Message of the President of ISCARSAH Stephen Kelley

Dear Friends and Colleagues,

ISCARSAH continues to grow! We recently received 8 successful applications for membership that were reported recently on the listserv. They are Expert Members Mustafa Humo (Bosnia + Hercegovina), Olimpia Niglio (Italy) and Satwant Rihal (USA); Associate Members Lyudmilla Borisovna Bezverkhova (Russia) and William Allen Lowry (USA); and Corresponding Members James Licari (Malta), Fazli Sattar Durrani (Pakistan) and Matthew Stuart (USA). You will be introduced to a couple of these new members within the pages of this newsletter.

Our Secretary General Lyne Fontaine (Canada) has stepped down from her post for which she was elected unanimously in 2008 and again in 2011. Lyne is a close friend and has been a backbone of the Committee, and I will personally miss her active participation. However she will remain an Expert Member and member of the ISCARSAH Executive Committee. The post of Secretary General will be filled through 2014 by Expert Member Dr. Debra Laefer who is affiliated with the School of Architecture, Landscape, and Civil Engineering at the University College Dublin in Ireland.

Announcement of next ISCARSAH Meeting

ISCARSAH will hold a full meeting on 23 July 2013 in Guimarães, Portugal as part of the Second International Conference on Structures and Architecture. For information on the Conference please visit: http://www.icsa2013.arquitectura.uminho.pt/

Attendance at the Conference is not a prerequisite for attending the meeting. Details of the meeting will be announced very soon on the listserv. I look forward to seeing many of you in Portugal.

Update on Prentice Hospital

I am taking the time to apprise you of the unsuccessful fight to save Chicago’s Prentice Hospital (with help from an opinion piece written by Cheryl Kent and Ron Grossman in the Chicago Tribune, April 11, 2013). I first reported on this preservation battle in the last ISCARSAH Newsletter. Prentice Hospital was designed by Chicago architect and engineer Bertrand Goldberg and completed in 1975. Its concrete curves, flat plates and daring cantilevers were among the first designed using FEM techniques that are routine today.

The battle to save Prentice Hospital, which Northwestern University is tearing down and replacing with a medical research facility, was joined by some of the biggest names in architecture and engineering. The Save Prentice Coalition enlisted high-profile architects from...
around the world to speak out for saving the building at the November 2012 hearing before the Chicago Commission on Landmarks. The ICOMOS 20th Century Committee was represented by Gunny Harboe. I represented more than 30 of our ISCARSAH Members. But the Chicago Commission on Landmarks was tightly controlled by Chicago Mayor Rahm Emanuel, who came out in favor of tearing down old Prentice two days before a highly orchestrated vote. The makeup of the Commission had undergone a major change shortly after the Mayor took office in 2011. Four members, including two architects who wanted a prompt hearing for old Prentice, were not reappointed. That July, the mayor appointed four new members: an obstetrician, a restaurateur, and two career politicians who did not appear to meet city requirements to be “selected from professionals in the disciplines of history, architecture, historic architecture, planning, archaeology, real estate, historic preservation or related fields”.

At the November meeting, the commission voted to give Prentice Hospital preliminary landmark status then voted later that evening to reverse itself based on a planning report provided by Northwestern University. Those of us present were part of a well-orchestrated play for which the outcome had been pre-ordained in the “smoke-filled rooms” of City Hall. The only commissioner who voted against withdrawing preliminary landmark status subsequently quit his post because of how the matter was handled.

The Chicago representative for the National Trust for Historic Preservation in the United States expressed frustration over the process. “Northwestern’s argument and the city’s argument was economic, not about the building. It was either/or from the start. Either Prentice is saved or a 1 billion USD investment disappears. They never had to prove that assertion”, said Christine Morris.

This unsuccessful fight might be best remembered for how a process intended to protect Chicago’s famed architectural heritage was overrun by Chicago politics. Perhaps it’s just that in Chicago, bare-knuckle politics is as much an art form as world-class architecture.

Sincerely,
Stephen J. Kelley
President - ISCARSAH
Sources of risk and vulnerability
Vulnerability of cultural heritage sites in Bhutan

Dechen Tshering
Conservation Engineer

Background
Bhutan is widely known to the outside world for unique and beautiful cultural heritage. The major aspects of Bhutan’s rich culture are the ancient traditions and customs that are still vibrantly alive and the rich traditions of architecture elaborately displayed in the cultural heritage sites and still part of daily life. In addition to the architectural, aesthetic, historic, and archaeological significance, most of the cultural heritage sites in Bhutan have deep spiritual and cultural significance. Furthermore, the cultural heritage sites in Bhutan are known for being “Living Heritage Sites” as they play a vital role in the daily lives of the society.

Vulnerability of cultural heritage sites
Due to the fragile topography of the Himalayan region, cultural heritage sites in Bhutan are prone to various natural disasters. Moreover, natural disasters could have a bigger impact considering the fact that most of the cultural heritage sites are already in stages of heavily deterioration due to continuous occupancy, weathering and renovations to adapt to the modern needs of the residents. A number of the most sacred heritage monuments in the country have been damaged by earthquakes, fire, floods and cyclones in the recent past. Severe damage to the Punakha Dzong in 1994 by a glacial lake outburst flood, several fires in heritage structures and the two recent earthquakes in 2009 and 2011 which damaged hundreds of ancient cultural heritage sites in the eastern and western parts of Bhutan were also strong wakeup calls. During all phases of a disaster, prior importance is usually given for infrastructure supporting immediate livelihoods such as schools, hospitals and home. This which is totally logical but it is only when we have lost them that we realize the loss of important cultural heritage sites.

Devastation by fire
Although, cultural heritage sites have suffered from damages from all kinds of disasters, it is fire that has been responsible for the most devastating disasters. Fire has destroyed ancient architecture, and invaluable and priceless murals and artifacts have been lost forever often leading to the total loss of the entire historical value of the structure. The complete ruin by fire in 1998 of the 7th Century Taktsang monastery (famously known as the ‘Tiger’s nest’), the severe damage to the 16th Century fortress of Gasa in 2008 and the very recent fire at the Wangduephodrang Dzong in 2012 are but a few examples that clearly depict how vulnerable cultural heritage sites in Bhutan are to fires. Unfortunately, although Vulnerability and Risk Assessment, was usually considered as part of planning for the management of sites, for various reasons, it was never given any real practical importance that it actually merits for the protection of cultural heritage sites in Bhutan. Detailed vulnerability assessment of cultural heritage sites have never been carried out in Bhutan but sporadic government and international reports of the consequences of damages and losses after every disastrous event clearly show how vulnerable our cultural heritage sites are.

The most recent example of the high vulnerability of heritage sites to fire was showcased dramatically in a very helpless manner when the Wangduephodrang Dzong, a historic fortress which dated back to the early 17th century, was totally gutted down by fire on June 24, 2012. The loss of the Wangduephodrang Dzong was not only a loss of a building, it was a national tragedy where hundreds of artifacts and murals were lost.

Challenges to carry out vulnerability assessment of cultural heritage sites
Although there is a clear indication in Bhutan for the urgent need for a comprehensive vulnerability assessment especially for important cultural heritage sites, it has faced major roadblocks. Dedicating appropriate technical assistance as well as adequate financial assistance is a major
challenge considering the lack of technical capacity as well as financial resources available in the country. This is further exacerbated by the absence of a culture of active fire preventive management traditions and practices.

Case Study of the Fire at the 16th Century Wangduephodrang Dzong
The strategic location of the majority of important cultural heritage sites over harsh mountain ridges which was originally a strategic advantage over a valley in order to safeguard from attacks is now posing a challenge for putting in preparedness measures and fighting fires. During the fire of the Wangduephodrang fortress, everyone could only stand helplessly watching the huge ancient and beloved structure being consumed by the fire slowly for almost 24 hours. That there was almost nothing that could be done to tackle the fire, very strongly displayed the weakness of our current capacity to cope with this degree of disaster in our heritage sites. The Wangduephodrang Dzong tragedy also made us realize where we stand in terms of technical capacity to fight fires. There are also a lot of ‘ifs’ associated with the incident during and after the fire - if there were fire alarm systems in place; if a chopper was available for such disasters; if there were an emergency exit and it still continues. There were plans to put in fire safety measures in the Dzong after the restoration works that was ongoing were completed because no one thought that a fire disaster of such scale would ever happen. But the irony was it happened!

