

DRY STONE PUBLIC GRANARIES IN MEGDEZ, A VILLAGE IN THE TASSOUAT VALLEY, GRAND ATLAS MOUNTAINS AN ARCHITECTURAL DRY STONE MOUNTAIN HERITAGE IN DECLINE

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ABSTRACT

Located on the Tassaout Valley, one of the highest valleys of the greater Moroccan Atlas, the Megdaz Village offers substantial heritage value; it contains rammed earth houses latched onto the mountains' flanks with a great number of public granaries all arranged in the same place.

Citadels are made from stone and positioned in the middle of the fortified earth-made granaries. Watchtowers are located on the sides of the village where it is more vulnerable; they are 14 m high and are built from perfectly square bases. This architecture proved to be ahead of its time through its exceptional building system: it brings together the dry stone and earth in a very learned process.

These granaries belong to the village's families and create a secured place to store food away from extreme temperatures and humidity; yet not for much longer.

Indeed, as electricity was introduced to the village, combined with the use of new materials (concrete, bricks) instigated a huge shift in the lifestyle of the inhabitants of the Megdaz Village. Furthermore, the constructions used for protection against outsiders started to lose their utility, eventually leading, in some cases, to their extinction.

Our primary objective in this mission is on one hand to increase the awareness of this unique architecture within the large and multifaceted cultural mix within Morocco and, on the other hand, to further understand the building systems and to alert the scientific world of its imminent and certain extinction.

KEYWORDS: Granaries, Architecture, Dry Stone, Mountain, Heritage

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INTRODUCTION

Theme: Knowledge and conservation strategy of the Mediterranean Architectural Heritage- Architectural studies and analysis: characterization, instrumentation

Megdaz, a Village in the Grand Atlas Mountains

Settled between the mountains of the High Atlas at more than 3300 m, on the axial zone of the Atlas, according to geologists, the valley of Tassaout, called the lost valley, is the hidden destination of the well-informed privileged. The

green belt is composed mainly of walnut trees, the walnut being one of the major resources of highlanders, undulates along a purring stream, which can take the shape of a torrent at the time of heavy rains.



Figure 1: The Village of Megdaz, Ghizlane Dhaidah, October 2016.

The valley of Tassaout is located at 140 km from Azilal. Magdaz, one of these many villages, is hung on the northern flank of the Mgoun massif, which extends for 110 km and culminates at an altitude of 4071m. The massif has the largest area of the uplands varying between 2000 and 3000m altitude.

Megdaz could be one of the many earth constructed villages in Morocco, but it has a feature that makes it a unique destination, especially for initiates and architecture student: Its granaries. In Berber "Megdaz" means "Moqaddas" in Arabic, which means holy. It is inhabited by Berbers speaking Tamazight, they are part of the Ait Mgoun, the name of the massif, the great tribe of Fetouaka. The village is surrounded to the north and north east by a mountain naturally colored in red-hot shades, protecting it from the strong winds of winter, and its shadow shelters it from the summer sun. Towards the South and the West, it spreads out to a river called "oued" in Arabic, along which develops the cultivated terraces of wheat and walnut trees. Its continental mountain climate knowing great thermal amplitudes. The rainfall varies from 600 to 1200 mm / year, 20 to 30% of which is snowfall.

The main activity is agriculture and arboriculture. Territory irrigation is insured mainly by spring water. An important traditional hydraulic network crosses the valley of Tassaout and particularly the lower regions of the Atlas. Sedentary or transhumant breeding is also one of the main activities of the region. However, these two activities remain utterly insufficient to constitute real sources of income for the local population. The traditional agriculture practiced on restricted cultivated areas with primary means of exploitation, as well as pastures on semi arid zones make the living conditions very harsh, as transcribed by Jouve Anne-Marie (2003): *"Despite its long Atlantic coast, Morocco is an arid country where irrigation is a necessity to intensify agriculture. However, despite good water and soil potential, an extensive agro-pastoral system prevailed over the majority of the territory until the middle of the 20th century. An irrigated agriculture existed, though small and scattered, along the Oueds, in the piedmont areas and in the mountain valleys,*

however more important on the northern and southern slopes of the High Atlas (Haouz, Tafilalet, Draa) »

A Tenuous Social Organization

The village is formed through five great families and their descendants: *Aïn Hassou, Aïthassain, Atizza, Aïthddou & AïtHamma*. The tradition has retained that it is the Ait Hsain who are the founders and that the other families were constituted since the XVIIth century.

