

SUSTAINABLE DEVELOPMENT OF BROWNFIELD SITE FOR A NEW LANDSCAPE PERCEPTION OF AN INDUSTRIAL HERITAGE IN THE CITY OF KENADSA

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Abstract

A palimpsest of heritage legacies, the city of Kenadsa superimposes the traces of the historical claim. This sedimentation of the built environments that persists in the urban landscape, tells a story and reflects a cultural blend that shapes its architectural identity. First known by its 'zaouia', the spiritual pilgrimage place of the believers and faithful of the saint "sidi Mohamed Ben Bouziane"; the cultural and religious attractiveness of the city of Kenadsa is hastily transposed into economic and industrial bloom following the discovery of coal making it the first bright city in Africa proliferating work for a cosmopolitan population. Today, it only bears witness to this rich history with a few fallows, including the industrial wasteland at the entrance to the city. Left to its own devices for a long time, abandoned without any positive intervention, this wasteland confers a negative perception of the post-industrial landscape. Therefore, the objective of this work is to find a way to preserve the historical and cultural value of brownfield sites, thus ensuring the sustainability of industrial sites. To do this, a documentary and then participatory historical approach will be used.

Keywords: *Brownfield; Kenadsa; Coal; Industrial heritage; Sustainable development; Landscape perception*

Introduction

Twenty kilometres southwest of Bechar (Algeria), from the vast expanse of sand, gushes the small town of Kenadsa, which feels calm and tranquillity. Renowned for its *zaouia* "monastery" (founded by the saint sidi Mohamed Ben Bouziyane in 1700), this town is still frequented by believers owing to its spiritual characteristics. Therefore, the perpetuation of the visits known as *ziarates* "religious visits" to the spiritual site combined with the authenticity of its famous old Ksar (vernacular human settlement) makes the area an attractive place that welcomes tourists from all sides. Kenadsa was originally a small oasis of some kind (before its discovery by Sidi Mohamed Ben Bouziyane) as there are so many others in the Sahara. Having been initially a source of water and valley, Kenadsa emerged as a living place full of activity in the Saoura region.

Short History

Disruption of Kendsa's destiny following the mining operations - the discovery of coal

Kenadsa has long been known as a carboniferous region since the first major expedition on April 10, 1870, on the 'Guir' (the reconnaissance that was carried out during the late 19th century by the French army on the southwest region of Algeria). It was after the French settled in Kenadsa in 1906 that the Flemish geologist discovered coal.

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Regarding this issue, two versions shaping the legend of the town have been provided by the indigenous people of the city of Kenadsa (Fig. 1). The first one which is mouthed by the local inhabitants, states that the discovery of coal was made by a person named "Ba-Bensadek". He was a slave of the zaouia who, while searching for salt or wood, about 0.1km East of Kenadsa and digging the ground, had found black soil. This land was brought to the chief or 'sheikh' of the zaouia named "Sidi Brahim". This discovery was so astonishing that the religious personalities and notables were so surprised that they called this black land which they had never seen before as the land of the Devil [1-5].



Fig. 1. View of the old Kenadsa Ksar

Given their ignorance and lack of knowledge in geology, the sheikh of the zaouia sent this land or this piece of coal to the Arab office then to another town called "Ain-Sefra", because Kenadsa and Bechar and the whole region were affiliated to Ain-Sefra. From this town, the stones were sent to Paris for analysis, taking into account that Algeria was under the French colonialism. The investigation revealed that the land in question was coal.

The exploitation of this coal began in 1917 by the Algerian Railway Company (CFA), for the supply of locomotives for steam trains. Until then, coal was not intended for marketing. It only covered the needs of trains. This interest did not become apparent until the early 1940s with the establishment of an organization appropriate to mining activity, the Kenadsa Coal Board in 1943. In 1947, collieries of the south known as "collieries of south Oran", which were created as part of the nationalization of the mines, succeeded to this employer company "*Régie de charbonnage*" (Figs. 2 and 3).