Responses in the aftermath of the fire at the Wangduephodrang Dzong
The responses in the aftermath of the fire at the Wangduephodrang Dzong were immediate. The Government of Bhutan took the Wangduephodrang Dzong tragedy as the biggest reason to improve fire safety measures especially in Dzongs. Fire safety campaigns in all important monuments were immediately conducted where the residents were trained how to use fire extinguishers; there were various fire drills and preparation of evacuation plans. Initiatives to come up with detailed evacuation plans and incorporation of fire safety measures have now begun in Bhutan. The People of Bhutan mourned the loss of this ancient Fortress and have been fully supportive in fund raising for the reconstruction of the Dzong. Almost every individual has been contributing whatever possible within his/her means both in cash and kind. However, the tragedy is that although huge amounts of money is being raised for the reconstruction and we all know for sure that Wangduephodrang Dzong will again stand magnificently over that ridge, Bhutan and the world has lost forever the authentic historical value in the fire and it can really never be regained. A regret we now have is that if only all this money that is now available for the reconstruction was available a few months back before the tragedy for fire prevention. The irony is that the money presently raised for the reconstruction would have been adequate for fire prevention measures for almost all heritage sites in Bhutan with all the required fire safety measures. One can only learn lessons from this tragedy and use it to apply it for measures in the future.

Photographs of before and after of the Wangduephodrang Dzong (built in 1638). Total devastation by the fire of June 24, 2012.
Eight Months in Bhutan
Seamus Phillips
Structural Engineer

Upon reading an email sent to the IS-CARSAH list by Dechen Tshering from Bhutan, I saw a great opportunity for me to offer my time to travel there and assist them. After some arrangements were made, kindly negotiated by Dechen, I was able to do this and consequently spent eight months volunteering as a structural engineer with the Division for Conservation of Heritage Sites under the Ministry of Home and Cultural Affairs. The work was challenging from conservation, engineering and cultural perspectives, yet it was also an experience that has taught me a great deal.

Bhutan’s Buildings
Bhutan is a small Himalayan country seated between India and China and has a population of under a million. It is most well known for its advocacy of Gross National Happiness and its recent peaceful transition from absolute monarchy to democracy. Unusually, it has never really been conquered and was closed to the world until the 1960s; it has therefore had little historic influence from the West and has remained an almost medieval country. This means that every structure prior to this time, and many since, have a very distinct Bhutanese style. They are built with somewhat basic techniques, namely rammed earth, stone masonry with earth mortars, and jointed timber framing. These traditional buildings make up a huge proportion of the building stock, and those that are still habitable are, quite uniquely, entirely used for their original purpose, be it houses, temples, monasteries or even fortresses (Dzongs) which are used as the centre of local governance. This continued use adds great value to Bhutan’s traditional buildings and has been key to preserving them from ruin thus far.

Conservation issues
However, over the last 40 years Bhutan has been developing at an increasing rate. The newly sprung towns across the country now largely consist of concrete frame buildings, albeit still with a distinct Bhutanese style. Traditional buildings are being demolished daily to upgrade to this modern style in order to provide better facilities and reduce maintenance.

In addition to this threat to the heritage structures from rapid development, Bhutan was hit by earthquakes in 2009 and 2011. One of 6.1 magnitude with its epicentre in the east, and one of 6.9 magnitude centred in Sikkim to the west. These killed twelve people and caused widespread damage to traditional structures. Naturally this has prompted a call for safer buildings, and unfortunately to many this is synonymous with modern buildings. During my time there I was also witness to a fire disaster which gutted one of Bhutan’s most impressive buildings; Wangduephodrang Dzong. This wasn’t the first disaster of its kind; another fire in 2000 destroyed Bhutan’s most photographed building, Paro Taksang, and there are many other stories of buildings being lost to fire in the past. This has called for buildings to be more fire resistant, which is understood by many as a suggestion to no longer use timber.

DCHS
These issues, among others, are being addressed by the role of the Division for Conservation of Heritage Sites (DCHS). Over the past five years DCHS have been
executing three large conservation projects involving three of Bhutan’s dzongs (fortresses), including Wangduephodrang Dzong prior to the fire. These projects involve substantial conservation minded repairs and upgrading the buildings to provide modern facilities. In addition to these projects the office also documents, assesses and advises on many other heritage buildings. My role at DCHS was to assist them with the structural aspects of this work, and since the office has very limited structural ability my assistance, although basic, was very welcome. This work typically involved travelling to the site (which was often very remote), documenting as much of the structure as possible (few drawings or historical information is available), and reporting a proposal of repairs to the relevant authority (sometimes the Prime Minister). Being an entirely new culture for me, none of these tasks were straightforward.

**Travelling**

Travelling to the sites was not necessarily simple; the majority of the temple structures are situated on mountain tops over 3000 m above sea level. Many trips involved a few hours on relatively good roads, then a few hours on a rough track winding up a mountain and then an hour or so’s walk. One particular building involved a four day trek to reach, as it was located right near the border with Tibet at over 4000m altitude. Another involved 20 hours driving to go just 570 km across the country on the main highway.

**Inspecting**

Inspecting the structure was usually fairly straightforward, as our work was welcome and access was no problem. However, gaining any oral history of the buildings was not so simple. I found that in general the users of the buildings were far more interested in the spiritual history of the site than the building, and so the question of “How old is this temple?” would be answered with the date the site was first recognised. Although the building styles have not changed greatly over the last 500 years, it did not take long for me to start spotting the subtle differences between building periods and consequently be able to question the users further to get the true answers.
A trend that I picked up on was that there appeared to be a peak in structural skill in the 17th Century when a lama named Shabdrung Ngawang Namgyel came from Tibet and united Bhutan, building many of the Dzongs. Some of the most impressive buildings stem from this time, and since then there has been a decline in quality, especially in the last 100 years when more work has been put into embellishing the buildings than the quality of their structure. Identifying recent alterations to the structures was thus vital due to this decrease in skill; many alterations used much poorer workmanship, and in many cases (as is common elsewhere) the alterations compromised the integrity of the buildings. Nearly all the damage that I observed was either due to poor alterations or neglect.

**Reporting**

Reporting the proposals of repairs was one of the most challenging aspects of the work. The analyses of the buildings were kept simple, but the appropriate choice of action was complicated by cultural and political issues, as well as the challenge of specifying work which was possible with the limited resources and skills available. For example, the traditional roofing material is timber shingles called shinglep, this is a great examples of a material fit for purpose as it is locally sourced and can withstand the strong winds. Yet over recent years a large proportion of the traditional buildings have had their shinglep roofs replaced with lightweight corrugated steel sheeting in an effort to reduce building maintenance and preserve trees. These sheets are fixed to the traditional roof structures and, consequently cause many of these roofs to blow off in high winds. Even with this problem it is very difficult to persuade the building owners that shinglep can be appropriate as it contradicts previous recommendations to save the trees. The Wangdue Dzong fire has added another reason not to use the shingles. It was one of the last remaining Dzongs to have a shingle roof as its windy location was not suitable for steel sheeting. The shingle roof however contributed to the spread of the fire and is too easily blamed for the extent of the disaster. Another example of proposal challenges is with the repair techniques understood by the local builders and engineers. I found that in general they were much happier to rebuild than to repair. It took some time to really understand their capabilities and I was surprised to find quite late in my stay that drilling a hole through a thick wall was not something they were comfortable with. This is a key skill for many types of repair works and I did not feel it would take much to train them and buy the appropriate equipment. Unfortunately this was not possible for the timescale for the work in question, but I hope it will be considered for the future.

