Phosphatvilles

~

Territory, Settlements and Architecture in the Moroccan extraction site of Ouled Abdoun

Phosphatvilles

Phosphatvilles
~
Territory, Settlements and Architecture in the Moroccan extraction site of Ouled Abdoun

anteferma

Summary

Annalisa Trentin, Stefania Rössl, Elena Mucelli

Phosphatvilles

Discovered in the 1920s, the phosphate basins, of which the country is one of the world's largest exporters, have made Morocco's fortune. These basins, concentrated primarily in the central regions of the country, have fundamentally transformed Morocco's economic landscape, making it the world's largest phosphate exporter, controlling approximately 75% of global phosphate reserves. Thousands of people have been employed in the different areas related to their extraction and processing, entire towns and districts have been built to house workers, managers, employees. Ports have been built for cargo ships to transport the ore, which reaches the ocean through kilometers of underground pipelines, creating a complex industrial infrastructure network that remains vital to Morocco's economy today. At the head of these operations is the Office Chérifien des Phosphates (OCP), which, since 1920, has been directly and indirectly the responsible and promoter of profound territorial, landscape, and urban transformations.

Starting from the 1920s, Morocco experienced a season of modernization and industrialization, related to mining activities, which changed the face of a country devoted to agriculture and livestock breeding and where nomadism was a widespread practice. This transformation was particularly dramatic in its social implications, as it introduced wage labor and industrial time management to communities that had previously followed seasonal rhythms and traditional forms of economic organization.

The Khouribga region, located in central Morocco approximately 120 kilometers southeast of Casablanca, is one of the first to have been the subject of OCP's interests, as well as one of the largest and most productive. Around the Ouled Abdoun basins, discovered in 1920, are settled the mining hubs and towns of Boujniba, Boulanouare, Hattane, Khouribga and Oued Zem: these are the Phosphatvilles. Conceived as autonomous and independent centers, these settlements were designed according to a recurring scheme that planned the installation of water and elec-

tricity networks, the construction of infrastructures for the transport of phosphates, basic services for daily life (schools, hospitals, churches, mosques, leisure and sports facilities), residential neighborhoods for executives and office workers (cottages and terraced houses) and finally for workers. The architectural planning of these towns reflects both the technological advancement of the early 20th Century and the social hierarchies of the colonial period. While for the urban design of the executives' houses, OCP's architects and technicians drew inspiration from the model of European garden cities, particularly those developed in France and Britain, the workers' cities are organised according to a scheme of patio houses juxtaposed to form a compact settlement surrounded by a wall, in which the only collective space is located in a barycentric position and houses the market, the entrances to the mosque, the hammam and the collective bakery. This dual approach to urban planning reflected not only social hierarchies but also attempted to reconcile European industrial modernization with traditional Moroccan architectural forms and social practices. In general, OCP's mining towns are conceived as company towns reflecting the patterns of productive organisation as well as the colonial segregative policies of the time according to which European (ruling class) and Moroccan (working class) populations had to inhabit distinct parts of the city. From the point of view of their planning, these urban settlements reveal affinities with ongoing discussions in the international scene of the time and constitute a relevant case study for different disciplines, including urban planning, colonial studies, industrial archaeology, and social history. The spatial organization of these towns provides valuable insights into the ways in which industrial development, colonial power relations, and local cultural practices intersected in early 20th Century Morocco.

Recent surveys have revealed how the heritage of the *Villes Minières* in this region is now compromised or threatened with

disappearance. The degradation of historic industrial infrastructure, combined with rapid urbanization and changing economic priorities, poses significant challenges to the preservation of these unique urban landscapes. In recent years, the Moroccan government has launched the "Plan Maroc Vert" project, which, among other things, envisages the construction of new "green" cities (as Benguerir) and the rehabilitation of disused mining sites, proposing urban schemes based on the most avant-garde technological imperatives, which in fact suggest an idea of an exclusive and individual city in which collective spaces are almost non-existent and, at the same time, ignore the type-morphological issues underlying the consolidated city and the many successful experiments conducted in modern times in Europe and Morocco. This tension between heritage preservation and modern development represents a critical challenge for urban planners and policymakers. The documentation and study of moroccan *Villes Minières* are intended to respond to two fundamental issues: the need to make this unknown and generally disowned heritage known, with the aim of raising stakeholders' awareness of their architectural, urban, historical and cultural value, which should hopefully generate virtuous actions for their preservation; and the recovery of some design themes as a valid reference for projects capable of responding to the needs related to the future development of the territory. These objectives are particularly relevant in the context of Morocco's rapid urbanization and economic development, which threatens to erase important aspects of its industrial and cultural heritage.

This publication collects the contributions and a selection of the materials developed within the project of international cooperation for departmental development – call for proposals Unibo - Global South – financial year 2022 entitled *Villes Minières du Maroc* (*VDM*), led by Department of Architecture of the University of

Bologna in collaboration with École d'Architecture et de Paysage of Casablanca (EAC), Memory of Moroccan Modern Architects (MAMMA) association, Casamémoire association, NOSTOI cultural association, the PhD course in Architecture, Design, Knowledge and Protection of Cultural Heritage, DIDA-Department of Architecture of the University of Florence and AUIC School - ABC Department of the Milan Polytechnic. Led by Annalisa Trentin as scientific coordinator, the University of Bologna (DA-Unibo) research group consists of Elena Mucelli, Stefania Rössl, and Massimo Sordi Davide Giaffreda, Marika Mangano, Chiara Ciambellotti, Cecilia Fumagalli, Serena Orlandi and Alice Aloisi; this international collaboration project brings together diverse expertise in architecture, urban planning, heritage preservation, and social history. *Villes Minières du Maroc* (*VDM*) follows and deepens some experiences conducted independently by the DA-Unibo and the Cultural Association NOSTOI in collaboration with DIDA-Unifi and the AUIC-POLIMI School, in order to open a debate on the future of the Phosphate Valley in Morocco, destined to undergo increasingly massive urbanization, and establishing a comparison with the *Nature of Architecture* project (DA-Department of Architecture Unibo) developed on the theme of the mining village of Formignano (FC-IT). This comparative approach allows for valuable insights into different models of industrial heritage preservation and adaptive reuse.

The comprehensive exploration of this research topics was also made possible through the establishment of the Thesis laboratory *Villes Minières du Maroc* at the University of Bologna's Master's program in Architecture, Cesena campus. The laboratory (under the coordination of Annalisa Trentin) brought together thirteen students who actively engaged in thorough study and analysis work. Throughout its duration, the laboratory served as a dynamic learning environment, featuring a series of specialized seminars and interactive workshops that enriched the research process.

Villes Minières du Maroc (*VDM*) project, by structuring the experiences conducted and in progress, continues the debate on Moroccan mining towns, analyzing their forms of living and reconstructing a background to understand the logics of urban development, to elaborate design strategies that respond to the current settlement needs and the landscape and cultural characteristics of the places under study. The project represents an important contribution to the ongoing discussion about sustainable urban development in Morocco, particularly in regions with significant industrial heritage. It emphasizes the importance of preserving historical memory while adapting to contemporary needs and environmental challenges. The research also highlights the role of these mining towns in Morocco's broader economic and social development, serving as examples of early industrialization and urbanization in North Africa. Their study provides valuable lessons for contemporary urban planning, particularly in regions experiencing rapid industrialization and urbanization. The preservation and adaptive reuse of these industrial heritage sites could also serve as a model for sustainable development that respects both historical legacy and contemporary needs.

In the next pages
Jalade Max, *Khouribga c'est Phosphatville*, in "France-Eurafrique", n. 142, May-June 1963, pp. 22, 23. Archives Nationales d'Outre-Mer, Aix-en-Provence, France.

Bouamar Baghdad, Abdelkader Taleb,
Maria El Glaoui, Mohamed El Boujjoufi

Landscape Study of Urban Dynamics in Mining Towns in Morocco

~

The Khouribga Phosphate District

"Dans le Tiers-Monde, l'industrie minière exportatrice n'a, par elle-même, que des effets d'entraînement économique limités, quand elle ne provoque pas une urbanisation déstructurante pour l'environnement rural. L'essentiel de ses effets potentiels positifs passe par les revenus qu'elle procure à l'État, revenus qui ont leur contrepartie en devises".[1]

Contextualization: History and Geography of Mining Towns

Origins and development of mining towns in Morocco

Morocco, with its varied geology and rich mineral wealth, has a long history of mining activity in the various regions of the Kingdom. Indeed, Morocco has a long mining tradition, as evidenced by the many remains found in the country Some of these remains date back to the Phoenician period and show that mining was an essential part of the country's socio-economic activity for centuries.[2] Historians and archaeologists have identified and described a large number of remains of former mining operations.

Ancient accounts relating to the Roman period point to the remains of mining works at Jbel Lahdid (Essaouira region) for the extraction of iron ore, and at Sidi Rahhou, Jbel Mahsour and Sidi Boubker in the Oujda region for the exploitation of lead.

These remains bear witness to the strategic and economic importance of mines in our country. More importantly, mines were at the origin of the birth and development of numerous towns, often in a physically constraining environment, such as Sijilmassa (**fig. 1**), Tamdoult, Aqqa (**fig. 2**) or Jbel Aouam, most of which have now disappeared.

According to Adidi[3], two elements can explain the important role played by mines in Morocco's history. Firstly, mines helped to consolidate the economy and intensify trade with foreign countries, mainly with Saharan and sub-Saharan Africa, as well as with Mesopotamia and Europe. Secondly, mines have always been a symbol of power, domination and authority throughout the dynasties that have succeeded one another in Morocco. Indeed, armaments and coinage were the foundations of dynastic supremacy.

During the period of the Great Discoveries (15th and 16th centuries), Morocco attracted the fervour of many European powers in search of precious metals and other metallic substances for the manufacture of tools. It was the first target of neighbouring European countries because of its proximity and the richness of its subsoil. In 1415, the Portuguese seized the town of Sebta, then occupied Kssar Sghir and Anfa. In 1497, they settled in Massa and, two years

1 Giraud Pierre-Noël, *Géopolitique des ressources minières*, in "Politique étrangère", n. 2 – 48, 1983, pp. 476-477.

2 Office National des Hydrocarbures et des Mines du Maroc (ONHYM), *Annual report 2022*. Available on: www.onhym.com/en/publication (Last Access: October 2024).

3 Adidi Abdelaziz, *Les villes minières marocaines face au défi du développement durable*, in "Gregummrs ESO CNRS", Université du Maine, 2006.

1
Vestiges of Sijilmassa (journals.openedition.org).

2
Akka mines (legoutdailleurs.fr).

3
Royaume du Maroc, Ministère du commerce, de l'industrie, des mines et de la marine marchande, Direction des mines, de la géologie et de l'énergie, Division de la géologie, Map of former mines in Morocco: from prehistory to the 19th Century, 1975.

later, dominated Taghost and Ifrane in the Anti-Atlas (**fig. 3**).

Undoubtedly, the Western powers will realise that Morocco is a country rich in mineral resources – its subsoil contains a variety of mineral substances, and practically every region of the country has at one time provided (or still contains) mining products.

On the eve of the 20th Century, Morocco became a battleground of interests and conflicts between European groups and monopolies, particularly in the mining sector. Rivalry was acute between the major European groups (French, German, Spanish, Portuguese, etc.). Prospecting and mining work which began at the beginning of the 20th Century led to the 1924 discovery, in the Oriental region, of clay furnaces used to treat the ore on the basis of partial oxidation. In the Taddars region, two earthen lamps were found near veins used for tin mining.[4]

Morocco's first modern mines opened in the 1920's. At that time, the State was involved in evaluating various mineral substances in the country's subsoil (fluoride, iron, lead, cobalt, zinc, copper, manganese, silver, phosphates, antimony, tungsten, etc.). It was also at this time that the main public institutions for geological infrastructure, exploration and mining were created (OCP, BRPM, CNA, etc.).