Fig. 2. View on the colliery of Kenadsa



Fig. 3. Arrival of a wagon

The marketing of coal did not start until the early 1940s. The rate of production was increasing day by day and the recruitment rate within the mine was increasing. Workers - whose

number reached 4000 - including labourers from Kenadsa, nomadic tribes, Berber, Morocco and Europe who together constituted the mining company's workforce [1-5].

In order to meet the needs of the mining labour-hand, it's was necessary to create a European city. That includes infrastructures such as: a medical treatment room, teaching classes, minor's houses, barracks.

Other large-scale infrastructures, namely an Air France Agency, a military base called "Mer-Niger" and a trans-Saharan company, were also established in Bechar Town following the exploitation of the Kenadsa mining basin. In this regard, it is worth-mentioning that these developments took place thanks to the creation of the Railway wich remained the spearhead of major socio-economic changes in the region.

As far as the original of coal is concerned, it's is very important to clarify this point. The coal is found in the form of underground veins which is initially an ancient forest that had been burned 20 or 30 million years ago. For coal washing, miners bring the coal wagons from the mining sites to the washhouse level where the raw coal was extracted, purified, washed, sorted and sieved. To this end, for the extraction of one tonne of coal, one tonne of water was used, and nearly three tonnes of inert materials were moved. Concerning the remains, they were simply deposited by cable-car near the mining site and the washhouse, ones the famous slag heaps of the town were formed.

Unlike the useless coal, the good one was transmitted to the World Coal Market, whereas the remains were transferred to "Bechar-Djedid" in order supply its power plant.

As this juncture, it's necessary to mention that the coal mining process began in 1918 and expended intensively between 1942 and 1960.

Annual production has evolved according to figure 4.

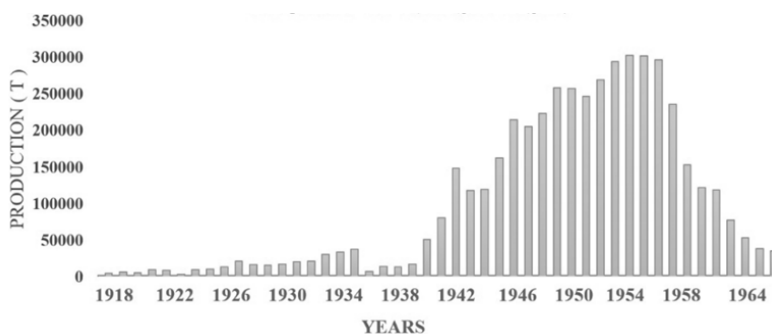


Fig. 4. Evolution of coal production in Bechar-Kenadsa basin

Production continued at the wake of the Algerian independence "1962" at a rate of 10,000 tonnes/year, mainly following the nationalisation of hydrocarbons in 1971. Nevertheless, this industrial activity was shut-down by governmental decision in 1975 for financial consideration. The latter, prove to be highly expensive and dangerous [2].

The industrial wasteland or the Brownfields

They represent an extremely varied heritage with plenty fields from industry (Metallurgy, Petrochemistry, steel, textile, chemistry ...), agri-food, etc. The built structure may prove to be particularly complex (surface and underground) and soil pollution can be very high [3].

Brownfields are more referred to "previously developed lands" than "contaminated sites" in United Kingdom (UK) and are accepted as all abounded, idled, or underused properties with fixed infrastructure and developed surface on site regardless of whether contamination is present or not [4].

Yet, the term "Brownfield" denotes an urban industrial site that had been abandoned where the reuse or the redevelopment is a complicated issue.

Birth of the slag heaps and their current state

The effective exploitation of coal in Bechar-Kenadsa Basin began in 1918. It lasted more than fifty years, until it was completely shut down in 1973.

The Bechar and Kenadsa coal basin then consisted of three mining districts: Kenadsa, Bechar-Djedid, and the “intermediate” one which is located between the two last cities. As far as the latter is concerned, the operation only lasted between 1969-1973 when production had significantly reduced.