**Opportunities**

Still having such a vast number of heritage buildings and the intangible skills associated with building them puts Bhutan in quite a rare position. It is not a simple task to classify these buildings as protected heritage sites, as they are generally seen as 'common' and now 'out of date', this can also be seen as directly opposing development. However I see this as a great opportunity for the country, with the knowledge and assistance from the rest of the world, to conserve their most significant sites better than anywhere else. I feel that my input has been useful for DCHS and that I contributed to saving some valuable buildings, and helped to improve the knowledge and methods of the office.

I look forward to returning with more experience behind me and follow up on the projects.
Historical Background

The Mughal record mentions that in 1490 AD Babar Mirza, Grand Son of Amir Taimur and cousin of Zaheer-ud-Din Muhammad Babar, founder of the Mughal dynasty in south Asia, advanced to the area known as Pakhli Sarkar, situated in the vicinity of Mansehra. Babar Mirza, assumed the title of Sultan Shahab-ud-Din Babar, is said to have built the fortified fort Feroza at Guli Bagh. Inside the ravaged fort was a court, the place where he and his successors used to decide the affairs of the state. The fort is perished now.

Guli Bagh was a cantonment area in the middle of River Siren and Koh-i Tanglai. The fort Feroza and the court (pavilion) is located at Guli Bagh on the left bank of River Siren, 23 km to the north of Mansehra. The fort can be approached through a link road connecting Hazara University and Baffa town situated to the east of the fort.

This place was famous for its beautiful scenery and flowers and it is known as “Guli Bagh” (the garden of flowers). In the background of the fort the rolling hills of Talangai enhance the natural location of the fort in the lush green surroundings. It was the capital of the Turk Sultans. A canal was provided to this area passing through the bottom of the Tanglai hill falling in a pool and then entered in Feroza Fort. The villagers have found the terracotta pipes which verify the existence of the pool and water channel. Akbar and especially Jahangir speak about the beauty and greenery of the area.

The fort was designed exactly in the manner like those prevailed in the Indian Sub-Continent. It was constructed from the same material like burnt bricks, stones and lime. According to Irshad Khan the bricks were prepared at Sikandra, six miles away from the fort. A ditch was provided around the fort in which the river was passed.

Captain Wais states that Guli Bagh was the capital of Turks and Emperor Akbar and Jahangir stayed here during their journey. Here were the graves of the Turks which were in ruined state. However the mausoleum of Diwan Raja Faqir Muhammad was in much better condition. It is also said that here are laying the graves of Shahab-ud Din Mirza (the founder of Mughals in this region) and other Salateens.

Diwan Raja Baba was the contemporary of Sultan Mahmud Khurd and was living at Guli Bagh. His full name is mentioned as Diwan Raja Faqir Muhammad. His mausoleum is situated in the enclosure which is not in the original form.
in which it was designed. In the last days of 17th Century AD, Guli Bagh received severe destruction especially during the mutiny of Sultan Muqarrab Khan. The Turks were dispersed and lost their central position while the princes captured the small areas. For suppressing them, in 1713 AD, Syed Jalal Baba (from Swat) attacked the Pakhli area. In those days the two sons of Sultan Mahmoud (wall Pakhal), Murid Khan and Aaqil Kahn were present. Both the princes are said to be buried here inside the enclosure. Syed Jalal Baba seized the fort, however the fort was destroyed and the whole city was razed to the ground.

Sultan Mahmoud Khurdwai had designed a grave for himself but couldn’t be buried due to his death in a battle, coming back from Delhi. The tomb now standing outside the enclosure is probably the same. The marble tomb stone is now lying in the Hazara Cultural Museum, Hazara University, Manserha. In short this site reflects the past glory of the region which needs more research for unveiling the mystery. However the primary measures are necessarily to be taken for the conservation of the whole complex.

**Damages afflicted to the Monument**

The monument through the ages remained exposed to direct and constant pressure of rains, sun and wind. It experienced unprecedented destruction during the devastating earthquake on 8th October 2005. The structure of the walls of the court is badly damaged and at some places the masonry is considerably pulled apart. The damaged portion should be thoroughly documented, repaired and consolidated. The platform is damaged at several points and is partially missing.

The old had been repaired at different points and rimes with cement, needed restoration with all its old originality intact. The inner wall in parts has developed cleavages. Moreover, some portions of the walls has been painted which had overlapped the originality of the monument. At the present state of research and investigation these are the sole examples of the style in the Hazara valley. Immediate remedial measures are needed to halt further decay.

**The cultural value of the Monument**

We have no historical information about the date of the building. But stylistically the treatment of facade, divided into several ornamental stories, brings it close to the Lodhi period square tombs like Bare-Khan-ka Gumbat, Chote-Khan-ka Gumbat at Lodhi Gardens, Delhi. The building of the court bearing the ravages of time over the Centuries has survived to this day and still possesses some of its original splendor and elegance.

The monument seems to be unique on the basis of style of construction and no comparative examples and specimens are recorded so far from this region (Hazara Valley). It is intriguing that the whole Hazara region has only two standing monuments of the medieval period, though it has been a route of trade caravans, royal journeys for centuries. They had been made of bricks where almost every other building is made of available natural stone. It is important to preserve this monument before complete deletion of this chapter from our Cultural Heritage. The preservation of this monument would contribute to the promotion of tourism, will preserve the dying cultural and historical heritage of the area, and the uplift of the community.

**Why to conserve and restore**

Human vandalism and the ravages of time have left deep marks on the archaeological and historical monuments and they have shown great and severe destruction, deterioration and depredation of their core, which needs to be attended to on emergency basis. It is also our duty to conserve and preserve these architectural jewels of the past history, which are the pride of the Muslim culture, and to maintain them for present and posterity and to create them as tourist places and for the projection of our culture and cultural heritage in the country as well abroad. This project will link our present with the golden past to attract tourists from all over the world.

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3 *Tuzuk-i Jahangiri.*
6 _Ibid_,
7 Khan, *cit.*, p. 298.
8 _Ibid_, p. 299.
Impact of Hurricane Sandy on New York City

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Hurricane Sandy originated as a tropical storm in the Caribbean Sea on October 22, 2012. Before reaching the United States, the storm caused significant damages and fatalities in Jamaica, Cuba, Haiti, the Dominican Republic, and the Bahamas. When Hurricane Sandy finally made landfall in the US, its effects were felt along the East Coast from the Carolinas up into Canada. In North America, the storm’s effects were felt most severely along the coasts of New Jersey and New York. This article will focus on the impact of Hurricane Sandy on New York City.

As Hurricane Sandy began to move towards the New York and New Jersey coasts, New York City officials took precautions. The subway system was shut down approximately 24 hours before the storm made landfall. Mandatory evacuations were ordered for low-lying communities most susceptible to flooding. These areas include the perimeter of lower Manhattan, the Coney Island Peninsula (Brooklyn), the Rockaway Peninsula (Queens), and the coastal areas of Staten Island.

Effects of the storm were felt in New York and New Jersey throughout the day on Monday, October 29, while the storm was just off the coast. Hurricane Sandy made landfall near Atlantic City, New Jersey that evening around 8 pm, after being downgraded to a post-tropical depression. Sustained winds of 60 mph (96 km/h) and wind gusts of up to 80 mph (128 km/h) were recorded in the area. But the most destructive aspect of Hurricane Sandy was the storm surge, which was approximately 13 feet (4 meters) high. To complicate matters, the storm made landfall during high tide on the night of a full moon, when tides are at their highest point during the lunar cycle. High tide occurred around 9 pm on October 29, just after the storm made landfall.

The hardest hit areas in New York City were lower Manhattan, Red Hook (Brooklyn), the Coney Island and Rockaway Peninsulas, and Staten Island. These areas were inundated with water from storm surge, in some places up to 18 feet (5.5 meters) deep. Subway and vehicular tunnels into lower Manhattan from Brooklyn, Queens, and New Jersey were flooded, impeding access into Manhattan for several days following the storm. The storm caused power outages throughout the city, and damage to waste water treatment plants in the area. Additionally, many waste water treatment plants and electrical substations in low-lying areas were flooded and damaged during the storm.