The Jmaât, assembly of the village, is comprised of the representatives of the families, the elders, the notables and the mosque of the village's Imam. It has always been the traditional authority that managed the village's affairs, including agricultural activities, the hydraulic network, litigation, new construction and so on. Today this social system is a somehow outdated. Local affairs are overseen by the Makhzen (the central administration) represented by the local authority: The Caïd. The average household size approaches 10 people. But, villagers note a diminishing in their family size caused for the main part by the countryside / city migration. This critical data of male immigration, tends to empty the villages of their men. Thus feminizing the village and often resulting in task resumption by women, including the tasks that were due to men, such as fields cultivating or fruit harvesting. The exchanges between houses are more widespread, due to the often sole presence of women, which results in creating units of neighborhood, mutual aid and community life, which were less palpable when the men were in situ. In addition, the arrival of the road and electricity allows a mobility that was not as dynamic before. Exchanges between homes, night visits are more frequent. The introduction of electricity as a mean of lighting, thus reducing the use of candles or gas lamps, provided a significant comfort to families. Nevertheless, the heating is still based on wood. But a change in the lifestyle and mode of inhabitation was found, thanks to the introduction of new equipment (refrigerator, satellite TV, internet through the 3 / 4G...)

A Knowledgeable Spatial Organization



Figure 2: Megdaz's Narrow Streets, Ghizlane Dhaidah, November 2017.

The village, clinging to the mountainside, is organized in a linear way parallel to the valley and the water course that runs down the mountain until it flows at its foothills. It overlooks the farmlands. Its shape defined by the scarcity of cultivable land, the village of Megdaz is characterized by a fabric anchored in the rock, continuous, dense, and punctuated

with narrow and winding streets. The constructions are in amity with their site. Viewed as a whole, the housing seems dense and compact, which is not really the case. The topography of the very steep site, installs the different constructions in parallel with the contour lines and following the natural slope of the site. This allows the creation of natural paths, allowing the houses to be superimposed in harmony, totally integrated in the landscape of the site. They stand out, cling to each other trying to catch the view of the mountain opposite, where the school is located, on the other side of the stream. The terraces are open and overlook the valley hanging the gaze on the top of the walnut trees. The red earth and stones found in situ, draw a built landscape which melts naturally in the mountain.

The *Tigmmis*, houses, are characterized by an integration and a balance of volumes in their rock environment, a use of local materials (rammed earth, stone, wood) which varies according to the resources of the owner. The dry stone is often used as a substructure for the walls and also as protection of the walls facing the prevailing winds. At a height varying from one to two levels (on average 2.5m), the house is organized around a central courtyard. The facades are perforated with openings covered and protected with grids. The window frames are sometimes highlighted by a lime line, or drawings reminiscent of the tattoos of Berber women.

The spatial organization scheme is thus completely affected by its pathways that reach all buildings either frontward, or rearward, often also through the terrace. The village molds the skyline of the mountain, and down the slope to the bottom of the road, which was opened less than 5 years ago. This road allowed Magdaz to come out of its isolation, especially during the snowy periods. Though, unfortunately, it also facilitated the flow of new materials (cement, breeze blocks...), which began to be introduced in the construction systematically.

Nevertheless, the traditional construction persists and the know-how is present for the moment. The houses are built of rammed earth (earth concrete) with a stone base and load-bearing walls. The earth also serves as a binder, when the construction is done in adobe (mud brick), an adjuvant lime and vegetable element (straws, debris...) may be added to give it more grip. The roofs are traditional, with wooden joists and a layer of rammed earth on top, resting on a bed of reeds and / or foliage of trees. The recent introduction of polyethylene sheeting makes it possible to quench roofing, which was previously insured only through earth and lime. Stone is another building material that is generally used only in amenities, mosque or granary. Occasionally, house constructions are made of stone, when it belongs to more affluent families, because its implementation is more costly than rammed earth.