The operation was then carried out in blocks and by surface lift using wagons loaded with coal. The ore and the casing, mined out, in a gallery, were stored on the surface (Figs. 5 and 6). The coal was sorted manually and then sent to the washhouse at the eastern exit of Kenadsa city (Fig. 7).



Fig. 5. Pull-up the coal wagon



Fig. 6. Industrious in work in factory

For years, the flat morphology of the land areas with their very low occupancy rate, helped coal slag heaps to develop and multiply on the washhouse's operating sites, as well as those formed near the other headquarters. These coal slags heaps were well isolated from populations and dwellings [5].

To this today, the state of the slag heaps remains intact. In other words, it still conserves its original morphology; unchanged since the cessation of activity.



Fig. 7. Intact soil of the washhouse

Topography or shape of slag heaps

The slag heaps had been developed in different ways, depending on the time of year, the nature of the soil and the technical means.

Small flat slag heaps. They are small flat slag heaps which their volume does not exceed a few cubic metres, were and are still scattered not far from the main slag heaps about a few hundred metres. This type is mainly observed at the eastern entrance to Kenadsa. Their reason for existence is due above all to the fact that during the construction of certain public or private buildings, the inhabitants moves the slag heaps or replace about only a short distance in order to exploit the land for dwelling purposes. However, these attempts remain unsuccessful due to the proximity of the buildings to the slag heaps. Currently, these slag heaps cover a very large area and disfigure the landscape.

Slag heaps of levelled circular to subcircular shape. They are second-rate slag heaps which have an average height of 2.5 to 8.0m, and irregular surfaces. These small mounts were built by human effort and the use of animal to pull wagons.

Conical slag heaps. These are the most important and significant slag heaps due to the evolution of cable-car construction techniques. Built in elevation on small surfaces, these slag heaps reached an altitude of 50m for a radius of more than 200m, and a volume that exceeds 1 million m³.

Truncated slag heaps. The hybrid form has taken over the base of a conical slag heap that has a planned top.

Physical positioning of slag heaps on the urban morphology of Kenadsa

The landscape architect must show a willingness to explore the objective worlds of science and engineering to gain an in depth understanding in geomorphology, top soil (salvage, maintenance, and redistribution), revegetation, slope stabilisation, grading, tailings disposal, drainage control, surface and ground water and fugitive dust [6].

The washhouse slag heap is characterized by its volume. Its maximum height is 28.10 m, its surface area 47277.3m² and its location at the entrance to the city of Kenadsa. Generally has conical in shape with a staircase at the top. It is located about a hundred metres north of the washhouse to which it was connected by a skip that stored the residues at a height [7]. The recent appearance of industrial World Heritage Sites is indicative of a general shift in society towards a perception that industrial remains are now old enough to be the past, important enough to be international heritage and attractive enough to visit [8].

State of slag heaps in the immediate environment

After the definitive closure of coal mining in 1975, for economic considerations (high costs; low reserves), the development programmes that succeeded, still included a budget for industrialization of the region and for encouraging agriculture to meet the region's needs, and to overcome the unemployment crisis that affects an increasingly large population (Fig. 8).

This industrialization has caused a significant rural exodus to the capital of the province which has led to several problems including labour problems and, in particular, housing problems, resulting in the sometimes-anarchic development of urbanization in the city.

The extension of housing estates built before the 1970s was such that it spilled over into areas very close to the dumps and sometimes into the dumps [9].

The classification of brownfield sites as an industrial heritage

The need to safeguard and classify the tangible heritage of Bechar province, in particular its industrial heritage, in the local and national registers, was highlighted by the local authorities of the culture sector. This raises questions about whether mining landscape should be formally recognised by some sort of heritage initiative, or whether this would alter the very value it holds by creating a bounded site of memory that "risks fetishizing place and space too much [10].

Bechar province has several sites of this kind of heritage that have a great historical and cultural importance. They are located in the communes of Bechar and Kenadsa.