The Coney Island and Rockaway Peninsulas are the two westernmost barrier islands along the southern coast of Brooklyn and Long Island Sound. These areas became popular resort destinations beginning in the mid-1800’s. In time, people began building small summer homes, typically bungalow-style cottages, on the peninsula. Most present-day residents live in these communities year-round. Summer cottages have been “winterized” by adding heating and insulation, or else demolished and replaced by larger, more modern homes. Additionally, public housing complexes were constructed on Coney Island Peninsula and other low-lying areas in the mid-1900’s, significantly expanding the permanent resident population in flood prone areas. Nearly all homes on the
Coney Island and Rockaway Peninsulas were subject to extensive flooding due to storm surge. Flood levels reached depths of over 10 feet (3 m) in some locations. Once flood waters subsided, mounds of sand and debris were left in the streets along with displaced boats and cars. Most homes with basements were left filled with water that had to be pumped out. Ocean-front homes sustained the most dramatic damage, where storm surge combined with wave action caused serious structural damage to homes.

The neighborhood of Breezy Point, on the westernmost tip of the Rockaway Peninsula, still contains a number of bungalow-style homes. Many of these homes are constructed of wood frames set on unreinforced concrete masonry unit foundation walls. The storm surge knocked out many of these foundation walls, leaving the upper portion of the homes unsupported and structurally unsound. In some cases, the homes floated off the foundations and into the streets, or struck other homes.

Privately owned homes in areas heavily affected by Hurricane Sandy were surveyed as part of an emergency inspection campaign implemented by the New York City Department of Buildings (DOB). DOB inspectors along with contracted local structural engineering firms performed rapid and detailed inspections of storm-damaged homes. The inspection program generally followed the evaluation procedure outlined in Field Manual: Safety Evaluation of Buildings After Windstorms and Floods (ATC-45) by the Applied Technology Council. The goal of these inspections was to identify potentially hazardous conditions to building occupants, focusing primarily on structural damages. Items listed on the assessment form for the inspector to look for include collapse or partial collapse, lean of the structure, foundation damage, and failure of significant structural elements or connections. The assessment form also lists nonstructural hazards, such as parapets at risk of collapse or restricted means of egress, and geotechnical hazards. Once a home has been evaluated by an engineer, a color-coded tag is affixed to the structure classifying it as "Inspected" (no hazards found), "Restricted Use," or "Unsafe.”

Once detailed inspections are complete, home owners are responsible for hiring contractors to perform necessary repairs. Unfortunately, insurance policies do not necessarily cover all the costs to return a home to a habitable state, and government aid is limited.

As the city continues to recover from the storm, steps are already being taken to protect against future disasters. In response to the extensive destruction caused by Hurricane Sandy, Andrew Cuomo, Governor of the State of New York, has proposed purchasing damaged homes from persons living in flood zones and returning the land to natural habitat (this plan is still pending on federal approval and other factors). The Federal Emergency Management Agency (FEMA) will revise flood maps in the New York City area based on a 100-year storm. This will extend the areas designated as flood zones and increase those impacted by wave action. The Code Counsel for the New York City Building Code has proposed a new wind category for hurricane-prone areas be included in the latest building code, which is still in development phase.

1 http://tidesandcurrents.noaa.gov/noaatidepredictions/NOAATidesFacade.jsp?Stationid=8517741
2 http://www.nytimes.com/2013/02/06/opinion/gov-andrew-cuomos-sandy-plan.html?_r=0
The problem child of Belgian’s natural stones
Het zorgenkind van de Belgische natuursteen

Els Verstrynge
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The Belgian built heritage is a most diverse and rich patrimony that contributes to the pride of local communities and that attracts millions of visitors every year to monuments, historic city centers and archaeological sites. Although especially Flanders is renowned for its “red brick” architecture, many monuments have been constructed with natural stones, such as different types of limestone (e.g. white limestone such as Gobertange and Balegem stone).

A very peculiar type of local natural stone is the ferruginous sandstone, which does not contain lime but has a ferruginous binder, causing its typical red-brown color. The most famous Belgian ferruginous sandstone is the Diestian sandstone which is the typical building stone of the Hageland (North-East Belgium) and was widely used at the height of the economic and demographic expansion in the 14th to 16th century. All emblematic gothic monuments of the region were constructed in this material whose limited capacity for sculpturing led to a local variant of the Gothic style, known as ‘Demer Gothic’.

Weathering processes often cause decay and material loss in Diestian ferruginous sandstone, see Fig. 1 for an extreme example. In addition, this sandstone has a relatively low average strength and a large scatter on its strength and stiffness properties. Long-term mechanical deterioration under elevated constant load levels (such as the dead load of a tower) can give cause to important deformations and crack growth. The process of deformation increase under constant loading is referred to as creep damage.

It is known that ferruginous sandstone is vulnerable to creep damage, although the occurrence of the phenomenon on the micro scale and the influence of moisture ingress is not yet fully understood. Long-term damage progress under constant load levels poses a risk for monuments and people and is of concern to the international scientific community as it can also occur in other low-strength building materials. In-depth research on long-term behavior of masonry structures under elevated constant load levels was initiated by professor Binda and her research team at the Politecnico di Milano in the ’80s after the collapse of the bell tower in Pavia (1989).

Ferruginous sandstone is a rather fragile resource, much of which has already been lost or replaced by building materials selected in the past without knowledge on the physical and mechanical properties, ageing characteristics or compatibility with the original material, see for example Fig. 2.

Stocks of replacement stone be-
come depleted and attempts to discover new quarry sites yielding quality stones are currently under investigation but were not successful so far. Hence, restoration of monumental constructions built with ferruginous sandstone for which the state of preservation could imply stone replacement is a complex issue. Besides Diestian ferruginous sandstone, other types of ferruginous sandstone in Belgium are for example the ‘Brusselian’ sandstone, naturally occurring and commonly used in Brabant Walloon and Flemish Brabant south of Leuven and the ‘bergsteen’, naturally occurring on hilltops and widely used in the Flemish Ardennes and southern West-Flanders. These varieties appear to be more durable and this contribution therefore specifically focusses on monuments constructed in Diestian ferruginous sandstone.

Case studies

1. St. Willibrordus church in Meldert (Lummen, Belgium)

The bell tower of the Sint-Willibrordus church in Meldert suddenly collapsed in July 2006, see Fig. 3. Large vertical cracks had been present in the base of the bell tower and monitoring of these crack widths had shown increases of 1 mm and more in the weeks before collapse. The failure of the tower has been attributed to long-term damage accumulation under high sustained stress levels. With a creep assessment methodology at hand, this case was re-investigated in detail. Samples were taken from the collapsed bell tower to investigate the material characteristics of the Diestian ferruginous sandstone. In addition to a range of standard tests (compression tests, Young’s modulus, composition of the lime mortar), experimental creep tests were performed. The results of the creep tests showed that creep damage is initiated at very low relative stress levels in this type of sandstone, even below 50 % of the compressive strength. It should therefore not be surprising that creep-related structural problems are found in a considerable number of monuments which are constructed with this material.

2. St. Eustachius church in Zichem (Scherpenheuvel-Zichem, Belgium)

Alarmed by the collapse of the bell tower of the church in Meldert, the stability of the tower of the St. Eustachius church in Zichem was investigated, as this tower was built with the same sandstone material and showed a similar damage pattern at the base of the bell tower, see Fig. 4. A combination of experimental material characterization, monitoring, non-and minor-destructive investigation of the lay-out of the pillars at the tower base, load calculation, creep modeling and probabilistic analysis were performed to assess the tower’s long-term structural safety. As the results of this detailed structural assessment did not guarantee the tower’s structural safety, the risk was considered too high and strengthening measures were proposed. The approaching December celebrations compelled swift interventions and it was decided to strengthen the base of the pillars of the tower by constraining the lateral deformations with epoxy bonded Carbon Fiber Reinforced Polymer sheets (CFRP). The constraining effect of the CFRP sheets increases the load bearing capacity of the pillars. The wrapping of the pillars was designed as a temporary measure, including a protective layer in between the CFRP and the sandstone masonry to
protect the original material. This temporary strengthening system ensures stability until an extensive strengthening and consolidation campaign can take place, e.g. including grout injections to increase the internal coherence of the pillars and the overall strength of the masonry. To date, such a consolidation campaign has not yet been undertaken.