It was precisely during this period that the main deposits came on stream: phosphate at Khouribga and Youssoufia (ex-Louis Gentil), lead at Boubaker – Touissite, Sidi Lahcene, Ahouli and Mibladene, iron at Ouichene and Aït Ammar, manganese at Imini and Bouarfa, cobalt at Bouazzer, etc., and other smaller deposits. But if there is one activity that has led to irreversible socio-spatial upheaval and, above all, has produced lasting urbanisation in the production areas, it is phosphate.

Mining was the main vector of socio-spatial transformation in production areas during the colonial period. Mining made a major contribution to the development of the national territory (railways, roads, ports, towns, etc.), and towns might never have materialised had it not been for the exploitation of numerous deposits during the colonial period. The opening up of the country by road and rail and the introduction of the market economy precipitated the decomposition of the semi-nomadic agro-pastoral structures that prevailed during the pre-colonial period.[5]

However, the discovery and exploitation of phosphate was a historic turning point for Morocco and the phosphate-producing regions, as well as for the world phosphate market. The exploitation of this mineral not only upset the traditional local balance, but above all gave a new direction to the country's colonisation and economy. The ex-

4 Lecomte, Paul, *Les sites pollués: traitement des sols et des eaux souterraines*, Lavoisier, New York, 1998.

5 Adidi Abdelaziz, *Les villes minières marocaines, entre ségrégation socio spatiale et marginalisation des populations périphériques*, Fondation Friedrich Ebert, Projet "Politiques Économiques pour la Justice Sociale", Tunisie, June 2017. Available on: www.mena.fes.de (Last Access: October 2024).

ploitation of phosphate deposits in the Oulad Abdoune and Gantour areas was the main vehicle for urbanisation: by creating new towns of varying sizes (Khouribga, Boujniba, Boulanouare, Hattane, Youssoufia, etc.); by encouraging the sedentation of nomads in the production regions; by contributing to the breakdown of pre-colonial tribal and agro-pastoral structures in the production zones; by giving rise to a new social category: the mining proletariat; and, above all, by bringing populations from various regions to the production zones.

According to Adidi[6], among the original urban concentrations are what can be called "resource cities "or cities that owe their birth and development to the existence of a natural resource, such as mining areas. The specific problem with these cities is that they only live as long as their economic base is secure. If this base changes (through the exhaustion of raw materials or changes in market conditions, etc...), these towns lose their raison d'être and have to look for a new economic base, or even a new identity. Otherwise, they risk becoming "ghost towns".[7]

In fact, during the 20th Century, a number of towns in the golden age of Moroccan mining were famous for their iron, haematite, baryte, lead and zinc deposits. Ouichane (Ouixane) (**fig. 4**): Nador region, Mibladen (**fig. 5**) and Ahouli (**fig. 6**): Midelt region, Touisset (**fig. 7**) and Sidi Boubker (**fig. 8**) and Jerada (**fig. 9**): Oujda region, etc. have given way to ghost towns.

In contrast to this pattern, some towns have continued to exist and develop despite the closure of the mine. One of these mines, which was abandoned in the mid-1980s, is located in the immediate vicinity of Zaida, a small town of 9,000 inhabitants that is currently growing rapidly and is the administrative centre of a rural commune that also includes several villages.

In fact, the Zaida lead mine which, due to its location on the Meknes-Errachidia Road axis, has instead developed into a rest stop centre for travellers and an annual souk for apples.

Breakdown of the main mining towns today

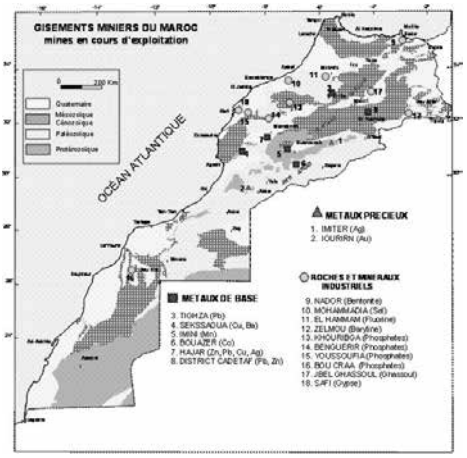
The map in Figure 14, based on the summary map published by Abarro et al.,[8] shows the country's various mines, broken down by type of exploitable material: precious metals, base metals and industrial rocks and minerals.[9]

Geographically and geologically, the different towns or mining centers of the mines exploited in Morocco are distributed as follows (**fig. 10**):

4
5
6
7
8
Ouixane iron mine (Nador);
Abandoned mine at Mibladen;
Ahouali abandoned mine;
Touisset mine; Sidi Boubker town.
Ph. B. Bouamar.

9
Fadel senna / AFP, Jerada town
and Anthracite tailings dam.
Ph. B. Bouamar.

6 *Ibidem*.
7 *Ibidem*.
8 Abarro Abdelaziz, Bouchta Rabah, Barodi El Bachir, *L'activité minière au Triple Junction*, Lecture Notes in Earth Science, 116, pp. 33-64, in "Chronique de la Recherche Minière", 531-532, 1998.
9 Mouttaqi Abdellah, Rjimati Ech-Cherki, Maacha Lhou, Michard André, Soulaimani Abderrahmane, Ibouh Hassan (eds.), *Les principales mines du Maroc / Main Mines of Morocco, in New geological and mining guides of Morocco*, Notes et mémoires du service géologique, 564, 9, Royaume du Maroc, Ministère de l'énergie, des mines, de l'eau et de l'environnement Direction du développement minier, Éditions du Service Géologique du Maroc, Rabat, 2011.



10
MEM, Map of current mining zones in Morocco, 2012.

11
CNEWS, Mine d'Imiter, 2014. Ph. B. Bouamar.

12
L'économiste, Bou-Azzer mine, 2018. Ph. B. Bouamar.

13
Energie, Mines & Carrières, Tighza mine, 2018. Ph. B. Bouamar.

1. The Eastern Anti-Atlas mines, with seven mines including the Imiter (**fig. 11**) and Bouskour silver mines, the Imi N-touza iron mine, etc.
2. The mines of the central Anti-Atlas, with a dozen or so mines including the Imni manganese mine, the Bleida Far West gold mine, the Bouazzer cobalt, nickel and zinc mines (**fig. 12**), etc.
3. The Western Anti-Atlas mines, with five mines including the Tazalarht copper mine, the Iourirn gold veins and the Jbel Tachilla oolitic iron.
4. Mines in the southern provinces, with four major mines: Tarfaya bituminous marl (Laayoune province), Boukra phosphate mine (Laayoune province) and Lafwila (Ouday çfa) gold prospect (Awserd province).
5. The Central Plateau and Massif Central mines, with six mines including the Khouribga phosphate district, the complex mining district: the El Hammam and Achmmach deposits and the Tighza-Jbel Aouam polymetallic district (Moroccan Massif Central).
6. The mines of the central High Atlas with three mines, the copper mine of the Tansrift red layers (Azilal Atlas), the Ali-ou-Daoud mine (Imilchil, central High Atlas) and the Aguerd n'Tazoult mine, a Zn-Pb mine in the central High Atlas.
7. Mines in the Southern Meseta and Western High Atlas, with around ten mines, including the Ganntour phosphate mines: Benguerir and Youssoufia (**fig. 13**), the Roc Blanc silver deposit (Jebilet) and the Hajjar polymetallic sulphide deposit.
8. Upper Moulouya and Eastern High Atlas mines (four), including the Upper Moulouya lead district (Aouli-Mibladen, Zeïda), Bou-Arfa manganese and Tamlelt-Menhouhou gold deposits.
9. Mines in the Middle Atlas and Horsts, including (four) Touissit-Bou Beker (north-eastern Morocco), the Jerada coalfield, Tazekka antimony and Timahdite oil shale (Middle Atlas).
10. The Prérif and Rif mines (three) e Fnideq-Beni Mezala antimony district (northern Rif), Beni Bou Ifrour-Ouixane iron deposits (eastern Rif) and the bentonite and perlite of the volcanoes in the Nador region (eastern Rif).

Finally, Morocco has long been developing its mining sector. Morocco has set up advanced research, mining and mineral enrichment units. The country has also been careful to train the managers and technicians needed for its mining industry. In addition to phosphates, which today represent a key pillar of the Moroccan economy, the country mines a wide range of mineral substances and produces large volumes of silver, lead, zinc, cobalt, copper, fluoride, manganese, baryte, etc.

With this in mind, since 2019 Morocco has launched several mining research projects in different regions and for different materials: precious metals, base metals and industrial rocks and minerals.

Environmental impact and sustainable development

Since the end of the 19th Century, the mining sector has developed without concern for the release of toxic elements into the environment. In fact, natural resources were long considered to be renewable, even inexhaustible over human generations, and capable of absorbing the waste from our activities without consequence.[10] We now know that natural resources (soil, water, sediment, flora and fauna) are characterised by a fragile balance and are vulnerable. These resources are constantly under threat, both from the heavy legacy of the past and from the amount of land devoted to industrial development.

The main issues associated with mines, especially abandoned mines, are contamination of natural resources (soil, surface water, sediment and groundwater), loss of terrestrial and aquatic habitat for wildlife, disruption of land use and economic spin-offs.

Abandoned mines can be the site of ground subsidence, violent rockfalls, ruptured waste rock piles and tailings dams, all of which can have serious repercussions for public safety and the environment. In addition, the state of the underground rock mass at these mines has an impact on land use, as they can be dangerous for people who carry out activities in the vicinity without being aware of the risks they entail. Finally, mine drainage, chemical leaching of toxic substances and metals, and erosion attributable to abandoned mines also represent a major environmental issue.[11]

Main types of environmental impact related to mining activity

The dynamics of mining are part of global economic processes, and the extraction of primary mineral resources involves numerous ecological, economic and social risks. The risks include local impacts (ecosystems, biodiversity, aquifers, Dutch disease economy, loss of cultural identity and social cohesion, population health, inequalities) and global impacts (greenhouse gases - GHGs). They also raise fundamental questions about the environmental and social sustainability of growth, the reduction of inequalities and poverty, and the reconfiguration of citizenship.[12]

The main environmental problems associated with mine tailings storage sites (mainly concentrator tailings and mine waste rock) relate to the chemical and physical stability of the tailings.

Most of the impacts that a mining residue can have on the environment result from a combination of the possible movement in space of its solid particles and the potential polluting capacity of its chemical components through transport in solution.

In environmental terms, the potential for mining waste to harm the natural environment is directly related to the useful substances

10 Lecomte, Paul, *Les sites pollués: traitement des sols et des eaux souterraines, op. cit.*

11 Baghdad Bouamar, *Environmental and socio-economic impacts of the abandoned Zaida mine (Haute Moulouya, Morocco)*, Habilitation Universitaire, Faculté des Sciences, Universitaire Ibn Tofail, Kenitra/UCL, Belgium), 2008.

12 Iraki Aziz, Smouni Abelaziz, Chevrillon-Guibert Raphaëlle, Fabrice Colin, *LMI AMIR: Activité Minière Responsable au Maroc: Enjeux, défis et solutions*, 2020. Available on: www.prodig.cnrs.fr (Last Access: October 2024).

mined, also known as mineralisation, and the minerals that accompany their emplacement (gangue minerals). These mineral phases, at varying levels of concentration in mining waste, are liable to cause pollution by releasing toxic elements (metallic trace elements) and anions that affect the physicochemical characteristics of water (acidity, sulphates, halides, etc.) as a result of the degradation of their structure after exposure to climatic hazards. To this potential must also be added the products added during the physicochemical treatments required to refine the useful substances. Thus, the specific characteristics of each site and each type of residue can only be properly assessed by direct observation: assessment of pollution or proven physicochemical instabilities on the site where the stockpiles likely to supply secondary raw materials are stored, characterisation of residues by mineralogical and chemical analyses, identification and speciation of potential pollutants, analysis of the susceptibility to being mobilised by leaching tests, etc.[13]

The environmental impacts of mining operations vary considerably depending on a number of factors, including the geographical and topographical location of the deposit, the type of deposit and the ore mined. The various environmental impacts affecting the environment include landscape disturbance due to changes in topography and the presence of heaps, slag heaps, quarries and mining lakes, etc.; presence of a high contaminant potential in heaps, slag heaps, etc.; pollution of surface and groundwater; health and safety of populations due to the presence of unsecured mining works and the use of polluted products (water and others).[14]

Environmental consequences of mining activities

Minerals and metals play a central role in the global economy and mining is an important source of economic development in many countries. However, the harmful effects of mining remain a challenge that society must recognise and address.[15]

Mining is not without its effects on the environment and the health of the people who live near these sites. Mining can disrupt natural environments in a number of ways: by transforming landscapes, depositing solid waste and discharging liquid and atmospheric effluents. This can inevitably damage the environment and the quality of life of neighbouring populations.[16]

13 Observation Français des Ressources des les InFrastructures (OFRIR), *Déchets miniers*, May 2006. Available on: www.ofrir2.ifsttar.fr/materiaux/categorie-de-materiaux/residus-sous-produits-industriels-miniers/dechets-miniers-ofrir1 (Last Access: October 2024).