The lifestyle inside the houses of Magdaz is very simple. Often the animals are parked inside, in the lower levels, which serve as stalls and straw storage places for the animals. The upper parts are, strictly speaking, the living areas. The lower parts are a warm natural buffer, which heat up to the upper parts. The houses can be sprawled on several levels, the parcels being narrow. They are favored with terraces that often overlook the valley, dominating the landscape and keeping an eye on the harvest.

On average all houses are wider than 100m² with an average of 4 living rooms. The widest room is usually the living and reception space. It is covered with carpets and mattresses on the floor. It is a mixed, multifunctional space that serves as both a reception and a night room. This space can be found on the 1st or 2nd level, but almost never on the ground floor, where we find the barn stable, storage (nuts, wood, wheat, straw...) sometimes a kitchen, and almost always the latrines. Access to the house is through a wooden door, at the low exterior height, because the interior level of the house is almost always lower than the outside, for constructive system issues. We often go under a decking and we directly access the central courtyard which serves as a well of light for the ground floor. Access to the upper levels is via one or

more stairs, sometimes not overlapping. A second kitchen is often located on the terrace, which is an area particularly dedicated to women and children. The Berber family structure of the High Atlas is less misogynous than in the plains, we also find men in the different areas. The population of Magdaz warms up and lights its fire only through the wood it collects below the mountain, in The valley. This task is often done by women.

The Ighrem, a Granary, a Citadel with Learned Architecture



Figure 3: Ighrem Aït Hassou, Village of Megdaz, Mouna M'hammedi, January 2018.

The *Ighrem* is a tradition deeply rooted in the region. Present in different forms. They are found both in the High Atlas, in the neighboring regions of the Anti-Atlas and Middle Atlas, as well as the region of *Souss* under the name of *Igoudars*. This traditional mountain construction reflects a social and economic way of life characterized by the spirit of community and adaptation to climatic conditions.

The *Ighrem* of Megdaz is a work that unfolds in a beautiful architecture in verticality. The mastery of the ancestral constructive art characterized by the use of local materials: earth, stone and wood, is amply expressed in an imposing architecture. Its powerful military aspect is generally translated by a strategic implantation on the high decks with steep slope, with difficulty of access, and an opening on a visual perspectives dominating the surroundings.

The *Ighrem* is organized in a single monumental entity of quadrangular volumetric aspects with a rectangular or square base. It is of important height often exceeding 17m. It is flanked on its high parts with angle bastions, watchtowers, loopholes, windows of small dimensions that reflect its defensive character. This compact and unopened internal configuration, deploying indoor spaces protected from the sun, is mainly due to its function as a granary, which must be sheltered from the sun and winds in order to secure and protect commodities and harvests from the rain, and light.

The *Ighrem* contains a learned architecture bearing witness to a know-how far beyond simple masonry. A mastered engineering technique, using elements of structures of a disconcerting stability. The architecture uses means of reasoning far beyond the common sense. It is in the mastery of construction techniques with great delicacy simultaneously for site installation as well materials used and the aesthetics generated. The use of the technical dry stone often deployed in the retaining walls of agricultural terraces, is well mastered by highlanders of the high atlas in general. It allowed a flamboyant architecture when it was implemented in granaries. The stone being used in cyclopean system where the earth binder is reduced to its maximum. The granary being often on a promontory, at the edge of a precipice, the stone allows the protection of the parts most exposed to the bad weather and formerly to the attacks.

These immense structures in uncovered stone, of which the lack of coatings attests to the beauty and complexity of the stone apparatus combined with a chain of juniper wood rising sinuously in the bearing walls on step design. The dry stone used is local. It is red sandstone, a rock that can be easily carved. The site of the village of Megdaz is located in the axial zone of the Atlas, at an altitude of about 3300m, it is essentially composed of red sandstone rocks, sedimentary rocks such as than shale.

The *Ighrem's* usage is twofold. It serves as a place of storage for family goods and rear base in case of attack, formerly. The latter no longer existing and the first one falling out of use. The *Ighrem* contains several rooms (*Ahanou*) whose function is the storage of crops and the valuables of families: *Adular* (notarized) deeds, money, jewelry, clothing, carpets and formerly weapons and ammunition. All in all, a family safe. Each family in the village had a room whose key is under the hand of the head of the family. The latter went there every morning to fetch the food of the day. As for its protective function, in the case of emergency, the whole village took refuge there. The watchtowers, as in castles, served as attacking posts.