3. The Maagden tower in Zichem (Scherpenheuvel-Zichem, Belgium)

The Maagden tower (in English "Virgin tower") had already partially collapsed in June 2006. Again, no sudden disturbance of the acting forces could be pointed out as having caused the collapse. There was a preceding period of heavy rain which could have weakened the masonry and enhanced failure. The tower was also composed of three-leaf masonry in Diestian ferruginous sandstone, which appeared in a bad condition.

A high dead load acted on the base of the tower, especially in the area where the cross section of the wall had been reduced by a staircase opening. It was at this point that the wall collapse was triggered.

To safeguard the remaining part of the structure after partial collapse, the tower was girded with a confining construction of vertical beams and circular tension rods and a cover was applied to protect the vulnerable inner core masonry from moisture ingress, see Figg. 5a, 5b. At present, grout injections are being carried out to enhance internal cohesion and strengthen the three-leaf masonry. Main issues in this process are the compatibility between the grout and the original material and the fact that a lot of water is injected in the masonry, which has a temporary negative effect on the masonry’s stability. If no precautions are taken during the injection and hardening period, this can cause instabilities and (local) collapse.

To test the compatibility and injectability of the grout, test injections with three different grout types have been carried out and core drilling has been applied to identify the most suitable grout. Unfortunately, all tested grout types were commercially available grouts which had not been composed specifically for use in ferruginous sandstone, therefore possibly affecting the masonry’s long-term behavior.

Future?

At the moment, further investigations are taking place to understand the influence of moisture on the creep behavior of ferruginous sandstone. Initial results indicate a large influence of water adsorption on the sandstone’s creep deformations and partially saturated conditions significantly enhance creep failure.

These issues were presented and discussed at the International Symposium on Structural Analysis of Historical Constructions (SAHC2012) which took place in October 2012 in Wroclaw (Poland). This fundamental knowledge is necessary to design more efficient assessment techniques and restoration guidelines for monuments constructed in Diestian ferruginous sandstone.

Therefore, this case is also a nice example of how fundamental research can support restoration practice. In the end, this specific type of sandstone has given a strong identity and character to the monumental architecture in the Hageland, see Figs 6-7, and the longevity of these monuments certainly deserves our attention. After all, “problem child” doesn’t necessarily need to be seen as a fully negative description... it’s also a child you care a lot about and which is close to your heart, it just needs a little more care than some of the others.
The ruins of the medieval Citadel Heraclea, or Enisala, are located in North Dobrogea, on a calcareous cliff dating from the Jurassic, at +109.6 m above the level of the Black Sea. This is the highest point in the lake area. Towards the East lies Lake Razelm, while towards the North-West is the Babadag Lake. The geographical coordinates of the citadel are 44°53’2’’ N and 28°50’7’’ E. The cliff is located within the area of Sarichioi Commune, Tulcea County, which is composed of five villages: Enisala, Sabangia, Sarichioi, Zebil, and Visterna. The closest village to the citadel is Enisala. “Enisala” is written in Turkish Yeni Sala, meaning “The New Village” (a name also used in Roman times, in its Latin version), while Sarikoy means “The Yellow Village”, because of the yellowish colour of the reed fields that cover the area. The commune stretches on 282 sq. km., its population is 5,715 inhabitants, whereas 56.4 % are Romanian and 43.1 % Lipovan, with a human presence of 20.3 inhabitants per sq. km. The chief occupation of the local people is fishing. The county capital, the city of Tulcea, lies at around 30 km north of Enisala. To the North-East lies the city of Sulina, to the North-West - Brăila and Galați, while to the South - Constanța. In the past, Haricleea Citadel was unique and famous for its civilization and might. However, today tourist guides presents its ruins as those of Enisala Citadel, which is the Turkish name of the nearby fishermen’s village. This is not the original name of the fort, but merely a translation of a later-date name. The Medieval history of Dobrogea is both rich and debatable, because of the interpretations proposed for historical events specific to one or the other political rules. Dobrogea was, and still is, a territory rich in natural resources and fascinating due to its natural life and landscapes. Because of its geographical position, Dobrogea hosted the chief communication roads of the entire continent and it constantly adapted to the changes that nature or civilization brought. There is a cult for historical and cultural traces in Dobrogea, while their preservation is viewed as a personal duty by the local people. In 1261, at Nymphaea, the Byzantine Emperor Michael VIII signed a treaty with Genoa, allowing the Genoese merchants the access to the Black Sea, through Dobrogea, under the control of the Byzantines and the Tatars. These merchants needed at the time this wide market, because the Venetians had banned them from the access to the Mediterranean. In the 13th century, access to the Black Sea was only possible through the Razelm Bay, which was at the time a maritime harbor, with salty waters. Placing a Genoese citadel there, to guard the land and sea routes right at the access point into the Black Sea was a reasonable and necessary decision. The Romanian historian Radu Ștefan Ciobanu stated that there is no proof that

**Safeguarding the Heraclea Citadel in Dobrogea, România**

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Heraclia, whose location is uncertain, was conquered by the Byzantine emperor Heraclius (611-642). On the other hand, there is documented proof that in the 13th century the waters of Razelm Bay washed the foot of the Heraclea cliff where these ruins lie today (Figs. 1, 2). Italian maps mention the area, around 1270, a settlement known as Bambola or Pampulo. However, there is no mention of a connection between this and the Heraclea citadel. Obviously, a structure as large as the present-day ruins suggest must have required several years or maybe decades of building works. In the Mediterranean culture, a structure as large, strong and strategically placed as Enisala Citadel was known as a “castle”. The late Roman settlement at the cliff foot, employed by the citadel builders under Genoese rule, is known as Vicus Novus, a Latin name meaning “The New Village”. The settlement was mentioned by the Roman historian Procopius as part of the fortifications built by emperor Justinianus in Dobrogea. Such a village was probably what we call today a “site camp”. First of all, the Genoese brought to Dobrogea the Roman art of building. The citadel, which was strategically devised in order to survey the ship movements, was included in the string of Genoese forts in Dobrogea alongside Vicina, whose location is uncertain, and Chilia. In 1388-1389, i.e. 119 years since the first documentary traces, the Ottomans led by Baiazid I Ildirim conquered Hera-
The Eastern side of the citadel, 30 m long, follows ground level variations, breaking in the centre at a mere 5° angle. The connection between the two ramparts is achieved by a four-sided tower, with each side 3.0 m wide, of which only the foundations are preserved, marked as E on the plan. The third hexagonal tower, located in the North-East corner, marked as F on the plan, has 2.5 m wide sides, just like the D tower, and a height of only 2.0 to 4.0 m, but it is well preserved. The North side of the citadel is 25 m long and 1.0 to 4.0 m high, with a square tower in the centre, marked G, identical with E, of which only foundations and a face are preserved. The North defence wall actually completes the abrupt stony wall of the cliff, which penetrated, in the Middle Ages, the waters of the Razelm Bay. Next to the North-West tower a narrow opening was achieved in the surrounding defence wall, marked M on the plan, which can be considered a secret secondary gate. The distance between the water level and the citadel was much shorter through this secret gate. The Northern square tower, marked H on the plan, has sides 5.0 m wide and 4.0 m high, it is well preserved and the waters of the present-day Razelm Lake can be seen through its Northern wall windows.

Finally, on the South-West side, which is 60 m wide, the defence wall, now mostly lost, was interrupted twice, at a degree of 5° to 15°, by a massive bastion of 2.0 x 3.0 m, marked J on the plan, which probably acted as a buttress. On this South-West side the citadel was protected by a natural ravine, with almost vertical stone walls, 70 m deep. Inside the fort 150 to 200 people could be lodged, but no building foundations were found. Interestingly, on the East side of the citadel, on the mild slope of the limestone cliff, some tens of meters away, foundations of an old building were found, larger than 0.6 ha in area, therefore, twice as big as the citadel itself, with triangular towers, completely derelict. The hypothesis of a faubourg-type structure could highly increase the interest for the ruins of Heraclea citadel.