14 Bureau de Recherches Géologiques et Minières / Service Géologique National – BRGM, *Hydrogeological study of the Saclay plateau (Essonne). Etude réalisée dans le cadre des actions de Service public du BRGM99-D094*, December 1999. Available on: www.infoterre.brgm.fr/rapports/RR-40840-FR.pdf (Last Access: October 2024).

15 Responsible Mining Foundation – RMF, *Harmful impacts of mining: when extraction harms people, environments and economies*, 2021. Available on: www.responsibleminingfoundation.org (Last Access: October 2024).

16 De Dieu Mangambu Mokoso Jean, *Exploitation minière semi-industrielle dans la rivière Aruwimi, Bassin du Congo (RDC). Impératifs et exigences du développement durable des communautés locales*, Editions Edilivre, Paris, 2023.

In Morocco, mining operations over several decades have left behind piles of sterile material that disfigure the urban fabric. These spoil heaps, which present a problem of stability linked to the action of run-off and landslides, constitute a very cumbersome legacy (**figs. 14, 15**).

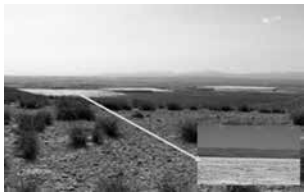
The mining districts of the Upper Moulouya (Aouli-Mibladen-Zeïda districts), located on the banks of the Moulouya wadi in eastern Morocco, made a major contribution to national lead production. These mining districts are currently abandoned without effective closure or rehabilitation.

Metallic contamination of aquatic ecosystems has attracted the attention of researchers from a wide range of backgrounds. It is one of the most threatening aspects of pollution in these environments. Its harmful effects could lead to critical or even dangerous situations, sometimes affecting the ecological balance of these ecosystems. Pollution is a topical issue that is of concern to all regions that are keen to maintain their water resources at a high level of quality. The Upper Moulouya region is a case in point, where there has been significant mining activity from 1972 to 1985. Lead accounts for a large proportion of this mining, with production in excess of 170,000 ton of concentrates, i.e. around 3.5% of world lead production.[17]

The Zaida mining district map[18] (**fig. 16**) shows the major impact of mining activity in this region. Various visual impacts have been recorded on satellite images and the negative environmental impacts noted are significant.

The environment is therefore a major problem for mining areas, insofar as the towns produced by the mining economy (lead, zinc, copper, coal, phosphate, etc.) suffer from multiple pollution and degradation factors. The situation is also very worrying for abandoned mining centres.

Action needs to be taken by the various mining and/or local players to remedy the situation, in particular by landscaping the slag heaps, covering them with earth and planting them with well-adapted trees. This will not only eliminate the current nuisance but will also create much-needed green spaces to brighten up a mostly austere environment. Appropriate measures must also be envisaged for the treatment of waste and tailings produced by mining.



Sustainability initiatives and policies (contribution of the mining sector to sustainable development)

The importance of mining to global economic development is indisputable. Since the 2000s, mining has grown steadily, albeit very unevenly from one continent to another. Today, it is generally accepted that mining contributes to achieving Sustainable Development Goal

14
Zaida dikes (Midelt region) with desert surface of dike 1. Ph. B. Bouamar.

15
Mibladan tailings dam (Midelt region - Eastern Morocco). Ph. B. Bouamar.

16
Visual impact of the abandoned Zaida mine on the satellite image (Spot - XS of 29 November 2002) of the area, 2008. Ph. B. Bouamar.

17 Wadjinni Ahmed, *Le plomb au Maroc: cas des districts de Touissit et de Jbel Aouam*, in "Chronique de la Recherche Minière", 531-532, 1998, pp. 9-28.

18 Baghdad Bouamar, *Environmental and socio-economic impacts of the abandoned Zaida mine (Haute Moulouya, Morocco), op. cit.*

(SDG8) on decent work and economic growth, as well as other SDGs[19], provided that negative impacts on the environment, workers and local communities are effectively addressed. In recent years, governments, employers and workers have taken steps to promote other SDGs.[20]

As a result, mining companies around the world are re-examining their role in society and their contribution to social, environmental and economic objectives. This means improving their relationships with local governments in host countries, indigenous peoples, mining communities, workers and suppliers, as well as taking into account the complexity of operating in a shared environment with different operators, while minimising the environmental impact of mining and respecting fundamental rights and labour law.[21]

In this regard, employers and workers in the large-scale mining sector are increasingly turning to international instruments, principles and standards to assess and improve the sector's performance and its contribution to decent work and sustainable development. Governments are increasingly taking steps to promote the contribution of mining to inclusive economic and social development.

In recent years, the Moroccan mining sector has been faced with new challenges relating to social and environmental requirements. Aware of this situation, the Moroccan government introduced a development strategy for the sector for the period 2013-2025 in 2013. This strategy, drawn up in consultation with the mining industry, was supported in 2014 by a 2015-2025 roadmap, set out in an action plan, for the development of geological and geothematic mapping. This strategy, which set ambitious targets for improving the mining sector's performance by 2025, recommended the structural projects to be implemented to achieve them.[22]

Six years after the strategy was put in place, a mid-term review was carried out in 2019. This assessment made it possible to diagnose the state of progress of achievements under the 2013-2025 strategy, and to draw up an inventory of actions to be developed and adjustments to be made in order to speed up its implementation. It was in this context that the

19 United Nations Development Programme (UNDP), *Africa Human Development Report*, 28 August 2016. Available on: www.undp.org (Last Access: October 2024).; United Nations Conference on Trade and Development – UNCTAD, *Achieving the sustainable development goals in the least developed countries. A Compendium of Policy Options*, United Nations, 2018.

20 International Labour Organization (ILO), *Women in mining - Achieving gender equality*, International Labour Organization, 2021.

21 Vallet Nathalie, El Boujjoufi Mohamed, *Exploring ways to measure the socio-economic impact of NBS: the use of the SROI*, pp. 51-57, in Centro de Estudos Sociais Laboratório Associado Universidade de Coimbra (ed.), *Making urban regeneration inclusive through nature-based solutions: contributions from the solidarity economy*, Cescontexto Publishes, Coimbra, 2023.; International Labour Organization (ILO), *Employment and social issues in the world. Trends 2021*, International Labour Office, Geneva, 2021.

22 Conjoncture économique Maroc: Le Centre Marocain de Conjoncture, *Le Secteur Minier au Maroc: Situation et perspectives de développement*, 23 novembre 2021. Available on: www.cmconjoncture.com/conjoncture/presse?title=2013-2025 (Last Access: October 2024).

process of drawing up the "Plan Maroc Mines (PMM)" was initiated.[23]

Following the implementation of a legal arsenal on environmental issues by Morocco, in particular Law n. 33-13 on mines and Law n. 27-13 on quarries, the participative construction of the new strategic vision for the mining sector identified six major challenges for the development of the national mining sector, in particular, enhancing the sector's image and improving its social acceptability and its impact on local development.

The PMM 2021-2030, which updates the development strategy for the national mining sector, has built on the achievements of the 2013 strategy and made the necessary and appropriate adjustments, taking into account current imperatives and the convergence of the interests of the various stakeholders, in order to make the national mining sector a driving force for responsible and sustainable development at local, regional and national level, combining good governance, economic integration, respect for the environment and the principle of sustainability, and respect for the rights of the local population; economic integration; respect for the environment and the principle of sustainability; and respect for people's rights.

The PMM thus defined lays the foundations for a global approach aimed at developing a competitive mining sector by 2030, working towards integrated industrialisation and sustainable growth.

Several initiatives have been undertaken by active mining companies to improve their environmental image. One example is the Office Chérifien des Phosphates (OCP), which has developed a strategy for its mines to reorganise the mining town and bring it up to standard for sustainable development. Projects to afforest the slag heaps were started a long time ago (in the 2000s) using endemic or exotic plants at the phosphate mines in the Sidi Chenane region (**figs. 17, 18**).

Recently, a large-scale programme to restore and rehabilitate mining towns has been launched for the towns of Khouribga, Benguerir, Youssoufia, etc., with the creation of villes vertes (green towns) and the setting up of social leisure infrastructure (gardens, squares, etc.), a library, a mining memorial museum, etc.

In addition to these many "inclusive" actions, OCP has implemented a number of largescale ecourban planning projects on its landholdings, including the rehabilitation of former mining sites into green mines, green new towns and sustainable technopoles. These projects, which are the subject of a strong media campaign, favour a highly entrepreneurial approach that uses the tools and methods of the private sector.[24] By their nature, consistency and international scope, they mark a major turning point in the way OCP and its subsidiaries intervene in mining areas.[25]

17
Reforestation with Atriplex (Sidi Chenane). Ph. B. Bouamar.

18
Phytoremediation using Jatropha Curca (Sidi Chenane). Ph. B. Bouamar.

23 *Ibidem*.

24 Harvey David, *From Managerialism to Entrepreneurialism: The Transformation in the Urban Governance in Late Capitalism*, in "Geografiska Annaler. Series B, Human Geography", 71, 1, 1989, pp. 3-17.

25 Harroud Tarik, *Urbanisme entrepreneurial "durable" au Maroc: Quel(s) changement(s) pour les villes minières?*, in "Justice Spatiale/Social Justice", 9, 2020, pp. 1-26.

Spread over large tracts of land and offering dense and diversified programmes, these projects have been designed according to recognised principles and standards of sustainability and environmental protection, with very detailed specifications for improving environmental efficiency. Unlike other property developers in Morocco, who have adopted French Environmental Certification (HQE), OCP has favoured cutting-edge North American certification (LEED) as part of a marketing and positioning strategy in relation to its competitors.[26] In addition, there is a clear preference for world-renowned design offices and architectural firms, which lend an internationalised image to the phosphate group's mega-projects.[27]

Socio-economic and community dynamics of mining towns

Social and economic composition of local populations

The extraction of ores or mineral fuels is a highly localised activity, the development of which can lead to the formation of dense population groupings. Large-scale mining production often gives rise, ex nihilo, to one or more urban concentrations that stand out for their morphology, their intra-urban structures and their social and territorial functions. A mining area can be defined as a geographical space that has been transformed and developed to ensure the production, processing and transport of the ore extracted. Mining areas are strongly characterised by monoactivity. Mining activity, which is often predominant, structures the space, the landscape, the economy, social relations, culture, and so on. For anthropologists and psychosociologists, mining also structures minds by producing social values, collective and individual behaviour, specific group reactions, perceptions and representations.[28]

However, the mining area is not just a physical configuration, it is a set of networks and social relationships, it is:

- A space that is manufactured, identified, sized, polarised and appropriated by the mining company and the people who live there;
- A cultural, social, ideological and political heritage;
- An area of domination and power struggles.

Mining heritage often coexists with pre-mining forms of spatial organisation. The mining town may be "spontaneous" or planned and created from scratch by the mining company. Mining towns cannot be isolated from the mining activity and space that produced them. As with any economic space, the mining town is the node, the hub, the structuring unit of the mining space produced.

Today, the enhancement and promotion of mining heritage has become a matter of public policy, insofar as it forms part of a wider con-

26 *Ibidem*.