The former coal production and exploitation station (Kenadsa washhouse) and the former coal-fired power plant in Bechar were classified in 2008 in the local register of tangible heritage. In other words, the province's industrial heritage is a prelude to a national classification [11]. It is now widely recognised that there is an inextricable link between

memory and place, with both personal and ‘social’ memories playing an important role in processes of place-making and identity [12].

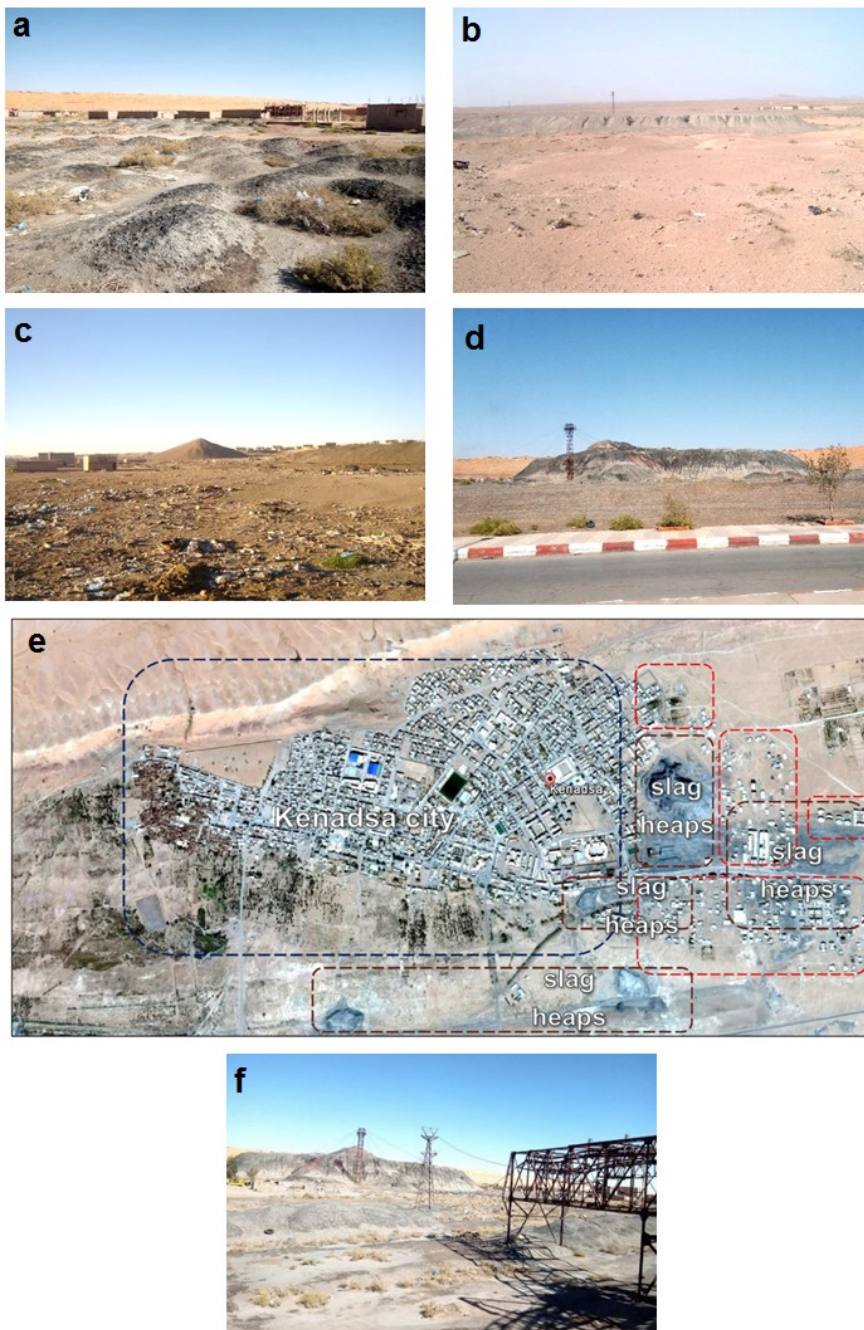


Fig. 8. Slag heaps in the Industrial area of Kenadsa city: a - Small flat slag heaps; b - Subcircular-shaped slag heaps levelled terraces, c - Slag heaps Conical ground, d - Truncated slag heaps, e - Situation of the Slag heaps compared to the city of Kenadsa, f - Slag heaps at the eastern entrance of Kenadsa

This measure is part of the actions for the protection and the preservation of the tangible heritage throughout the country as undertaken for years by the Ministry of Culture in accordance with Law No. 98-04 that was promulgated on June 15, 1998, for the protection of the cultural heritage.