Historians formulated three theories concerning the origins of the Heraclea citadel builders. The first one admits that the fort is Western in its architectural design and attributes it to the Genoese. The Genoese merchants controlled the markets around the Black Sea in the 13th-15th centuries and could afford making such an investment. The second theory attributes the citadel works to the Byzantines, also present, but intermittently, in this area. Finally, based on the resemblance of the citadel hexagonal towers with those seen at Tsepina, Shumen, Perperikon and Vidin, the third theory involves the Bulgarians. Other researchers noticed certain similarities with the “Lower citadel” of Hârșova.

Considering the shapes that were chosen and the structural techniques, and after analyzing the mortar that was employed, building works were dated to the 13th century or the beginning of the 14th. In a stamp dating from the 19th century, the openings of two windows that are no longer visible today comprise Gothic stone frames, a style characteristic of the Genoese, and not of the Byzantines. This supports the first theory proposed by historians.

Openings in the surrounding defence walls and the height of the citadel ramparts allowed the view
all around the area. The eye-sight could reach present-day Cernet and Dunărea channels, as well as Gura Portița on the Black Sea coast. Outside the North-West corner of the citadel, at the bottom of the cliff, a swamp is situated today. Historians place here the Genoese port on the Razeln maritime bay. This bay served two purposes: a military one, harboring the ships that surveyed navigation to and from the Black Sea, and a commercial one, for the benefit of the civil population that earned the income necessary for the maintenance of the Genoese garrison hosted by the citadel. Even if still mysterious, the imperial name given to this citadel suggests that a high value was considered. Mircea Eliade asserted that standards applied to the building of medieval fortresses in the Balkan Peninsula were embraced, in a cryptic form, by legends meant to protect the so-called trade secrets, which were not few. Some of these legends had an Oriental source, but their motivation was the same: to satisfy the professional performance requirements of the time. In the case of Heraclea citadel the wall structure, perfectly adapted to the ground level variations and the use of strategic benefits of the limestone cliff are the main assets. The wall reveals the same structure as the Genoese fortification in Constanța and the wall of the Lower Citadel in Hârsova. The three forts are contemporary and they have been attributed to the same builders. The surrounding defence wall of Heraclea citadel has faces made of stone masonry built in the technique “alternate headers and stretchers”, while the emplecton, or filling between two faces, is achieved of stone rubble, or even blocks, immersed in mortar. It seems that the limestone was brought from the Visterna quarry, located near the Babadag forest, 7 km away. Therefore, the emplecton was a cyclopean concrete, while the stone faces acted as formworks. Historians do not provide any details about the binder, but considering the strength performances and proven durability, it must have been of high quality. The binding could only have consisted in hydraulic lime, a mixture of Calcium and Aluminium oxides, well known in the Balkans ever since the erection of the bridge over the Danube at Drobeta (Turnu Severin), or possibly of Pozzuolan, a volcanic ash shipped from Pozzuoli, Italy. The inner walls were built of small blocks of limestone, roughly cut in rectangular shapes and placed in layers, somewhat unevenly. Nevertheless, every few rows a horizontal equalization joint was provided, with voids for the insertion of the cantilevers that supported the wooden board of the scaffolding that served at the laying of the stone masonry. Moreover, the planning of the inner yard and the winding access road leading to the main gate proves a solid mastery of geometry, as well as of hydraulics, required for the collection and drainage of rainfall.

Even the Heraclea citadel comprises the best preserved ruins in Dobrogea. Its cultural role, in the widest sense of the word, may be identified in various elements. For instance, the coin recovery during archaeological searches added essential information to the existing data-base concerning the area, which is rather poor. Forty-nine coins have been discovered in
total, whereas forty-one date from the Middle Ages. They are preserved in the Coin Department of the Constanța Museum of Archaeology. These are coins struck in Walachia, from the times of princes Vlaicu (1364-1377) and Mircea the Ancient (1386-1418), or in Moldavia, from the times of Petru Mușat (1375-1391) and Alexander the Good (1400-1432), and also Genoese, Turkish, Byzantine and Tatar coins. Considering the information on the coin producers, it seems that Genoese were the most present in the area, hence the theory that they also built the Heraclea citadel.

The ceramic pieces found at Enisala were displayed at the Galați Historical Museum. Findings included enamel pieces, vividly coloured in green, yellow and blue, decorated with floral and animal motives, typically medieval, which date from the 13th-14th centuries, and of a Byzantine provincial type.

A more detailed survey of the Byzantine ceramics in the area dates from 1937. Based on the ceramic pieces, historians placed the first phase of construction at Heraclea citadel in the last quarter of the 13th century.

The dragon's cavern, located in the stone cliff of Heraclea citadel, fuelled the imagination of the local people, who tell fantastic stories. They claim that the cavern was so long that it reached underneath the citadel, and sometimes weird flames were seen flying out of its opening. The legend tells that once a fierce dragon was trapped by fire, who captured a fairy that he confined to the underground palace under the citadel. One day the fairy managed to escape, but she inadvertently fell into a big hole where she found her death, and the dragon found no consolation.

Beyond the legend, it is however interesting to consider the hypothesis that there was a storage room in the cavern, for the citadel, and that it collapsed because of an earthquake. The possibility of such natural events needs to be considered carefully. Limestone areas often undergo sinking at the ground level, and very violently. Such local phenomena are included in the category of induced earthquakes, which are now often recorded on seismic engineering maps. Another legend provides surprising data concerning a Byzantine fortress of the same name, but older than the Heraclea citadel, under survey here. The legend asserts that St Theodor Stratelates lived in this place in the 4th century. Born in Heraclea Pontica, he became a brave general and great military commander. Emperor Licinius (307-321) granted him the rule of the Heraclea citadel. First devoted to the pagan gods of the Romans, Theodore was later baptized and turned against the official cult. He was convicted to death by the Emperor, suffering martyrdom by the sword (8 February 319). His relics were deposed in Euchaneia, the Anatolian city of his forefathers, where a pilgrimage is still taking place. The biography of this Saint, written by his personal secretary, contains interesting data. His feast is celebrated in the Orthodox Church on 8 February. The patron saint of Venice before St Mark, i.e. before his relics were deposed there in 828, was St Theodore (possibly not Stratelates, but Tiron). Mircea Eliade asserted that for certain historical periods and certain places, as the Middle Ages in the Balkans, legends are the only reports that contain, in a cryptic form, indisputable truths.

History shows that the greatest risk for abandoned citadels and fortifications is destruction by humans. The German architect Robert Johann Koldewey, for instance, assessed that around 95 million burnt clay bricks were extracted from the walls of the city of Babylon, all bearing the seal of Nebuchadnezzar II (c. 634-562 BC). In Enisala, six centuries after the citadel was abandoned, a great part of the buildings and the walls has disappeared. The cyclopean concrete in the surrounding defence wall stayed in place. This material is surprisingly strong for the times when it was cast.

From the point of view of seismic risks, the ruins are now of low heights, with only the hexagonal tower at the gate a little higher. But since he has a double-connection cross-section and a symmetric axis, its seismic vulnerability is relatively low. The current seismic protection code P100-1/2006 stipulates a moderate value of $\text{PGA} = 0.16 \text{ g}$ for the projected ground acceleration. The 100 m height from the ground level where the ruins are located may amplify the dynamic effect of earthquakes, but not to disturbing values. The climatic action of winds and freezing-thaw cycles are worth considering for their cumulative effects in time, even if they do not pose an immediate threat. The ecological risks caused by the windmill parks that suddenly flooded the region. Fortunately, both the theoretical foundations and the technology exist now which are necessary to identify and assess all the potential risks.