27 Barthel Pierre-Arnaud, Zaki Lamia, *Les holdings d'aménagement, nouvelles vitrines techniques del'action urbaine au Maroc. Les cas d'Al Omrane et de la CDG Développement*, pp. 205-227, in Zaki Lamia (ed.), L'Action urbaine au Maghreb. Enjeux professionnels et politiques, Karthala, Paris, 2011.

28 Adidi Abdelaziz, *Les villes minières marocaines face au défi du développement durable, op. cit.*

text, that of the local development of mining communities and regions. For example, promoting industrial and mining heritage is increasingly seen as one of the levers for the development and conversion of mining regions in decline or in crisis. This type of heritage is made up of both technical features and heterogeneous buildings that reflect the history of a production process and working conditions, as well as the living conditions of working-class populations for whom the rule was to group together in residential complexes in close proximity to the workplaces.

The housing estates built by the mining companies, particularly OCP, follow an overall pattern that reflects ideological concerns (social, cultural, safety and hygiene). The provision of housing has always represented a considerable advantage for miners, but it is also an ideal way for mining companies to maintain and control miners and their immediate families close to the workplace. Wherever mining companies have built housing estates, they have designed them according to their organisational model.[29]

According to several studies[30], among others, the urban planning adopted enshrines the guiding principles of exploitation: paternalism, hierarchy, division of labour, etc., but the originality is that these mining towns are in most cases the first foci of urbanisation that is often uncontrolled and anarchic.

It is therefore legitimate to ask questions about the different forms of urbanism produced by the mine, and how they relate to and function in the mining area in general. Given the risky nature and arduous conditions of mining work, the housing provided for miners took on a major social and ideological function. By building mining towns, companies are not only aiming to provide accommodation for their staff, but also, through carefully thought-out urban planning, to produce a stable, docile micro-society that is easy to control and hard-working.[31]

Impact of mining industries on local communities

The various studies on the effects of mining on developing countries[32] show that the impact on living standards and conditions remains uncertain and, secondly, the instabilities associated with primary specialisations, which have become more pronounced since 2008, have had an impact on the definition and implementation of development strategies and policies.[33]

29 Adidi Abdelaziz, Michel Laferrère, *Espace minier et formes de croissance urbaine: le bassin phosphatier de Khouribga, Maroc: la problématique du développement d'une ville minière marocaine*, Thesis, Université Jean Moulin, Lyon III, 1986.

30 Adidi Abdelaziz, *Les villes minières marocaines, entre ségrégation socio spatiale et marginalisation des populations périphériques, op. cit.*

31 Adidi Abdelaziz, *Les villes minières marocaines face au défi du développement durable, op. cit.*

32 Biresselioglu Mehmet Efe, Demir Muhittin Hakan, Gonca Arsen, Kolcu Onat, Yetim Ahmet, *How vulnerable are countries to resource curse? A multidimensional assessment*, in "Energy Research and Social Science", 47, January, 2019, pp. 93-101.; Badeeb Ramez Abubakr, Lean Hooi Hooi, Clark Jeremy, *The evolution of the natural resource curse thesis: A critical literature survey*, in "Resources Policy", 51 (C), 2017, pp: 123-134.; Gilberthorpe Emma, Papyrakis Elissaios, *The extractive industries and development: The resource curse at the micro, meso and macro levels*, in "*Extractive Industries and Society*", 2, 2, 2015, pp. 381-390.; James Alexander, *The resource curse: A statistical mirage?*, in "Journal of Development Economics", 114, 2015, pp. 55-63.; Smith Brock, *The resource curse exorcised: Evidence from a panel of countries*, in "Journal of Development Economics", 116, 2015, pp. 57-73.

33 Géronimi Vincent, Mainguy Claire, (2020). *Mining and development: still controversial effects*, in "Mondes en développement", 189, January, 2020, pp. 7-29.

The impact on living standards and conditions remains uncertain, and the instabilities associated with primary specialisations have weighed heavily on the definition and implementation of development strategies and policies.[34] Since 2015, the fall in prices has revealed the same mistakes as in the past, such as indebtedness, too rapid a pace of exploitation and a lack of diversification strategies.[35]

The "new" mining regulations introduced since the 2000s, such as the Extractive Industries Transparency Initiative (EITI) and voluntary codes (UN Global Compact, corporate social and environmental responsibility schemes) focus on these very issues, to promote transparency on the size of mining revenues, and on how they are distributed and allocated between mine stakeholders (including local populations), at international, regional, national and local levels.[36]

In fact, since the early 1990s, as is the case almost everywhere in the world, communities living in the vicinity of mining projects have opposed the progress of mining operations. It should be pointed out that the mining industry is the catalyst and bedrock of modern economic growth, so any disruption to the security of supplies of mining products warrants a mobilisation of the international community.

These claims are the expression of a contemporary demand that decisions to develop mining resources should incorporate the principles on which globalisation is based, namely: respect for the right to collective and individual development, respect for human rights, including the right to the environment, and the participation of communities, or individuals, in making any decision that may affect their lives.[37]

A study of the issue of community mobilisation against mining in African countries with established mining traditions, such as Morocco, shows that mobilisation against mining projects is a reality.

The attempted solutions and the institutions designed to implement them in this new Eldorado are far from making most of the mining projects undertaken there immune from the wrath of protesters in the long term.[38]

In Morocco, there is a considerable contradiction between the promotion of sustainable entrepreneurial urban planning by mining companies, particularly OCP, and the deplorable social and economic situation that persists in its mining territories. Despite the new citizen approach adopted by the group, the link between the eco-urbanism projects launched and the local level, understood here in its social, economic and political dimensions, remains weak.

34 Venables Antony J., *Using natural resources for development: Why has it proven so difficult?*, in "Journal of Economic Perspectives", 30, 1, 2016, pp. 161-184.

35 Lahn Glada, Stevens Paul, *The curse of the one-size-fits-all fix: Re-evaluating what we know about extractives and economic development*, in "WIDER Working Paper", 21, January, 2017.

36 Géronimi Vincent, Mainguy Claire, (2020). *Mining and development: still controversial effects, op. cit.*

37 Gnamien Yao, *L'Industrie minière face aux évolutions sociétales: quels impacts des attentes des populations et des collectivités locales sur le développement des projets miniers?* Thesis, Ecole Nationale Supérieure des Mines de Paris, 2014.

38 *Ibidem*.

It would appear that these new projects do not represent a break with, but an extension of, the old segregated and fragmented configuration that has long marked mining towns. Insofar as they benefit the image of the mining companies and their international development prospects, the new measures put in place as part of the sustainable entrepreneurial urban planning approach actually conceal and perpetuate the dynamics of social and territorial marginalisation. This is evidenced by the persistence of a deplorable social and economic situation in most of these areas, and the still marginal involvement of local political, associative and ordinary players in the implementation of these projects.[39]

Finally, it is clear that mining affects the socio-economic activities of the local population (miners and local residents) and the environment. Compliance with the codes, laws and procedures in force will make it possible to remedy these impacts.

Case study: City of Khouribga

As part of the *Villes Minières du Maroc* (*VDM*) project, our study focuses on an in-depth landscape analysis of the specific mining town of Khouribga.

The Khouribga phosphate district

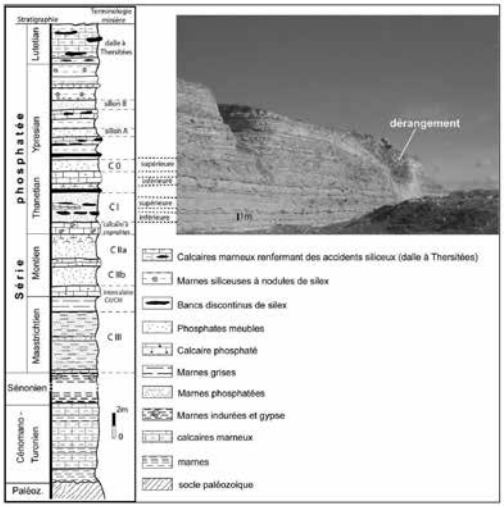
Khouribga is a mining town located on the geological Central Plateau. This is essentially the area of tiered plateaux that stretches from Settat to Oued Zem, and joins up southwards with the Tadla. Its upper part is known as the *Phosphate Plateau*, as it is here that the remarkable phosphate deposits of the Khouribga region are found.

The Oulad Abdoun Plateau, or Phosphate Plateau, is an inner part of the Atlantic coastal basin that extended across the western Meseta during the Upper Cretaceous-Eocene.[40] It contains the world's largest phosphate deposits and stretches between the 6°W and 7°35'W meridians, and the 32°15' and 33° parallels to the north. Its importance lies not only in its vast surface area, but also in the high levels of marine phosphates found there.[41] In addition to this economic aspect, this plateau is also very well studied from a palaeontological point of view due to its great wealth of fossils of ma-

39 Harroud Tarik, *Urbanisme entrepreneurial "durable" au Maroc: Quel(s) changement(s) pour les villes minières?*, *op. cit*.

40 Zouhri Samir, Kchikach Azzouz, Saddiqi Omar, El Haïmer Fatima Zahra, Baidder Lahssen, and Michard André, *The Cretaceous-Tertiary plateaus*, pp. 331-358, in: Michard André, Saddiqi Omar, Chalouan Ahmed, Frizon De Lamotte Dominique (eds.), *Continental Evolution: The Geology of Morocco. Lecture Notes in Earth Sciences*, 116, Springer, Berlin, Heidelberg, 2008.

41 Boujo Armand, *Contribution à l'étude géologique du gisement de phosphate crétacé-éocène des Gantours (Maroc occidental)*. P*hD Thesis, Université Louis Pasteur de Strasbourg, Institut de géologie*, 1972, in "Sciences Géologiques. Mémoire", 43, 1976, pp. 1-227; Moutaouakil Driss, Giresse Pierre, *Petrology and sedimentary environments of mesocenozoic phosphates from the Ouled Abdoun basin (Morocco)*, in "Bulletin de la Societe Geologique de France", 164, 3, 1993, pp. 473-491.



19
El Assel Nora *et al.*, p. 51, Phosphate sedimentary series in the Khouribga-Ouled Abdoun region.

rine and terrestrial vertebrates of Maastrichtian to Ypresian age.[42]

Near the towns of Khouribga and Oued Zem, the sedimentary series forming the plateaux is traditionally described[43] as comprising five major superimposed lithological units.

The phosphate series proper (**fig. 19**) begins with phosphate marls and limestone levels very rich in bone debris, known as bone-bed limestones of Maastrichtian age.[44] This stage heralds the start of phosphatogenesis, which reaches its peak in subsequent stages. The Montian is represented by loose phosphates surmounted by limestones with coprolites and flint nodules, which constitute a mining landmark during mining.

These phosphate deposits, operated by the Office Chérifien des Phosphates, are in full operation. Annual production was 44 Mt in 2018.[45] After various treatments: screening, washing, drying, calcination, etc.[46], the phosphates are transported by rail to the ports of Casablanca and Jorf Lasfar (south of El Jadida), where there is a chemical complex for the manufacture of superphosphates and sulphuric acid. In 2013, a pipeline carrying a mixture of phosphate and water (mini pipeline) came into service for transport to Jorf Lasfar.

Mining began in March 1921 at Khouribga. A second mine was opened at Youssoufia in 1931 and a third later in 1976 at Benguerir. OCP Group then diversified by investing in phosphate processing and setting up chemical sites in Safi (1965) and Jorf Lasfar (1984).

In 2008, Office Chérifien des Phosphates became OCP Group SA, owned by the Moroccan State and the Banque Populaire Group. OCP has strengthened its relationship with communities, demonstrated its commitment to reducing the impact of mining activities on the environment and motivated its partnerships with innovative local and international companies.

42 El Assel Nora, Kchikach Azzouz, Teixidó Teresa, Peña José Antonio, Jaffal Mohammed, Guerin Roger, Lutz Pascale, Jourani Es-Said, Amaghzaz Mbarek, *A ground penetrating radar and electrical resistivity tomography prospection for detecting sterile bodies in the phosphatic bearing of Sidi Chennane (Morocco)*, in "International Journal of Geosciences", 2, 4, 2011, pp. 406-413.

43 *Ibidem*.