The purpose of this Act is to define the Nation's cultural heritage, to lay down the general rules for its protection, preservation and enhancement, and the conditions for their implementation.

Under the terms of this Law, all movable, immovable cultural property existing on and in the ground of the buildings are considered as the nation's cultural heritage [13].

The intention behind the classification of these industrial wastelands as province's heritage sites is to protect them against acts of theft and vandalism such as: the hazards of nature and human destruction. These ones can affect the various structures of these facilities that constitute an important phase in the history of the city and the Saoura region.

The classification of this industrial site in 2008 as a local heritage was not followed by operations of rehabilitation and development of the area in question. In other words, no action has been made for the sake of protecting and converting the area into a place of knowledge as a part of the history of industry in the region and the country.

Associations as well as ordinary citizens concerned with the preservation of local tangible and intangible heritage have long advocated for the inclusion of these two sites, as well as others such as: many "Ksour" in the region into the national heritage list.

The creation of local representations of specialized national structures that are responsible for the protection and enhancement of the tangible heritage is also the wish of the local authorities as well as the cultural associations which are active in the field of heritage protection and cultural development [14].

This historical site, like an open-air museum occupying a vast area within these two localities of the Bechar region, has not been the subject of any study and reflection until now. A policy of rehabilitating these remnants and classifying them as part of Algeria's tangible and intangible heritage deserves to be seriously undertaken.

No efforts have been made to rehabilitate this valuable heritage, except for a statue erected just at the entrance to Kenadsa depicting a miner pushing a cart full of fossil rock and a museum built in the centre of the same town. This museum houses the objects and photos retracing the history and genesis of the mine.

Urbanization and the industrial site

The ancient washhouse and slag heaps of Kenadsa are surrounded by residential areas largely made up of new districts built in the last two decades.

The urban setting of this mining site gives it a particularly strong social value, from the point of view of the residents living nearby. Axial views of slag heaps from urban roads and other public spaces are particularly important, in the sense they to reveal the presence of a mining site that is easily access from the neighbourhoods.

This urbanization is developing along the city's main roadway on the former industrial wasteland (abandoned mine tiles, slag heap rights-of-way, etc.). The landscape qualities specific to the mining industry can be influenced by this urban development. This often leads to the underestimation of the industrial landscape, since the specificities of the existing industrial wasteland are not taking into account.

Whether it develops along roads or extends over open spaces, urbanization often hides and even closes, totally or partially outstanding views of the identity elements of brownfield (slag heaps and industrial buildings), and consequently devalues the memory element.

Waste heaps: monumental landmarks and memory vectors can be seen in figure 9.