Maintenance should be permanent and qualified. The second condition is monitoring, i.e. a survey of the behavior, over time, of the administered ruins accompanied by reports on any and all alterations, leading to qualified intervention. In respect ISCARSAH Recommendations could be useful. As far as remedies are concerned, there are two options, depending on the available funding. The minimal option is the conservation of the existing ruins and the prevention of further degradation. The maximal option considers a reconstruction of the most representative components of the citadel, and placing them under a roof, as recommended, for instance, by the National Geographic Society. Both options are worth taking into account when considering the future of the Heraclea citadel.

Heraclea citadel was unique for its beauty and the exquisite location it occupied for 150 years, as a port at the Black Sea, in North Dobrogea. There is no certainty yet as to who and when built it, or why it bore an imperial name. The only certainies are that it functioned as a military garrison for a long time, but was finally defeated, surprisingly, by a natural element: the sand strands that were brought by the winds and the waves of the Black Sea at the entry into the Razelm-Babadag Bay. The ruins of the former citadel are also, at present, unique in Dobrogea. This is reason enough for them to be saved from oblivion and dereliction, with its original Byzantine name.
Abstract
This paper shows the best practice and the constraints and difficulties encountered in the Fez medina conservation. The overall rehabilitation strategy for this historical area is to alleviate the constraints through a conservation program, especially the historic housing stock, the social development and the urban environment, which could not be launched without seeking adequate tools (institutional, financial and technical) for its implementation. ADER-Fez (the Agency for the Dedensification and Rehabilitation of Fez Medina) places stakeholder participation at the core of its implementation strategy, including social animation and social participation in housing rehabilitation, and sets a program of emergency intervention on housing units threatening collapse and on infrastructure and urban facilities. This had a direct impact on project design.

Keywords: urban conservation, rehabilitation, participation

Introduction
The medina, historic urban area, is the oldest section and the historic heart of some Moroccan cities. Various international bodies have instituted policy to save historic monuments and even entire cities: The Global Charter of Historic Cities adopted by ICOMOS in 1987, the 1972 adoption by UNESCO of a convention to protect built and natural history, both include Morocco’s medinas in their scope of preservation. In the 1980s UNESCO acknowledged the cultural significance of several old towns in Morocco by including them in the UNESCO world heritage list1.

Fez, a World Heritage City, is the spiritual, scientific, and cultural capital of Morocco. The importance of its medina is reflected through several factors:
• A vast geographical area: 280 hectares.
• A dense medina: 800 to 1200 persons/ha.
• A large number of historic buildings: 14,000 of which 50% are in good state, 34% are degraded, 14% are threatening ruin or are at risk of collapse, and 2% are in ruin.
• A large number of historic monuments (about 3000)
• An historic university which is considered as one of the oldest universities in the Islamic world: the Qarawiyyin.

But today, Fez medina offers a striking contrast between areas of thriving economic activity and over-densified residential quarters whose buildings are deteriorating steadily (Figure 1): A cultural heritage and monumental of an exceptional richness, and a degraded historical built environment. The medina is today a major economic centre for the whole urban agglomerate of Fez; its economic sectors are artisanship and tourism. However, this richness does not seem to profit with its population, nearly 160,000 inhabitants, 36% of whom are below poverty level.

The most serious problems of Fez medina include the deteriorating residential zones, the degradation of the infrastructures, the transformation of traditional handicraft activities into partially mechanized small-scale manufacturing, the significant number of low-income households, the complex property ownership and occupancy patterns, and the environmental pollution. In front of this situation, the Moroccan public authorities, supported by an international momentum of solidarity, made safeguard of Fez medina a national priority.

The safeguard process of the Fez Medina, its principal stages and components
The overall rehabilitation strategy for the Fez medina is to alleviate the above constraints through a conservation program which could not be launched without seeking adequate tools (institutional, financial and technical) for its implementation. The process of safeguard began from the production of the first urban document, the Urban Planning Orientation Scheme of the Fez city2 which underlined the importance of the medina in the development of the whole of the Fez agglomeration. The process of safeguard can be divided into 3 principal stages:
• 1st stage (1980 - 1989): Launching of the safeguard process of Fez

In 1981, the medina was classified by UNESCO; then the Moroccan government and UNESCO launched in 1985 the international campaign for the Fez medina safeguard. In 1989, the government created ADER-Fez, the Agency for the Dedensification and Rehabilitation of Fez Medina, a new institutional framework to implement the strategic projects for the medina.
ADER-Fez is now an agency specialising in the conservation and rehabilitation of the world heritage city of Fez; it has accumulated a long and valuable experience in intervening on the historic fabric of the Fez medina through various local and international initiatives.

- **2nd stage (1990 - 1998): Phase of deepening and experimentation**
  All aspects of the safeguard have been deepened through the examination of the technical, institutional, legal and financial components. This period was also characterized by the realization of the experimental operations: restoration of the monuments, rehabilitation of the houses and the urban facilities, etc. Local capacity to plan and carry out the various project components have been strengthened through the elaboration of the master plan, the improvement in the field of the restoration and urban rehabilitation, and the implementation of some management tools: GIS, a comprehensive Geographic Information System, linked with planning and cost estimate tools, to support supervision of the rehabilitation project.

- **3rd stage (1999 - 2005): Collaboration with the international financial institutions and launching of the great structuring programs**
  ADER-Fez was the main interlocutor of the World Bank team in charge with the case of Fez in order to carry out the “Rehabilitation Project of the Medina of Fez”. The global budget of the project was 12.6 million USD [1999], and the development objective being “conservation of the Fez medina by mobilizing its inhabitants and local institutions” and more precisely “(a) to support the efforts of conservation in progress; (b) to consolidate the partnerships between public and private and (c) to use the process of rehabilitation to eradicate poverty”.

  These global development objectives were declined in the following components:
  - Development of the historic buildings rehabilitation programs;
  - Improvement of accessibility and emergency circulation network;
  - Improvement of the medina environment;
  - Exploration of the rehabilitation process to eradicate poverty;
  - Institutional strengthening and capacity building.
  - Tourism development and improvement of the urban landscape
  All these components were achieved in 2005, and the project had a positive impact on the development of the medina of Fez. Although in terms of financial indicators, the achievement of a project of such a size is not always fully met, it has generated many synergies of actors and investors pursuing the lines of the components. This established a model in the level of practice of development in a conservation zone.

  In addition to the World Bank loan, other financial actors participated in Fez such as FADES (Arab Fund for Social and Economic Development).

  FADES has been involved widely in the rehabilitation of the monuments, housing and infrastructure of Fez. Private national and international donors supported the restoration of many monuments in Fez. Other main source of financing for the ADER’s operations is the Moroccan government. The different ministries (especially the Ministry of Housing and Urban Planning, the Ministry of Cultural Affairs and the Ministry of Islamic Affairs and Waqf) participate financially in different programs following their prerogatives.

  The financial structure of the conservation program might reflect a very advanced participation of local authority, municipal councils, NGOs, national / international donors, and national / international financial institutions.

  The large number of implemented rehabilitation projects in the medina of Fez has made it a successful case study, particularly in fund raising and financial investment in the heritage sector. Despite the fact that a historic city of 160 000 inhabitants could not be conserved or fully saved from danger, Fez is very advanced in the implementation of its vision of conservation compared to other historic cities in Morocco.

  The different investments made in the conservation project of Fez between 1981 and 2005 (Figure 2) show that infrastructure is the most important with 53% of the whole budget. The second largest investment is made in the rehabilitation of buildings with 22%. The third is the restoration of monuments with 11%. The fourth is the protection of environment with 7%. The fifth is cultural and tourism development with 5%. The sixth is training and institutional reinforcement with 1% and 1% respectively.

**Housing and social development**

This component includes the following sub components:

- Social animation and social participation in housing rehabilitation:
  Early in project preparation, social scientists were recruited from the university in Fez to undertake a participatory and social assessment, which began with data collection on and consulting with a wide array of stakeholders. Government, religious and civic leaders, merchants, artisans, householders, renters, and many other ordinary population contributed ideas for possible elaboration into project components, worked toward consensus on interventions and strategy, and described the social dynamics of the city to assure a match among plans, aspirations, and local capacities.