The Granary, Ighrem, an Obsolete Vital Necessity

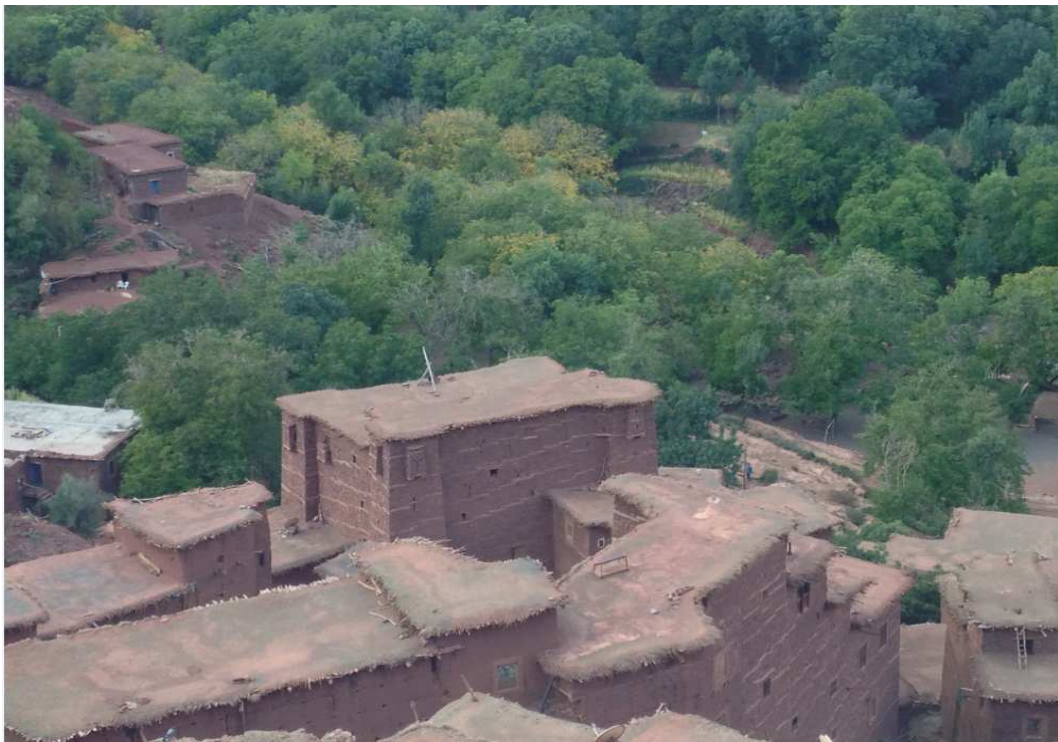


Figure 4: Megdaz Valley, View from One of the Ighrems, Ghizlane Dhaidah, January 2018.

The socio-economic and defensive importance of *Megdaz's* fortified granaries gave it a place of importance in the local and regional territory that extended far beyond the village itself. The geographical location of *Megdaz* and the *Tassaout* valley on the nomad passage ways, fueled the covetousness of the latter. It was necessary to preserve the goods and food in safe and hard to access locations, hence the birth of these granaries. Furthermore, harsh climatic conditions, and the uncertainty of the harvests, called on the inhabitants to ensure a long conservation of food in order to guarantee a permanent supply of food. On the other hand, the isolation of the village within the mountains made neighboring communities and markets inaccessible. The village therefore had to provide a minimum of food in situ. Finally, during periods of war and famine, combatants had to have highly secure places for storing food, ammunition and weapons. Several granaries have seen the day following these constraints, they had to be strong places and in sufficient number in order to fulfill their functions. Thus, the *Ighrems* specialized, considering their number in the village:

- *Ighremntaqbilt* (Granary of the tribe)
- *Ighrem n'khzin or ighrem n'lakhzin* (Granary for storage)
- *Ighrembaroud* (Granary for powder or powder shop)
- *Ighremlâassa* (Guard / security post).