44 Boujo Armand, *Contribution à l'étude géologique du gisement de phosphate crétacé-éocène des Gantours (Maroc occidental)*. *op. cit*.; Suberbiola Xabier Pereda, Bardet Nathalie, Jouve Stéphane, Iarochène Mohamed, Baâdi Bouya Baâdi, Amaghzaz Mbarek, A *new azhdarchid pterosaur from the Late Cretaceous phosphates of Morocco*, in "Geological Society, London, Special Publications", 217, 1, 2003, pp. 79-90.

45 El Assel Nora, Kchikach Azouz, Durlet Christophe, AlFedy Njiwa, El Hariri Khadija, Charroud Mohammed, Amaghzaz M'Barek. J. E. G., *Mise en évidence d'un Sénonien gypseux sous la série phosphatée du bassin des Ouled Abdoun*: *Un nouveau point de départ pour l'origine des zones dérangées dans les mines à ciel ouvert de Khouribga, Maroc*, in "Estudios Geológicos", 69, 1, 2013, pp. 47-70.

46 Gharbi Aziz, *Les phosphates marocains*, in "Chronique de la recherche minière", 531-532, 1998, pp. 127-138.

Birth and development of the town of Khouribga

The development of one of the world's largest phosphate deposits (in terms of volume and quality) was to radically transform not only the economy, but also the demographic and social structures around which the life of a formerly nomadic population was organised.

Mining activity created the basic infrastructure needed to make an almost desert area viable, and above all it created the first nucleus of population and consequently the urban core of the town of Khouribga. As a new town, Khouribga owes its origins to mining, and its development has remained linked to the boom in the phosphate economy. However, since the end of the protectorate, which was accompanied by a boom in mining activity, Khouribga has experienced very sustained urban growth.[47]

During the Protectorate, the OCP played a key role in the development of the built environment in Morocco.

Until independence in 1956, the OCP worked with the colonial administration's planning departments, such as the Ponts et Chaussées Coloniaux (1920) and Travaux Publics Coloniaux (1952 to 1955).[48]

In this context, urban planning and architecture were not the prerogative of architects and town planners, but were more often entrusted to engineers of various specialities. Each with their own rationality – from purely economic reasoning to more enlightened ideas advocating quality housing and community services for workers – they were responsible for many of the urban and architectural complexes linked to mining activities.[49] The result in the Gantour region is a landscape of mining towns of very different sizes, such as Boujniba, Boulanouare, Hattane and Khouribga.

Khouribga, like most mining towns built by companies with an extremely clear and compartmentalised urban structure, can be interpreted on the one hand as a spatial expression of the general principles of mining management, and at the same time as a form of social and cultural control. The town of Khouribga, located in the centre of the country 120 km south-east of Casablanca and also the largest mining town founded by OCP, is one of the best examples of this.[50]

The urban structure of Khouribga clearly follows the Taylorist logic of a strict separation of functions, and is thus divided into four distinct zones (production units as well as the OCP factories, the so-called "executives' town", the area in the centre is the administrative district which acts as a buffer zone between the town of Europeans and that of Muslims. The fourth is separated from the others by sports facilities, green areas and the railway line: it is the economic housing area (Lebyoute and Hay Salam neighbourhoods) where the mine workers are housed (**figs. 20, 21**).

47 Sahsah Mohammed, *Naissance et développement d'une ville minière marocaine: Khouribga*, PhD thésis, Université Saint-Etienne, 1996.

48 Avermaete Tom, Gosseye Janina, *Urban Design in the 20th Century: A History*, GTA Verlag, Zurich, 2021.

49 *Ibidem*.

50 *Ibidem*.

OCP not only designed housing for its workers, but also tried to promote education. From the outset, the Khouribga plan included the design of school facilities. Even more important was the physical well-being of the mine workers and employees. The plans contained extensive areas for sport and recreational activities.

During the 1950s, new discoveries were brought on stream, along with new processing plants (Beni Idir and Sidi Daoui). Khouribga no longer had a monopoly on phosphate processing. Khouribga was undergoing major transformations in terms of its area. The few outlying *douars* were demolished in 1955 and their inhabitants rehoused in the new *Médina du Séchage*.

What emerges from these brief historical indications is the importance of the OCP in the history of the city, in terms of its employment capacity, its financial resources and its housing policy. It could be said that the OCP was the city's creator and driving force. But from the beginning of the 1950s, Khouribga's urban population grew at a rate that far exceeded the mine's capacity to absorb it. Between 1952 and 1960, Khouribga doubled its population and became one of Morocco's fastest-growing cities, with almost 100% growth.[51]

In 1959, Khouribga was promoted to the rank of Municipality, then to that of Province Capital in 1967. The city reached a population of almost 73,000 in 1971, then 127,000 in 1982, 153,000 in 1994 and 216,828 in 2014 (latest census).

Between 1960 and 1984, the phosphate economy underwent profound changes. OCP adopted new capitalist development strategies to escape the vagaries of the international economic situation, as the world phosphate market was characterised by fierce competition. The Khouribga zone evolved and tended towards the use of increasingly advanced technology. Underground mining is giving way to opencast mining.[52]

Demographically, with a considerable increase in the non-mining population, the mine having become incapable of absorbing all the active workers, hence the development of latent urban unemployment and a so-called "survival" or informal economy, despite the development of the administrative function and the commercial apparatus.

In social terms, the weakening of the mine's role has led to a strong hierarchical structure in the urban population. OCP agents and their immediate families appear to many city dwellers as a privileged minority. OCP executives form a veritable caste within the urban elite, given their income and social benefits: villa, company car, holidays, medical care.

Finally, in terms of space, urbanisation over the last thirty years has resulted in a strong compartmentalisation and hierarchisation of space. Urban expansion outside OCP has given the city a dual spatial structure.

20
The executive housing estate, 1947 (Archives diplomatiques, Ministère de l'Europe et des Affaires étrangères, Protectorat Maroc). Ph. J. Belin.

21
The swimming pool, 1955 (Archives diplomatiques, Ministère de l'Europe et des Affaires étrangères, Protectorat Maroc). Ph. J. Belin.

51 Adidi Abdelaziz, *Les villes minières marocaines, entre ségrégation socio spatiale et marginalisation des populations périphériques*, *op. cit.*

52 Outahyoun Siham, Boulguid Aya, Sabi Safaa, *Analyse paysage de la ville minière de Khouribga (Maroc)*, Projet de fin d'études, Master Paysage, École d'Architecture et de Paysage de Casablanca – EAC, 2024.

The town of Khouribga is organised around two structures:

- A more modern, more European OCP centre;
- A non-OCP centre resembling a medina, with its small shops, *kissarias*, services, etc.

From all the above, we can deduce that Khouribga is gradually losing its specific characteristics as a mining town, unlike Boulanouare and Hattane, which remain heavily enclosed.

In recent years, the town has been transformed, both in the village (the mining town) and in other parts of the town.

In terms of landscaping, several infrastructures have been created and developed, often in partnership with OCP.

In 2013, the OCP Group began a process of integrated scientific tourism known as "Green Mine", which will cover more than 300 ha, with a media library, cafeteria and auditorium. An amusement park and an environmental park will then be built, along with a range of leisure, sports, property and hotel facilities. All of this will be integrated into a tourist circuit, including the Khouribga mine museum.

Green Mine

For the phosphate capital of the world to breathe an air of renewal, the completion of a number of projects is essential. Aware of this, OCP has started in Khouribga with the creation of the green mine.

The "Green Mine" project (**fig. 22**) is part of an overall environmental approach based on the sustainable rehabilitation of mining sites, a project that will undeniably contribute to the reinvention of the urban character of the phosphate capital, including the creation of a residential city and a megapark of attractions, a museum retracing the history of phosphate mining, a forest reserve for the planting of 2,300 trees over an area of 2,600 ha at the level of the mining sites being exploited with a view to extinction, and many others.

22
OCP, Master plan of the Green Mine project, 2024.

Conclusion

This work examined the complex dynamics of mining towns in Morocco, highlighting their historical evolution, their environmental and socio-economic impact, and the sustainability initiatives implemented by the Moroccan state and major mining groups.

Mining towns, intrinsically linked to the exploitation of natural resources, represent both economic development opportunities and environmental challenges. The example of a town like Khouribga illustrates how urban planning, dictated by the needs of mining companies, shapes not only the physical landscape but also the social and economic structure of local communities. However, dependence on mining resources exposes these towns to economic crises when they lose their productive base, sometimes leading to their transformation into ghost towns.

The environmental impacts of mining activities also remain a cause for concern, requiring concerted action to mitigate pollution and rehabilitate abandoned mining sites. Initiatives such as the Plan Maroc Mines and eco-urbanism projects are promising responses, aimed at integrating sustainability into the development of the mining sector. However, the effectiveness of these policies depends on greater inclusion of local communities and recognition of their rights and needs in decision-making processes.

The future of Moroccan mining towns will depend on their ability to reinvent themselves as sustainable entities, while preserving their identity and contributing to balanced socio-economic development. The transition to sustainable development models in these regions is not only desirable, but essential to ensure their resilience in the face of future challenges.

It is within this framework that scientific research at the Casablanca School of Architecture and Landscape (EAC) intends to address several research topics directly linked to practical achievements. The expected results of work on these research objectives are as follows:

- Significantly increased scientific collaboration between the two institutions, EAC and Unibo, with enhanced teaching and research capacity.
- Publication of research results, both objective (landscape and architectural analyses and their interpretations, socio-economic study data) and methodological (development of a decision-making tool), which can be reproduced and extended.

Bouamar Baghdad is an Associate Professor at the School of Architecture and Landscape of Casablanca and a former teacher-researcher at the Hassan II Agronomic and Veterinary Institute of Rabat. An environmentalist and expert in georesources with forty years of experience, he earned his doctorate in environmental sciences from Ibn Tofail University of Kenitra in collaboration with UCL Belgium. He is also an associate researcher in various scientific groups and has worked on numerous projects related to natural resources and the environment. He has conducted several training sessions on environmental assessments for development projects and programs, including their monitoring and evaluation, and on environmental pollution in air, soil, water, and vegetation.

Abdelkader Taleb is Associate Professor at the Casablanca School of Architecture and Landscape (EAC). Former teacher-researcher at the Hassan II Agronomic and Veterinary Institute of Rabat (IAV). Expert Botanist and Floristic Biodiversity, He obtained his State Doctorate in Agronomic Sciences in 1995 from Cedoc of the IAV. He is also a member of several multidisciplinary and multi-institutional scientific teams where he has participated in several projects in the field of natural resources and environment in general and on floristic aspects in particular. He has participated in several projects on the degradation and biodegradation of historic monuments, on soil phytoremediation, on invasive plants and aromatic and medicinal plants.

Maria El Glaoui is a Moroccan architect specializing in urban development and heritage. Her professional experience began in urban planning at the Agence urbaine de Rabat/Salé (2008-2014). During these years, her work focused primarily on the historic heritage sectors of the capital agglomeration, with an emphasis on understanding and manipulating the mechanisms by which the city is made. From 2014 to the present day, her main activity has been teaching architecture and urban planning. From 2022 to 2024, she was in charge of teaching at the Casablanca School of Architecture and Landscape. At the same time, she is conducting scientific research, focusing in part on the central High Atlas, from the study of monumental architecture (the Kasbah of Télouet) to the analysis of the contemporary transformation of mountain dwellings.

Mohamed El Boujjoufi is an architect, urban planner and researcher in urban sociology graduated from the University of Liège. He is currently a researcher at the Centre de recherche en urbanisme et aménagement du territoire LEMA (Local Environment Management & Analysis) at the University of Liège. Formerly Director of Partnerships and Research at the Casablanca School of Architecture and Landscape (EAC), his research explores the relationship between the spatial and social dimensions of cities. His work contributes to the development of new methods of urban governance, encouraging the involvement of citizens in the planning of spaces and territory. Through his research projects, he has experimented with innovative approaches to involving citizens in thinking about their city, rethinking classic "top-down" methods.