  Participation was high, given the involvement of a number of local NGOs in the project development between ADER-Fez and the population, and of many local stakeholders in the implementation of the social assessment.
This had a direct impact on project design. The objectives are the direct involvement of the population in the rehabilitation process in order to improve the living conditions and to fight against poverty by job creation. ADER-Fez presents this participatory process and community development into two forms: A financial aid evaluated to 30% of the cost works and a help out in terms of building materials and technical assistance. The inhabitants contribution is about 70% of the works cost.

- Emergency intervention on housing units threatening collapse:
  Housing presents a high risk because of the threat of collapse of their physical structures. In 1991, ADER-Fez launched an innovative emergency actions program that targeted the saving of human lives from this threat. The program consisted of an emergency team of builders, architects, and engineers who engaged themselves in the service of stopping the collapse of the buildings. Buildings threatening collapse require emergency action involving both the public and private sectors. Beyond consolidation and critical repairs, the municipalities lack the technical capacities and political must enforce building codes. Priority is given to emergency repair of housing units threatening collapse and fronting on improved roads and tourist circulation routes. One of the challenging task of ADER-Fez is to facilitate the reduction of the extremely high population density within the historic urban fabric as this is causing a rapid degradation of the historical and traditional structures. Various programs related to the emergency intervention on housing units threatening collapse have been implemented. The restoration and rehabilitation laboratory was established and it consists mainly in the follow-up of the stability of physical structures, control of the rate of degradation, as well as the auscultation, diagnosis, and analysis of the quality of materials. The laboratory structure is assisted by the survey and spatial analysis group, a team of skilled technicians whose main task is to gather data and survey the different buildings and structures of the medina. In addition to the scientific data, this laboratory is also exploring the technical know-how of the master builders through the interaction of engineers with the traditional techniques.

At project closing, the overall state of the housing stock of the medina has not improved, with the exception of the project interventions and of the private investments in the transformation of historic houses and palaces into Riads and guest houses. Indeed, the collapse of housing units due to decay and lack of maintenance has continued, with no losses of human lives, due to the campaign of wooden buttressing of the endangered buildings financed by the Ministry of Housing and Urban Planning and carried out by ADER-Fez.

**Infrastructure and facilities**
The success of the revitalization of the medina is greatly associated with the upgrading of its infrastructure and facilities which include the following:

- Emergency and liaison circulation networks have noticeable impact on the communication and transportation networks in the medina.
- Traffic organization: the traffic network has been improved especially...
surrounding the historic walls and their monumental gateways.

- Accesses and parking: the accesses facilitate enormously the parking of cars outside the pedestrian road network, and they contribute to the increase of the economy and real estate value of many parts of the medina because of the easy accessibility.
- Water and sewage system: water supply and sanitation are important basic needs affecting the quality of life and productive efficiency of the medina population. Provision of these basic services continues to be among the core activities of urban local bodies. The municipal council, RADEEF (Water Supply and Electricity Public Utility of Fez) and ADER-Fez are the main actors in the improvement of water and sewage systems (both traditional water channels and modern sewage systems).
- Electricity: the municipality and the RADEEF played a major role in the electrification of the whole medina. Public lighting, electricity and telephone networks have increased the number of businesses and the tourism activity.

- Urban facilities: the Ministries of National Education and Public Health have found ways to adapt their equipments norms to the historic building capacity, and then they have built a significant number of schools and nurseries in the medina. These infrastructures are only examples of the efforts made by many actors to increase the living conditions of the medina.

Tourism development and improvement of the urban landscape
The tourism sector has been developed through the improvement of the urban landscape and the development of the thematic tours including the tourist signs, the restoration of historic gardens, the restoration of traditional latrines, the cultural activities, ...

Conclusions: lessons learned
There are some areas of success of the Fez conservation program:

- Social participation is essential for the successful rehabilitation of the historic housing stock. -The project has demonstrated that reconciling the objectives of urban conservation and rehabilitation with the housing needs of the impoverished inhabitants is feasible, through a process of consultation and social participation in the design and implementation of the interventions on the historic housing stock.
But there are some constraints:
- The tenure of land and buildings is a critical difficulty in the rehabilitation of historic cities, and the municipality should consider delegating urban rehabilitation operations to competent agencies.
- The urban rehabilitation projects should be designed according to simple objectives and design. Given the complexities of intervening in historic cities, the related interventions should not try and address all of the needs and opportunities under a single operation, but should rather support a programmatic approach.

References

Acknowledgments: The author would like to acknowledge the contribution of Omar Hassouni, from ADER-Fez.

2 SDUF, Schéma Directeur d’Urbanisme de Fès, 1975.
3 Régie Autonome de Distribution d’Eau et d’Electricité de Fès.
The 2014 International Conference on Structural Analysis of Historical Constructions will be held at Mexico City, Mexico on 15 - 17 October, 2014. One day pre-conference course will be offered.

SAHC 2014 will bring together scientists, engineers, designers, architects and conservators who will present conservation, research, theories and doctrines achievements. SAHC 2014 only accepts unpublished papers. Submitted conference papers will be reviewed by the technical committee of the Conference. All accepted papers will be published in the conference proceedings.

Selected papers presented at the conference (after extension) will be recommended for publishing in some International Journals, indexed by ISI or Scopus.

Important Dates:
- Abstract Submission: 15 October, 2013
- Notification of provisional acceptance: 15 January, 2014
- Manuscript submission for Review: 15 April, 2014
- Notification of final acceptance: 30 May, 2014
- Submission of final manuscript: 30 June, 2014

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Architectural Student Centre at Vyatka State University (Kirov, Russia)
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Translated by Alexander Salenikovich, Université Laval

Architectural Student Centre (ASC) is a unique youth research association created in 1973 under the auspices of the Department of Architecture and Urban Planning at the Faculty of Civil Engineering and Architecture at Vyatka State University (VyatGU) in Kirov, Russia. ASC VyatGU supports the training of highly qualified engineers focused on the effective management and solving of the critical challenges of the modern construction industry and architecture.

General task of the ASC is education of future engineers in the spirit of the best examples of architecture and urban planning of the native land in order to achieve the main goal – the restoration of the professional, cultural, and spiritual continuity vanished in the twentieth century.

Research focus of the ASC is architectural and urban studies and conceptual design of modern and historic buildings. The research work of students is organized in accordance with the comprehensive plan spanning their academic and research activities for the entire period of studies at the university.

The ASC membership is primarily composed of students of the Faculty of Civil Engineering and Architecture as well as students of other faculties, interns, and high school students supervised by professors of the Department of Architecture and Urban Planning specializing in four research areas:
- Urban Architecture
- History of Architecture and Urban planning
- Industrial Architecture
- Building Physics.

The cofounder and scientific director of the ASC is Professor Lyudmila Bezverkhova, PhD in Architecture, member of the Union of Architects of Russia.

The ASC activities are conducted in the form of creative studios, research seminars, discussion clubs, and research and educational associations. The ASC members conduct studies of the architectural monuments of historical and cultural heritage. They are engaged in the scientific research to develop recommendations for conceptual design of protection zones of historical architectural ensembles and urban areas.

Key achievements of the ASC. During thirty years, they have developed design documentation for over hundred thirty projects of reconstruction and renovation of individual buildings, including residential, public, and industrial buildings, churches, chapels and temples, architectural ensembles and urban areas of important historic and cultural heritage in Kirov Region.

They have received numerous regional, national and international awards and diplomas from regional and federal governments and associations for their projects, including diplomas from the architectural exhibitions in Moscow, St-Petersburg, China and France. In collaboration with the Kirov regional TV Company “Vyatka”, they have produced 25 films about historic sites and architectural history of the Kirov Region that have been broadcasted by the regional TV station. The ASC developed the map of the zones of protection of the cultural and historic sites of the Kirov City, which serves as the basis of the evaluation and general urban planning of the city’s development in 2010-2020.

The thirty years of successful experience present convincing arguments that the ASC helps awakening creative spirit, awareness of historical responsibility and ownership of the Great Russian culture in the young generation of civil engineers and architects.