Case Study: Ighrem Aït Hassou

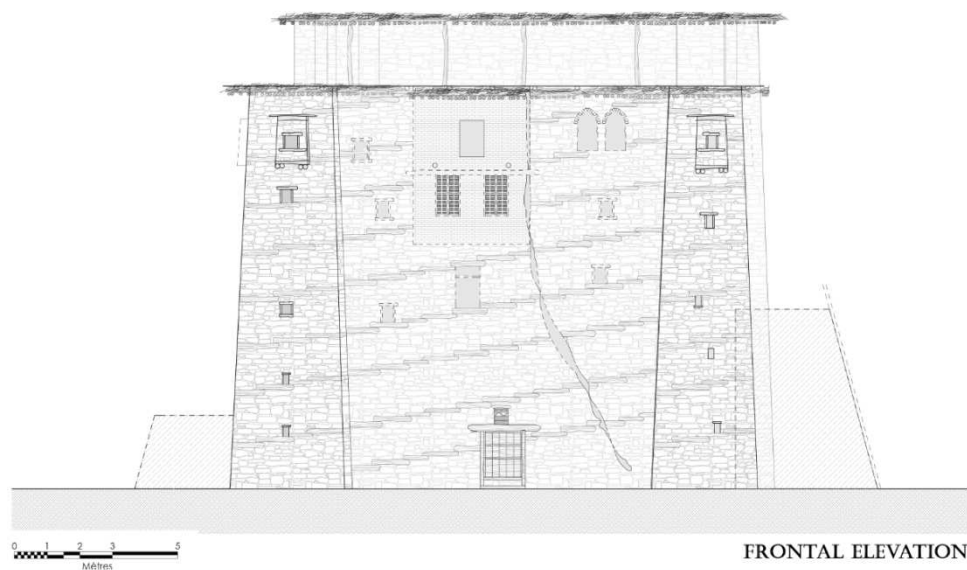
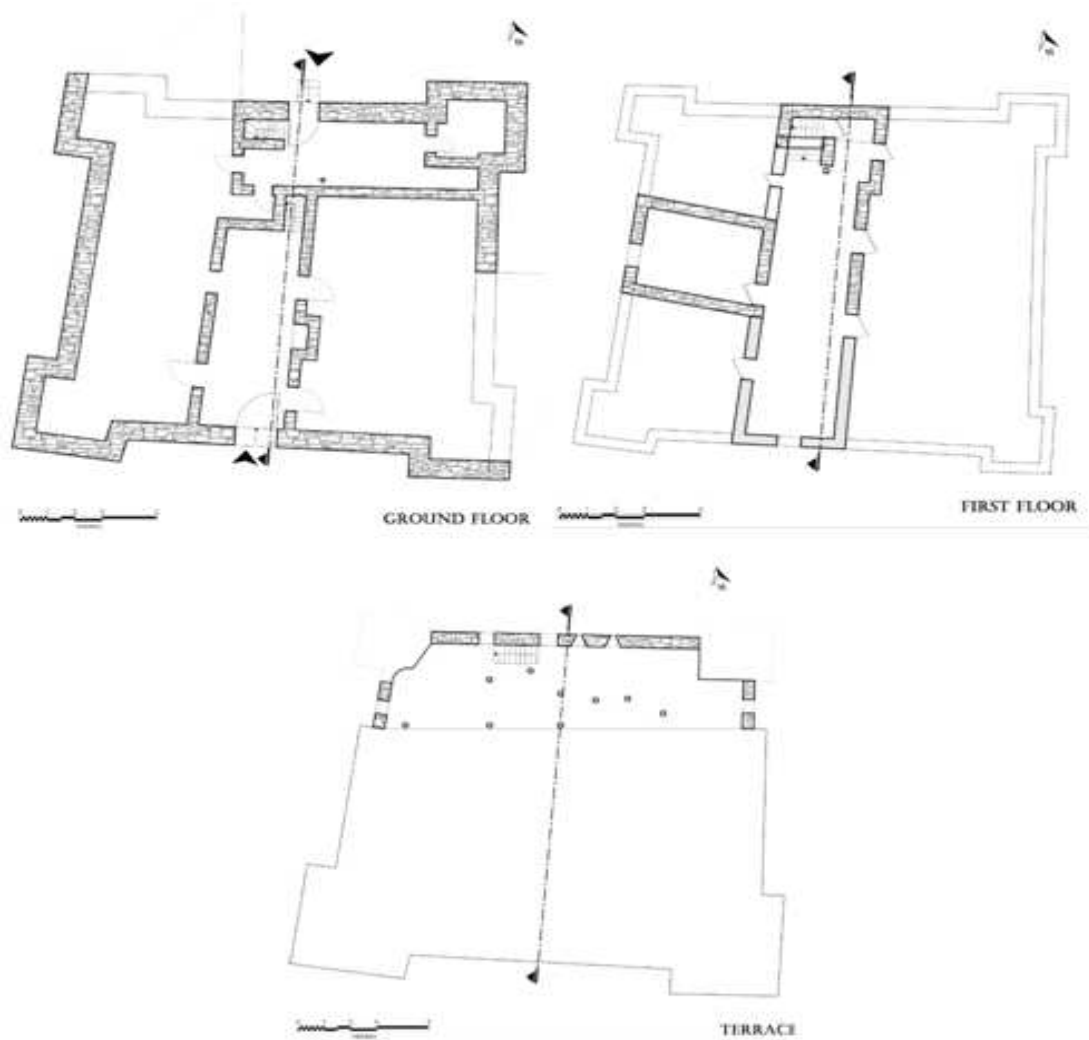