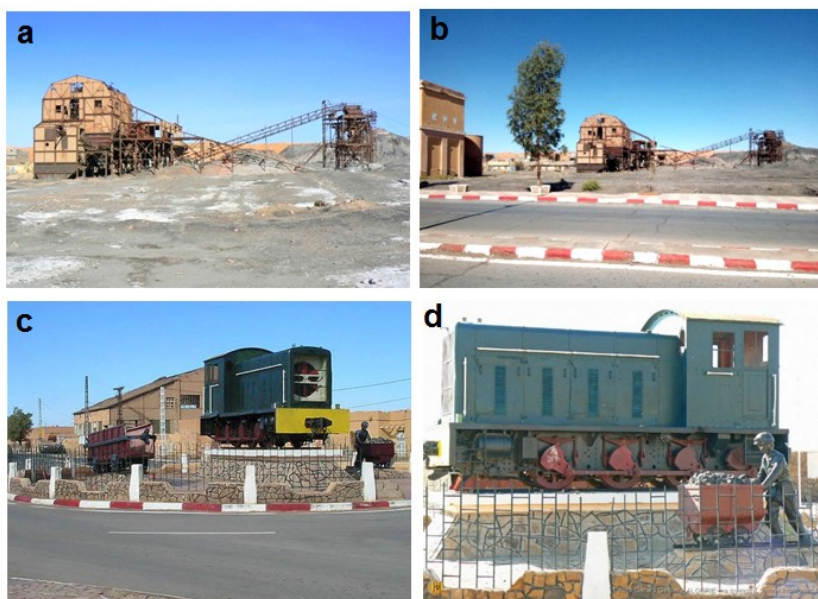


Fig. 9. Kenadsa coal: a - washing facilities, b - view on the industrial wasteland of Kenadsa, c and d - monument of a driving locomotive and a status of a miner pushing a cart filled with rock at the entrance to the city

Dominating the entrance to the city by their silhouette, the slag heaps have an impact on the landscape on the scale of the city of Kenadsa similar to that of the pre-eminent landmarks in any urban space.

As landscape elements distinguishing the identity of the places, the slag heaps represent the essence of the town and the symbol of the past industrial activity. They are vectors of particular emotion which challenge our gaze, and which forcefully question us on mining activity, extinct and yet so present by these monumental traces that it has left behind. The monumentality of some slag heaps makes them self-perceiving at distant distances.

Kenadsa inherits a natural geography with mostly peaceful reliefs. In this context without any significant roughness, the landforms of the slag heaps have the value of events. Thus, far from blending into the pre-existing landforms, the slag heaps, on the contrary, detach themselves from them, "claiming" for the most part their artificial origin to the benefit of their readability in the basin's landscapes.

Industrial buildings: a sign at the entrance to the city

The former Kenadsa washhouse and the remaining mine infrastructures at the entrance to the city also have an important "indicative" value. Their height, which is more remarkable than those of other constructions, associated with the old pits, constitutes a sign. These industrial buildings can be seen from long distances and thus makes the identification of the site easily spotted.

Beyond this sign and reference value, this industrial emblem is also a precious element because of its uniqueness, its singular architecture and its eminently symbolic status.

Like the slag heaps, the vestige of the washhouse has a manifold appearance around a unique function; a variety linked in particular to the evolution of construction and extraction techniques.

Landscape perceptions of slag heaps and mining facilities

The most common post-mining land use purposes include agriculture, forestry, recreation, construction, conservation and lakes. Although perception of post-mining landscapes is often negative, they can harbor unique natural, cultural and economic potential [15].

The perception of slag heaps and various mining installations in the landscapes of the city of Kenadsa is made possible by the presence of sufficiently clear spaces between the signal elements and the points from which they are observed. The elements “The former Kenadsa washhouse and slag heaps” that more or less closely frame these perceptions are all factors that influence perceptions and can reinforce, or on the contrary weaken the quality of views on the major mining landmarks. When we turn to reuse and redesign of previously destroyed landscapes, we may find surprising, sometimes unimaginable possibilities emerging [16]. The most successful examples of redesigned landscapes have evolved from negative legacies that have become the catalyst for transformation. The transformations of such landscapes are ‘distinguished by the creative approaches applied to problems traditionally resolved by engineers and scientists [17].

One factor that particularly generates landscape quality in the views of slag heaps is the readability of their relationship to their natural base which makes it possible to appreciate this contrasting relationship between natural reliefs that are often indolent, and those of the slag heaps which are artificial and more assertive. This relationship between the "heap object" and the ground evokes similar landscape relationships that concern high-profile sites such as: the great pyramids of Egypt on the Giza Plateau. It also evokes more urban situations, those of these monuments highlighted by the esplanades and open squares that accompany them, and which offer the necessary perspective to appreciate the overall composition of their facades.