Bibliography

Abdelmajid Arrif, *La ville coloniale au Maroc*, communication at the seminar "Architectures exportées: transferts, expérimentations, métissages", Laboratoire Urbama (Université de Tours), équipe LAA (EAParis-la Villette), laboratoire Ladrhaus (l'EA Versailles), Tours, 1993.

Adidi Abdelaziz, *Les villes minières marocaines face au défi du développement durable,* in "Gregummrs ESO CNRS", Université du Maine, 2006.

Adidi Abdelaziz, *Les villes minières marocaines, entre ségrégation socio spatiale et marginalisation des populations périphériques*, Fondation Friedrich Ebert, Projet "Politiques Économiques pour la Justice Sociale", Tunisie, June 2017. Available on: www.mena.fes.de (Last Access: October 2024).

Adidi Abdelaziz, Michel Laferrère, *Espace minier et formes de croissance urbaine: le bassin phosphatier de Khouribga, Maroc: la problématique du développement d'une ville minière marocaine*, Thesis, Université Jean Moulin, Lyon III, 1986.

Agence Ter, *Sols vivants, socles de la nature en ville,* Exposition à la Galerie de l'architecture, Paris, 2021.

Amar Hicham, Benzaazoua Mostafa, Elghali Abdellatif, Hakkou Rachid, Taha Yassine, *Waste rock reprocessing to enhance the sustainability of phosphate reserves: a critical review,* in "Journal of Cleaner Production", n. 381, 2022, pp. 1-17.

Angélil Marc, Charlotte Malterre-Barthes (eds.), *Cairo Desert Cities*, Ruby press, Berlin, 2018.

Ashley Ken, Cordell Dana, Mavinic Donald, *A brief history of phosphorus: From the philosopher's stone to nutrient recovery and reuse,* in "Chemosphere", n. 84, 2011, pp. 737-746.

Avermaete Tom, *À la recherche des villes patronales: les petites villes minières marocaines dans les archives européennes*, pp. 118-125, in Piaton Claudine, Godoli Ezio, Peyceré David (eds.), *Construire au-delà de la Méditerranée*, Publications de l'Institut national d'histoire de l'art, Paris, 2012.

Avermaete Tom (ed.), *Another Modern: The Post-War Architecture and Urbanism of Candilis-Josic-Woods*, NAI Publishers, Rotterdam, 2005.

Avermaete Tom, Casciato Maristella (eds.), *Casablanca Chandigarh. A Report on Modernization*, Canadian Centre for Architecture and Park Books, Zurich, 2014.

Avermaete Tom, Gosseye Janina (eds.), *Urban Design in the 20th Century: A History*, GTA Verlag, Zurich, 2021.

Avermaete Tom, Johan Lagae (eds.), *L'Afrique, C'est Chic. Architecture and Planning in Africa 1950-1970*, NAi Publishers, Rotterdam, 2010.

Avermaete Tom, Serhat Karakayali, Von Osten Marion (eds.), *Colonial modern. Aesthetics of the past rebellions for the future*, Black dog publishing, London, 2010.

Azaitraoui Mustapha, Bouaouinate Asmae, Hassani Bouchra (eds.), *Les espaces ruraux au Maroc: dynamiques et mutations*, Cahier de la recherche géographique n. 3, Ayoris, Rabat, 2020.

Azaitraoui Mustapha, Feltrin Lorenzo, Vacchiano Francesco, *The Social Life of Phosphate on the Two Shores of the Mediterranean: Ecology, Work and Migration*, 2022. Available on: www.noria-research.com (Last Access: October 2024).

Babas Latifa, *Jerada: Les conséquences économiques et démographiques de la fermeture officielle de la mine*. Available on: www.yabiladi.com/articles/details/60572/jerada-consequences-economiques-demographiques-fermeture.html (Last Access: October 2024).

Badeeb Ramez Abubakr, Lean Hooi Hooi, Clark Jeremy, *The evolution of the natural resource curse thesis: A critical literature survey*, in "Resources Policy", 51 (C), 2017, pp. 123-134.

Baghdad Bouamar, *Environmental and socio-economic impacts of the abandoned Zaida mine (Haute Moulouya, Morocco)*, Habilitation Universitaire, Faculté des Sciences, Universitaire Ibn Tofail, Kenitra/ UCL, Belgium), 2008.

Barbier Thibault, Delorme Mathieu, and Rives Charles, *Du sol foncier au sol vivant*, in "Projets de paysage. Revue scientifique sur la conception et l'aménagement de l'espace", n. 27, 30 December 2022.

Bardet Nathalie, Suberbiola Xabier Pereda, Iarochene Mohamed, Bouyahyaoui Fatima, Bouya Baadi, Amaghzaz M'barek Amaghzaz, *Mosasaurus beaugei Arambourg, 1952 (Squamata, Mosasauridae) from the Upper Cretaceous phosphates of Morocco*, in "Science Direct", Elsevier, Geobios, 37, 3, 2004, pp. 315-324.

Barthel Pierre-Arnaud, *Le Maroc à l'heure de l'éco-urbanisme: innovations et décalages sur le terrain des premiers projets urbains "verts"*, pp. 77-89, in Dupret Baudouin, Rhani Zakaria, Boutaleb Assia, Ferrié Jean-Noël (eds.), *Le Maroc au présent. D'une époque à l'autre, une société en mutation*, King Abdul-Aziz al-Saoud Foundation, Casablanca, 2015.

Barthel Pierre-Arnaud, Clerc Valérie, Philifert Pascale, *La "ville durable" précipitée dans le monde arabe: essai d'analyse généalogique et critique*, in "Environnement Urbain / Urban Environment", n. 7, 2013, pp. 16-30.

Barthel Pierre-Arnaud, Zaki Lamia, *Les holdings d'aménagement, nouvelles vitrines techniques del'action urbaine au Maroc. Les cas d'Al Omrane et de la CDG Développement*, pp. 205-227, in Zaki Lamia (ed.), *L'Action urbaine au Maghreb. Enjeux professionnels et politiques*, Karthala, Paris, 2011.

Baudelle Guy, *Le système spatial de la mine, l'exemple du bassin houiller du Nord-Pas-de-Calais*, PhD Thesis, Université Lille III, 1995.

Béal Vincent, *Greening the Neoliberal City? Urban Sustainability and Selective Neo-liberalization in Manchester and Nantes*, pp. 119-135, Pinson Gilles, Morel Journel Christelle (eds.), *Debating the Neoliberal City*, Routledge, London, 2017.

Beauchamp Weldon Harold (ed.), *Tectonic evolution of the Atlas mountains, North Africa*. Cornell University, Ithaca, New York, 1998.

Belbahri Abd-el-Kader, *Formation urbaine et espaces migratoires: l'exemple de Khouribga (Maroc)*, pp. 161-172, in Ganne Beranard, Haeringer Philippe (eds.), *Anthropologie et sociologie de l'espace urbain* (Programme Citadinités: Dossier 2), Université de Lyon 2, GLYSI, Bron, 1986.

Benjelloun Touimi Youssef, *Le Développement de la ville phosphatiere de Khouribga*, Thesis, U.P.A. n. 6, 1982.

Benjelloun Zineb, Saoud Karim, *Phosphate mining and the circular economy: Morocco's OCP Group's approach to sustainable water use*, in Davis Cheryl, Rosenblum Eric (eds.), *Sustainable Industrial Water Use: Perspectives, Incentives, and Tools*, IWA Publishing, 2021.

Bergeron Kristina Maud, Jébrak Michel, Yates Stéphanie, Séguin Charles, Lehmann Valérie, Le Meur Pierre-Yves, Angers Philippe, Durand Suzanne, Gendron Corinne, *Mesuer l'acceptabilité sociale d'un projet minier: essai de modélisation du risque social en contexte québécois*, in "Vertigo. La Revue électronique en Science de l'Environnement", vol. 15, n. 3, December 2015, pp. 1-32.

Bianca Stefano, *Urban Form in the Arab World. Past and Present*, vdf Hochschul verlag an der ETH, Zürich, 2000.

Bianco Luisa, *Emigrare dal Marocco. Squilibri socio-ambientali ed esodo da un polo minerario (Khouribga) (1921-2008),* PhD Thesis XXV, Facoltà di Lettere e Filosofia, Dottorato in "Società, politica e culture dal tardo medioevo all'età contemporanea", Università di Roma - Sapienza, Roma, 2012.

Bianco Luisa, *Emigrare dal Marocco. Squilibri socio-ambientali ed esodo da un polo minerario (Khouribga) 1921-2013*, Rubettino, Soveria Mannelli, 2015.

Biresselioglu Mehmet Efe, Demir Muhittin Hakan, Gonca Arsen, Kolcu Onat, Yetim Ahmet, *How vulnerable are countries to resource curse? A multidimensional assessment*, in "Energy Research and Social Science", n. 47, January 2019, pp. 93-101.

Bleuchot Hervé, *Une ville minière marocaine: Khouribga*, in "Revue de l'Occident musulman et de la Méditerranée", n. 6, 1969, pp. 29-51. Available on: www.persee.fr/doc/remmm_0035-1474_1969_num_6_1_1004 (Last Access: October 2024).

Bogaert Koenraad, *The Revolt of Small Towns: The Meaning of Morocco's History and the Geography of Social Protests*, in "Review of African Political Economy", 42, 143, March 2015, pp. 124-140.

Bonneuil Christophe, Fressoz Jean-Baptiste, Viallet Jean- Robert (eds.), *Nous avons mangé la Terre: l'événement anthropocène*, Seuil, Paris, 2022.

Bordaz Robert, *La conception de la rente chez Adam Smith,* in "Revue d'histoire Économique et Sociale", vol. 24, n. 2, 1938, pp. 101-108.

Boriani Maurizio (ed.), *La sfida del Moderno. L'architettura del XX secolo tra conservazione e innovazione*, Unicopli, Milano, 2003.

Bouba-Olga Olivier (ed.), *Pour un nouveau récit territorial*, Plan urbanisme construction architecture, La Défense, 2019.

Bouba-Olga Olivier, Talandier Magali, Vanier Martin, *Catégories et clivages. La fin de la paix territoriale?*, in "Multitudes", vol. 86, n. 1, 2022, pp. 202-208.

Boudon Philippe, *Pessac di Le Corbusier*, Franco Angeli, Milano, 1983.

Boujo Armand, *Contribution à l'étude géologique du gisement de phosphate crétacé-éocène des Gantours (Maroc occidental*), PhD Thesis, Université Louis Pasteur de Strasbourg, Institut de géologie, 1972*,* in "Sciences Géologiques. Mémoire", n. 43, 1976.

Bulletin économique et social du Maroc (1951). *Les phosphates marocains. Étude technique, commerciale et sociale (suite et fin)*, in "Bulletin économique et social du Maroc (BESM)", n. 51, 1951, pp. 573-577. Available on: www.cinumed.mmsh.univ-aix.fr/collection/item/84811-les-phosphates-marocains-suite-et-fin?offset=3 (Last Access: October 2024).

Bulletin économique et social du Maroc, *Les phosphates marocains. Étude technique, commerciale et sociale (graphiques)*, in "Bulletin économique et social du Maroc (BESM)", n. 27, 1945, pp. 108-123. Available on: www.cinumed.mmsh.univ-aix.fr/collection/item/83750-les-phosphates-marocains-etude-technique-commerciale-et-sociale-graphiques?offset=12 (Last Access: October 2024).

Bulletin économique et social du Maroc, *Les phosphates marocains. Étude technique, commerciale et sociale*, in "Bulletin économique et social du Maroc (BESM)", n. 50, 1951, pp. 403-413. Available on: www.cinumed.mmsh.univ-aix.fr/en/collection/item/84280-les-phosphates-marocains-tude-technique-commerciale-et-sociale (Last Access: October 2024).

Bureau de Recherches Géologiques et Minières / Service Géologique National – BRGM, *Hydrogeological study of the Saclay plateau (Essonne). Etude réalisée dans le cadre des actions de Service public du BRGM99-D094*, December 1999. Available on: www.infoterre.brgm.fr/rapports/RR-40840-FR.pdf (Last Access: October 2024).