Figure 5: Frontal Elevation, Ighrem Aït Hassou, Megdaz Village, March 2018.

It is a construction that developed during periods of insecurity and permanent conflicts between tribes of the high atlas, the years of *siba*, or even the colonial period. Its aspect of fortress allowed it to be a refuge for the population, as well as the most valuable goods of the village. Built on five levels, it combines both functions of habitat and protection of property.

Although dry stone is the predominant element, this *Ighrem* contains parts built of earth, the presence of wood in the peripheral chain over the entire height, testifies to the great architectural ingenuity and local ancestral know-how. The choice of stone as a construction material and its implementation varies according to its function and the efforts it must bear: The hardest and most massive stones are intended for basement walls, foundations, and quoins, the smaller stones as

well as rubble stones, are laid out in more or less regular beds on the rest of the walls. The rammed earth walls rest on stone foundations, which are realized with the help of crushed stones and mud. Right over the foundations is poured a mortar of earth, above which rise the adobe walls. However, the importance of earthen construction is relatively recent compared to the stone construction which is more primitive and original.



Figures 6,7,8: Ground Floor, 1st Floor, Terrace, Ighrem Aït Hassou, Megdaz Village, March 2018.

Today's Granaries, Inventory of a Brownfield in the Mountains

The valley's *Ighrems* undergo a visible and palpable disintegration and degradation of their architectural appearance, as well as the abandonment of their initial function. They have gone from living buildings to neglected wastelands. This situation of brownfield transformation is characterized by an accelerated degradation due to the wear of time, nature, and users. It is currently an architectural heritage in crisis that is suffering the ravages of time, and that is deconstructing and deteriorating. It also undergoes untimely changes to meet new needs. What was the symbol of power and independence tends to fade more and more to appear archaic, uncomfortable and obsolete in the eyes of new generations that desert it, attracted by the siren songs of big cities.

The question arose during the workshops that we conducted with the heritage architects¹, to know what would be

¹ Higher diploma in Heritage Architecture ENA/Chaillot

the emergency actions to be carried out in order to safeguard architectures of this quality? and how to put it back into a new dynamic of an integrated economy? What was certain was that as heritage architects, we felt that it was at least necessary to undertake granary survey work in order to safeguard at least one archival trace.

Reasons of Granaries Abandonment in Megdaz

Natural Constraints

The inclemency of the climate strongly influences the way of dwelling and the life of the inhabitants. The temperatures fall in winter, the heavy snow precipitations, the floods affecting harvests and houses make life difficult. The village position, its isolation in winter, reduce the capacity of action of the inhabitants and the emergency services in case of natural disaster or simply of medical urgency.

New Infrastructures

One of the major constraints facing the village of Megdaz lies in the difficulty of access related to the poor quality of the road infrastructure. However, the opening-up of the village through the construction of regional and rural roads as part of the national rural road programs and the *Tagouht* Road, has made it possible to supply these areas with commodities almost all year long. The need to store food becomes irrelevant, especially if access to it becomes easier in the quantities requested, fresher and in better quality. Furthermore, Megdaz has benefited from the policy of rural electrification that amounts to 99.49% in 2017 according to the ONEE website (national office of electricity and drinking water), either via a connection to the electricity networks, or through the installation of solar and photovoltaic panels. We have witnessed the emergence of refrigerators, thus the change in methods of food conditioning, which begins to be insured at home. Essential equipment, such as a grocery store or infirmary are present, but operate with a minimum of products, especially for the infirmary.