Some natural reliefs (hillsides and ridge lines) or of mining origin (summits of slag heaps or headframes), offer interesting panoramas which allow the observation of the "signal" mining elements.

The recent appearance of industrial World Heritage Sites is indicative of a general shift in society towards a perception that industrial remains are now old enough to be the past, important enough to be international heritage and attractive enough to visit [18].

As long as the overhang effect is sufficiently strong, slag heaps and industrial buildings can be perceived from a long distance, even when their surroundings are urbanized or wooded.

The views concerned are therefore particularly attractive, as they generally allow these slag heaps and headframes to be understood in all the complexity and richness of their context.

Favourable sites for new uses and new sustainable vocations

Post-industrial mining sites are now well established as a magnet for residents of the city and its surroundings, and increasingly for visitors from further afield (Fig. 10). While remaining closely linked to the local mining history, these sites constitute a diffuse network of "attractive and "exotic" "breathing spaces" within the conurbation of the basin. Personal memory, through its affective and temporally complex nature, also has a powerful influence over perceptions of place in the present moment [19].



Fig. 10. View from above the colliery of Kenadsa

Post-industrial sites have become the support for multiple activities, mainly focused on laws, discovery and soft travel.

So,

- The topography of the heaps is an attractive support for certain sporting activities (Hiking, cycling, paragliding...) or more contemplative.
- The "esplanades" open spaces that provide remote views of the slag heaps and the old Lavoir are, in particular, strategic to allow the latter to be perceived in the landscape. These spaces can accommodate various popular festivals at official ceremonies, and thus providing the city which is in social decline, an opportunity to become a meeting place during such kind of occasions, where the remains of a former industrial activity add another significance to the area. In this manner, not only does the area regain its industrial value but it also flourishes (Figs. 11 and 12).



Fig. 11. Performance of the traditional Fantasia of horses



Fig. 12. Types of cultural religious events in Kenadsa

In this sense, the current ambitious policies of renewal and animation in industrial contexts can rely on celebration, visits “ziarates”, or culture in general. The practice of these activities is often an opportunity to discover or to make discover the history of these sites, reinforcing the tourist potential of the places.

Both of theory and practice focus on recovery, development and protection of ecosystem degradation problem [20]. Mine ecosystem restoration is one of the important fields of restoration ecology study. Theoretical research with sustainable development as the guiding ideology of theoretical study based on land reclamation, ecological succession and abandoned landscape construction in mining area [21-24].

Landscape planning, often referred to as ‘environmental planning’ or ‘ecological planning,’ is a way of directing or managing changes in the landscape so that human actions are in tune with nature and the environment [24].

These spaces are also conducive to the practice of educational activities related to the discovery of the environment. Indeed, despite their anthropic origin, some of these former mining sites are proving to be formidable reservoirs of biodiversity. The specificities of the slag heaps (Black shale soil that tends to retain heat, relief) attract species that are not normally found in the region.

Conclusion

The protection and enhancement of the landscape is a collective responsibility which requires the broad mobilization of the territory's stakeholders.

To ensure in a sustainable way the presence and legibility of the mining heritage in the landscape of the former mining industry of the city of Kenadsa are decisive elements. Incorrect en arabe

It is now crucial to preserve these open spaces in order to reveal the heritage value of the major mining landmarks.

Strategies to achieve this objective include the following:

- Protect and enhance the value of open spaces "esplanades" that include major mining landmarks in the landscape;
- Control and compose an urban development at the fringes of open spaces offering views of slag heaps;
- Keep away from heaps, projects and other vertical infrastructure that may compete excessively with them in the landscape;
- Enhance sites and routes that offer views of mining heritage;
- Control the development of tree vegetation around slag heaps;
- Preserve or restore continuity between mining sites and natural "great landscapes";
- Protect and enhance mining cities and remarkable built infrastructures;
- Linking the elements of the mining framework: underground mining galleries, slag heap rights-of-way, disused pit tiles and mining towns;
- Create an urban planning and an architecture of high which correspond with mining heritage elements.

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