Bureau de Recherches Géologiques et Minières / Service Géologique National – BRGM, *Les résidus miniers français: typologie et principaux impacts environnementaux potentiels*, in "Les techniques de l'industries minérales", n. 3, 3éme trimestre, 1999, pp. 77-110.

Caccia Gherardini Susanna (ed.), *Le Corbusier dopo Le Corbusier. Retoriche e pratiche nel restauro dell'opera architettonica*, Franco Angeli, Milano, 2014.

Campagne Pierre, Pecqueur Bernard (eds.), *Le développement territorial: une réponse émergente à la mondialisation*, C. L. Mayer, Paris, 2014.

Capomolla Rinaldo, Vittorini Rosalia (eds.), *L'architettura INA Casa (1949-1963). Aspetti e problemi di conservazione e recupero*, Gangemi, Roma, 2003.

Catin Maurice, Cuenca Christine, Kamal Abdelhak, *L'évolution de la structure et de la primatie urbaines au Maroc*, in "Région et Développement", n. 27, 2008, pp. 216-223.

Catin Maurice, Hanchane Saïd, Kamal Abdelhak, *Structure Industrielle, Externalités Dynamiques Et Croissance Locale Au Maroc*, in "Région et Développement", n. 25, 2007, pp. 45-63.

Catin Maurice, Van Huffel Christophe, *Urban concentration and industrialisation*, in "Mondes en développement", n. 121, 2003, pp. 87-107.

Caye Pierre (ed.), *Durer: Éléments pour la transformation du système productif*, Belles Lettres, Paris, 2020.

Cefaly Pietro (ed.), *Littoria 1932-1942. Gli architetti e la città*, Casa dell'Architettura, Latina, 2001.

Chiodi Cesare (ed.), *La città moderna*, Hoepli, Milano, 1945.

Chakroun Nadia, Taleb Mustapha, *Les cités ouvrières au Maroc. Cas de la ville de Khouribga*, Thesis, Ecole nationale d'Architecture de Rabat, 1992.

Chapus Roget (ed.), *L'exploitation des phosphates au Maroc. L'Office Chérifien des Phosphates*, Ernest Sagot, London 1928.

Chernoff Carlotta, Orris Greta, *Data Set of World Phosphate Mines, Deposits, and Occurrences. Part A. Geologic Data,* in "U.S. Geological Survey", 2002, pp. 1-352.

Chevallier Dominique (ed.), *L'espace social de la ville arabe,* Maisonneuve & Larose, Paris, 1979.

Clévenot Emmanuel, *Mine de lithium dans l'Allier: "Ne nous parlez pas de sauver le climat!",* in "Reporterre", December 2023. Available on: www.reporterre.net/Mine-de-lithium-dans-l-Allier-Ne-nous-parlez-pas-de-sauver-le-climat.

CNEWS, *La mine d'Imiter investit sur l'avenir*, 05/06/2014. Available on: www.cnews.fr/ (Last Access: October 2024).

Cohen Jean-Louis, Eleb Monique, *Casablanca: Mythes et figures d'une aventure urbaine,* Hazan, Paris, 1998.

Cohen Jean-Louis, Eleb Monique (eds.), *Casablanca: Colonial Myths and Architectural Ventures*, Monacelli Press, New York, 2003.

Collotti Francesco, *La médina, un livre ouvert / La medina, un libro aperto*, in Hadda Lamia (ed.), *Médina. Espace de la Méditerranée*, Firenze University Press, Firenze, 2021.

Conjoncture économique Maroc: Le Centre Marocain de Conjoncture, *Le Secteur Minier au Maroc: Situation et perspectives de développement*, 23 novembre 2021. Available on: www.cmconjoncture.com/conjoncture/presse?title=2013-2025 (Last Access: October 2024).

Cooper James, Lombardi Rachel, Boardman David, Carliell-Marquet Cynthia, *The future distribution and production of global phosphate rock reserves*, in "Resources, Conservation and Recycling", n. 57, 2011, pp. 78–86.

Cuneo Paolo, *Le città del mondo islamico tra conservazione e trasformazione,* in Paolo Cuneo, Ludovico Micara, Attilio Petruccioli (eds.), *Architettura nei Paesi Islamici. Seconda mostra internazionale di architettura,* Edizioni La Biennale di Venezia, Venezia, 1982, pp. 219-236.

Cuneo Paolo, Micara Ludovico, Petruccioli Attilio (eds), *Architettura nei Paesi Islamici. Seconda mostra internazionale di architettura.* Edizioni La Biennale di Venezia, Venezia, 1982.

Cuneo Paolo (ed.), *Storia dell'urbanistica. Il mondo islamico,* Laterza, Roma-Bari, 1986.

Dahmani Imad, El Moumni Lahbib (eds.), *Modern Casablanca Map*, MAMMA Group, Casablanca, 2019.

De Dieu Mangambu Mokoso Jean (ed.), *Exploitation minière semi-industrielle dans la rivière Aruwimi, Bassin du Congo (RDC). Impératifs et exigences du développement durable des communautés locales*, Editions Edilivre, Paris, 2023.

De Haas Hein, *Morocco: From emigration country to Africa's migration passage to Europe*, 2005. Available on: www.migrationinformation.org (Last Access: October 2024).

De Haas Hein, *Trans-Saharan Migration to North Africa and the EU: Historical Roots and Current Trends*, 2006. Available on: www.migrationinformation.org (Last Access: October 2024).

De Haas Hein, *Turning the tide? Why development will not stop migration*, in "Development and Change", vol. 38, n. 5, September 2007, pp. 819-841.

Derrida, Jacques (ed.), *Mal d'archives. Une impression freudienne*, Éditions Galilée, Paris, 1995.

Deshaies Michel (ed.), *Les territoires miniers, exploitation et reconquête*, Ellipses, Paris, 2007.

Dezzi Bardeschi Marco, *Conservare, non riprodurre il moderno*, in "Domus", 649, April, 1984, pp. 8-13.

Di Resta Sara, "*Less is (still) more*". *Il restauro dell'architettura razionalista: un quadro di insieme*, pp. 78-89, in Delizia Francesco, Di Francesco Carla, Di Resta Sara, Pretelli Marco (eds.), *La Casa del Fascio di Predappio nel panorama del restauro dell'architettura contemporanea. Contributi per aiutare a scegliere*, Bononia University Press, Bologna, 2015.

DOCOMOMO, *Italia giornale*, monographic number, 26, May, 2010.

Duchac Réne, *Propositions pour une recherche sur le développement de Khouribga, i*n "*Revue de l'Occident musulman et de la Méditerranée"*, n. 7, 1970, pp. 49-69. Available on: www.persee.fr/doc/remmm_0035-1474_1970_num_7_1_1058 (Last Access: October 2024).

Écochard Michel (ed.)*, Casablanca, le roman d'une ville*, Editions de Paris, Paris, 1954.

Edixhoven J. D., Gupta Joyeeta, Savenije Hubert H. G., *Recent revisions of phosphate rock reserves and resources: reassuring or misleading? An in-depth literature review of global estimates of phosphate rock reserves and resources*, in "Earth System Dynamics", n. 4, 2013, pp. 1005-1034.

Egan Dan (ed.), *The Devil's Element: Phosphorus and a World Out of Balance,* W. W. Norton & Company, New York, 2017.

El Assel Nora, Kchikach Azouz, Durlet Christophe, AlFedy Njiwa, El Hariri Khadija, Charroud Mohammed, Amaghzaz M'Barek. J. E. G., *Mise en évidence d'un Sénonien gypseux sous la série phosphatée du bassin des Ouled Abdoun: Un nouveau point de départ pour l'origine des zones dérangées dans les mines à ciel ouvert de Khouribga, Maroc*, in "Estudios Geológicos", 69, 1, 2013, pp. 47-70.

El Assel Nora, Kchikach Azzouz, Teixidó Teresa, Peña José Antonio, Jaffal Mohammed, Guerin Roger, Lutz Pascale, Jourani Es-Said, Amaghzaz Mbarek, *A ground penetrating radar and electrical resistivity tomography prospection for detecting sterile bodies in the phosphatic bearing of Sidi Chennane (Morocco)*, in "International Journal of Geosciences", 2, 4, 2011, pp. 406-413.

El Bamiki Radouan, Raji Otmane, Ouabid Muhammad, Elghali Abdellatif, Khadiri Yazami Oussama, Bodinier Jean-Louis, *Phosphate Rocks: a Review of Sedimentary and Igneous Occurrences in Morocco,* in "MDPI Minerals", n. 11, 1137, 2021 pp. 1-23.

Energie, Mines & Carrières Magazine**,** *Assistance and supportfor mining SMEs. Call for amendment of law 33-13*, 2019. Available on: www.energiemines.ma/ (Last Access: October 2024).

Energie, Mines & Carrières Magazine**,** *Health impacts of mining operations*, 2016. Available on: www.energiemines.ma/ (Last Access: October 2024).

Energie, Mines & Carrières Magazine, *Impacts des exploitations minières sur la santé*, 30 septembre 2016. Available on: www.energiemines.ma/impacts-des-exploitations-minieres-sur-la-sante/ (Last Access: October 2024).

Energie, Mines & Carrières Magazine**,** *Tighza, a new twist*, 2018. Available on: www.energiemines.ma/ (Last Access: October 2024).

Escoffier Claire, *Transmigration et communautés d'itinérances au Maghreb*, in Ali Bensaâd (ed.), *Le Maghreb à l'épreuve des migrations subsahariennes*, Paris, Karthala. 2009.

Extractive Industries Transparency Initiative (EITI), *Opening the data, building trust, Follow-up Report 2019*, Oslo, 2019. Available on: www.eiti.org (Last Access: October 2024).

Eyssautier Louis (ed.), *L'Industrie minière au Maroc: zone française*, Editions du Service Géologique du Maroc, Rabat, 1952.

Faccio Paolo (ed.), *Le Corbusier Sette Architetture. Conoscenza e conservazione dell'architettura del XX secolo*, Altralinea, Firenze, 2016.

Faouzi Mostafa, *Place de la population dans la réhabilitation des quartiers OCP de la zone minière de Khouribga*, Thesis, Institut National d'Aménagement et d'urbanisme Rabat, 2006.

Ferlaino Beatrice, *Il Marocco dei fosfati: politiche e discorsi nel governo del sociale,* Thesis, Università degli Studi di Torino, Dipartimento di culture, politica e società, Torino, 2018.

Fiori Sandra, Mariolle Béatrice, Poli Daniela, *Repairing post-mining territories through territorial, landscape, architectural and artistic approaches*, in "Les Cahiers de la recherche architecturale urbaine et paysagère", n. 7, 30 June 2020.

Foster John Bellamy. *Marx écologiste*, Éditions Amsterdam, Paris, 2011.

Foucault, Michel, *L'archéologie du savoir*, Gallimard, Paris, 1969.

Fumagalli Cecilia, Martinelli Eliana, Mossa Emilio (eds.), *Villes minieres/ Mininig cities*, series Quaderni, n. 1, Nostoi, Milano, 2020.

Fusaro Florindo, *La città islamica,* Editori Laterza, Bari, 1984.

Gadrey Jean, *La biodiversité n'est pas une ressource naturelle*, in "Reporterre", 9 September 2014. Available on: www.reporterre.net/La-biodiversite-n-est-pas-une-ressource-naturelle. (Last Access: October 2024).

Gallotti Jean, *Le jardin et la maison arabes au Maroc*, Librairie centrales des beaux-art, Parigi, 1926.

Geissler Bernhard, Steiner Gerald, C. Mewa Michael, *Clearing the fog on phosphate rock data. Uncertainties, fuzziness, and misunderstandings,* in "Science of the Total Environment", n. 642, 2018, pp. 250–263.

Geissler Bernhard, *Striving Toward a Circular Economy for Phosphorus: The Role of Phosphate Rock Mining*, in "Minerals" 2018, September 2018.

Goldhagen Sarah Williams, Legault Rejean, *Anxious Modernisms. Experimentation in Postwar Architectural Culture*, MIT Press, Cambridge, Massachusetts, 2002.

Guigou Jean-Louis, *Le sol et l'espace: des énigmes pour les économistes*, in "L'Espace géographique", vol. 9, n. 1, (1980), pp. 17–28.