An Obsolete Management Mode

The change in management mode of collective goods :transition from delegated management to locality to management by the deconcentrated services of the State has diminished the role of the head of the *Jmaâa*. The once important role of the head of the family as key holder is today forgotten and forgone. As the inhabitants no longer felt the need to have a room in the granary, they withdrew and abandoned it to his guardian, who is still there.

Safety in the Village

Since the upsurge of security, after independence, ammunition storage granaries, the *Ighremsnbaroud*, have no use. The disappearance of intestinal and tribal wars and legislation prohibiting the possession of weapons by Civilian citizens have also contributed to the non-use of these buildings. Security has had a rather surprising effect. Family and community cohesion resulting from periods of insecurity gradually disappears, leading to the break-up of the family unit, resulting in the abandonment of *Ighrems* with dual use (granary and housing) accentuated by modernizing factors and the attractiveness of cities.

Rural Migration

The migration to the nearest towns offering more job opportunities to young people has also contributed to the abandonment of these constructions. Indeed, these architectures require a tedious and regular maintenance to ensure their sustainability and prevent their degradation. The village is therefore found with fewer and fewer men who would normally

take care of it. At times, these men settle and start families far from the village, emptying Megdaz of its human potentialities.

The Local know-how

Construction and maintenance techniques require a specialized know-how. In stone and earth construction, used in granaries, the techniques of implementation of structural systems, maintenance of roofs and walls etc. must be passed on to the younger generations to ensure their sustainability. Which is no longer the case.

Proposals and Axes for Reflection for a Revalorisation of the Granaries in Megdaz

Registration and Classification

Located in a site rich in natural heritage, this built legacy, in its various forms and manifestations, is a wealth that must be protected and saved from the wear and tear of time. The classification of this heritage first on the national list of tangible heritage, and second on the UNESCO world list, because of its uniqueness and not reproducibility seems a national and international necessity.

Local Products and the Promotion of Local Wealth

Local products such as nuts could be marketed in other forms. Walnut oil for example is a product that has not yet been experimented by the people of Megdaz, while there exists nut producers and the valley is well known for its walnut trees. Setting populations through actions and assistance from the region to enable them to diversify their product, market it and finally be able to live on it must be one of the national priorities. In addition, training young people in dry stone & earth building techniques, could be an asset for the region, which would see a revaluation of its habitat through the perpetuation of a know-how.

Tourism

Observing the living conditions of the inhabitants of Megdaz, as well as the interviews carried out with the locals enabled us to have a general idea about the living standard, and the economic conditions of this mountainous area characterized by low incomes, related to the justifications that we have formulated before (natural constraints, lack of infrastructure, migration of productive forces, change of management modes) which are today considered indicators of crisis. Thus, the *Tassaout* valley, which can be considered representative of the villages in mountainous areas in Morocco, requires sustained efforts that need to be integrated into the regional economic environment.

In this same perspective, tourism is able, as experience in the region have shown, to play a major role in local development, the promotion of Megdaz's wealth, its dynamisation, as well as the repositioning of its touristic image, as well as mountain villages in general, in favor of natural and socio-cultural potential characterizing it, as well as highlighting the cultural, built and natural heritage of the region.

The Tassaout valley in general and the village of Megdaz in particular are located in the itinerary national and international hikers and trekkers. They are still discovering Megdaz and its unique granaries with a lot of wonder. This sector's promotion would make it possible, to revalorize this heritage and save these buildings in distress in addition to encouraging a more global vision, proposing models of economic and tourist development of the region led by the State.

The *Ighrems*, granaries of Megdaz, still survive through the presence of some irreducible highlanders who still resist the introduction of the modern way of life and continue to use these buildings as granaries. This initial function being no longer tenable, it is time to consider converting them into cottage for example, or to other activities that would allow the *Ighrems* to be maintained by the local population which appears today as a sine qua none condition to their sustainability.

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