space dedicated to the history, culture and techniques of khattaras in the world and in Morocco.



Concept of the project: organization of gardens and water distribution in an oasis.



Plan.



Renderings.



Transversal section.