Guigou Jean Louis, *La rente foncière: les théories et leur évolution depuis 1650*, Paris, Economica, 1982.

Guillibert Paul, *Terre et capital: pour un communisme du vivant*, Éditions Amsterdam, Paris, 2021.

Germann Georg, *De la plate-bande à la poutre Hennebique*, in "Histoire de l'art. Regards extérieurs. Études d'historiens étrangers sur l'art en France", n. 50, 2002, pp. 17-27.

Géronimi Vincent, Mainguy Claire, *Mining and development: still controversial effects*, in "Mondes en développement", n. 189, January, 2020, pp. 7-29.

Gharbi Aziz, *Les phosphates marocains*, in "Chronique de la recherche minière", 531-532, 1998, pp. 127-138.

Gilberthorpe Emma, Papyrakis Elissaios, *The extractive industries and development: The resource curse at the micro, meso and macro levels*, in *"Extractive Industries and Society",* n. 2, 2015, pp. 381-390.

Gnamien Yao, *L'Industrie minière face aux évolutions sociétales: quels impacts des attentes des populations et des collectivités locales sur le développement des projets miniers?* Thesis, Ecole Nationale Supérieure des Mines de Paris, 2014.

Hadda Lamia (ed.), *Médina. Espace de la Méditerranée*, Firenze University Press, Firenze, 2021.

Harribey Jean-Marie, *La portée écologiste de l'œuvre de Marx*, in "Actuel Marx", vol. 52, n. 2, 2012, pp. 121–29.

Harribey Jean-Marie, *La richesse, la valeur et l'inestimable: Fondements d'une critique socio-écologique de l'économie capitaliste*, Les Liens qui Libèrent, Paris, 2013.

Harroud Tarik, *"Sustainable" Entrepreneurial Urbanism in Morocco: What Change(s) for Mining Cities?*, in "Justice spatiale/Spatial Justice", n. 15, September 2020.

Harroud Tarik, *Urbanisme entrepreneurial "durable" au Maroc: Quel(s) changement(s) pour les villes minières?*, in "Justice Spatiale/ Social Justice", n. 9, 2020, pp. 1-26.

Harvey David, *From Managerialism to Entrepreneurialism: The Transformation in the Urban Governance in Late Capitali*sm, in "Geografiska Annaler. Series B, Human Geography", 71, 1, 1989, pp. 3-17.

Haut-Commissariat au Plan, *Monographie de la province de Khouribga*, 2017. Available on: www.hcp.ma/ (Last Access: October 2024).

Henry Patrick, *Des tracés aux traces: Pour un urbanisme des sols*, APOGEE, Rennes, 2023.

Hurel Jean, *Maroc. Khouribga: ville de phosphates*, in "Regard", n. 131, 1931, pp. 6-7.

Info Tourisme Maroc, Youssoufia. Available on: www.infostourismemaroc.com (Last Access: October 2024).

International Fertilizer Industry Association (IFA), *Global phosphate rock production trends from 1961 to 2010. Reasons for the temporary set-back in 1988-1994,* in "Feeding the Earth", October 2011, pp. 1-4.

International Labour Organization (ILO), *Employment and social issues in the world. Trends 2021*, International Labour Office, Geneva, 2021.

International Labour Organization (ILO), *Women in mining - Achieving gender equality*, International Labour Office, Geneva, 2021.

Iraki Aziz, Smouni Abelaziz, Chevrillon-Guibert Raphaëlle, Fabrice Colin, *LMI AMIR: Activité Minière Responsable au Maroc: Enjeux, défis et solutions*, 2020. Available on www.prodig.cnrs.fr (Last Access: October 2024).

Jackson Simon, *The Phosphate Archipelago: Imperial Mining and Global Agriculture,* in "French North Africa, Jahrbuch für Wirtschaftsgeschichte", vol. 57, n. 1, 2016, pp. 187-214.

Jacoud Gilles, *Jean-Baptiste Say et la critique de la physiocratie: l'opposition à Pierre Samuel Dupont de Nemours*, pp. 245–262 in Klotz Gérard, Minard Philippe, and Orain Arnaud (eds.), *Les voies de la richesse?*, PUF Rennes, Rennes, 2017.

James Alexander, *The resource curse: A statistical mirage?*, in "Journal of Development Economics", 114, 2015, pp. 55-63.

Jasinski M. Stephen, *Phosphate rock,* in "U.S. Geological Survey, 2019 Minerals Yearbook", March 2024, pp. 56.1-56.11.

Jasinski M. Stephen, *Phosphate rock*, in "U.S. Geological Survey, Mineral Commodity Summaries", January 2024, pp. 134-135.

Jest Camille, *Habitat du personnel journalier permanent de l'Office Chérifien des Phosphates*, in "Bulletin économique et social du Maroc (BESM)", n. 76, 1957, pp. 435-462. Available on: www.cinumed.mmsh.univ-aix.fr/collection/item/86339-habitat-du-personnel-journalier-permanent-de-l-office-cherifien-des-phoshates?offset=59 (Last Access: October 2024).

L'architecture d'aujourd'hui, *Habitations Collectives*, in "L'architecture d'aujourd'hui", 57, December 1954.

Lahlou Mehdi, *Les migrations irrégulières entre le Maghreb et l'Union européenne: évolutions récentes*. Rapport de recherche CARIM-RR 2005/03. Le Consortium Euro-méditerranéen pour la recherche appliquée sur les migrations internationales.

Lahn Glada, Stevens Paul, *The curse of the one-size-fits-all fix: Re-evaluating what we know about extractives and economic development*, in "WIDER Working Paper", The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, n. 21, January 2017.

Lalucq Aurore, *Économistes et écologie: des physiocrates à Stiglitz*, in "L'Économie politique", vol. 58, n. 2, 2013, pp. 35–52.

Lazarev Grigori, Pascon Paul, *Gestion des villages miniers,* OCP, Rabat, 1969.

Lecomte Paul, *Les sites pollués: traitement des sols et des eaux souterraines*, Lavoisier, New York, 1998.

L'Economiste, *Cobalt: L'australien Clancy exploitera la mine de Bou Azzer*, 24/07/2018. Available on: www.leconomiste.com (Last Access: October 2024).

La Direction de l'Office Chérifien à Rabat, *L'Office Chérifien des Phosphates*, Éditions africaines Perceval, Rabat, 1948.

Le Corbusier, *Architecture, the expression of the materials and methods of our times*, in "The Architectural Record", n. 66, August 1929, pp. 123-128.

Magalhaes Nelo (ed.), *Accumuler du béton, tracer des routes: une histoire environnementale des grandes infrastructures*, La Fabrique, Paris, 2024.

Malterre-Barthes Charlotte (ed.), *On Architecture and Greenwashing*, Hatje Cantz, Berlin, 2024.

Maricchiolo Luca, *Fenomeni di resilienza dello spazio pubblico di Rabat Salè, Dall'habitat di Michel Ecochard al progetto contemporaneo,* PhD Thesis, Università di Roma - Sapienza, Roma, 2015.

Marsh George Perkins (ed.), *Man and Nature; or, Physical Geography as Modified by Human Action*, C. Scribner & co., New York, 1864.

Marx Karl (ed.), *Capital: A Critique of Political Economy*, vol. 1, Vintage Books, New York, 1977, or. ed. Das Kapital. Kritik der politischen Ökonomie. Von Karl Marx. Erster Band. Buch I: Der Produktionsprocess des Kapitals*,* Otto Meissner, Hamburg, 1867.

Maktab al-Fusfāṭ al-Maghribī (ed.), L'*Effort social de l'O.C.P. en faveur de ses ouvriers,* Imprimerie Maroc-Matin, Rabat, 1952.

Material Cultures, *Material Reform. Building for a Post-Carbon Future*, MACK, London, 2024.

Mazkour Aimad (ed.), *Etude critique et amélioration des performances de l'unité de séchage des phosphates*, Université Sidi Mohammed Ben Abdellah, Fés, 2014.

Mbembe Achille, *The power of archive and its limits*, in Hamilton Carolyn, Harris Verne, Taylor Jane, Pickover Michele, Reid Graeme, Saleh Razia (eds.), *Refiguring the Archive*, Kluwer Academic Publisher, Dordrecht, 2002.

Meffre Gislhaine (ed.), *Architecture marocaine du XX siècle. Edmond Brion et Auguste Cadet*, Senso Unico Éditions, Mohammedia, 2010.

Meloni Giaime, Peghin Giorgio (eds.), *Voyages en Sardaigne – Nelle miniere di Iglesias / Into the Mines of Iglesias*, Caryatide, Paris, 2022.

Michard André, Saddiqi Omar, Chalouan Ahmed, Frizon De Lamotte Dominique (eds.), *Continental Evolution: The Geology of Morocco. Structure, Stratigraphy, and Tectonics of the Africa-Atlantic-Mediterranean Triple Junction,* Lecture Notes in Earth Sciences, n. 116. Springer, Berlin, Heidelberg, 2008.

Ministre de L'Énergie, des Mines et de L'environnement (MEM), *Carte Des Ressources Du Sous-Sol Marocain et Projets D'exploration*, 2012. Available on: www.mtedd.gov.ma (Last Access: October 2024).

Ministre de L'Énergie, des Mines et de L'environnement (MEM), *Plan d'action national pour la valorisation des rejets miniers*, 2021. Available on: www.mtedd.gov.ma (Last Access: October 2024).

Monde Arabe*, Etude. Les phosphates d'Afrique du Nord.* In "Monde Arabe", n. 28, 1968/4, pp. 27-39.

Monnin Alexandre, *Manuel de redirection écologique*, Éditions de l'Atelier, Paris, 2024.

Moutaouakil Driss, Giresse Pierre, *Petrology and sedimentary environments of mesocenozoic phosphates from the Ouled Abdoun basin (Morocco)*, in "Bulletin de la Societe Geologique de France", 164, 3, 1993, pp. 473-491.

Mouttaqi Abdellah, Rjimati Ech-Cherki, Maacha Lhou, Michard André, Soulaimani Abderrahmane, Ibouh Hassan (eds.), *Les principales mines du Maroc / Main Mines of Morocco*, in *New geological and mining guides of Morocco*, Notes et mémoires du service géologique, 9, 564, Royaume du Maroc, Ministère de l'énergie, des mines, de l'eau et de l'environnement Direction du développement minier, Éditions du Service Géologique du Maroc, Rabat, 2011.

Mumford Eric (ed.), *The CIAM Discourse on Urbanism, 1928-1960*, The MIT Press, Cambridge (MA), London, 2000.

Nasri Khouloud, Chtara Chaker, Hassen Chekir, Fiallo Marina, Sharrock Patrick, Nzihou Ange, El Feki Hafed, *Recrystallization of Industrial Triple Super Phosphate Powder*, in "Industrial and engineering chemistry research", vol. 53, n. 37, August 2014, pp. 14446-14450.

Nazzi Ikbal, *Airs parasitaires dans les fours secheur,* Université Moulay Ismail, Faculté des Sciences et Techniques Errachidia, Khouribga, 2013.

Nelva Riccardo, Signorelli Bruno (eds.), *Avvento ed evoluzione del calcestruzzo armato in Italia: il sistema Hennebique,* Edizioni di scienza e tecnica, Milano, 1990.

Niederberger Thomas, Haller Tobias, Gambon Helen, Kobi Madlen, Wenk Irina (eds.), *The Open Cut: Mining, Transnational Corporations and Local Populations*, Lit Verlag, Zurich, 2016.

O.C.P., *L'Effort social de l'O.C.P. en faveur de ses ouvriers*, Imprimérie Maroc-Matin, Rabat, 1952.

Observation Français des Ressources des les Infrastructures (OFRIR), *Déchets miniers*, May 2006. Available on: www.ofrir2.ifsttar.fr/materiaux/categorie-de-materiaux/residus-sous-produits-industriels-miniers/dechets-miniers-ofrir1 (Last Access: October 2024).

Office Chérifien des Phosphates (OCP), *Etude architecturale et paysagère du projet Mine Verte,* Edition 2011, 2024.

Office Chérifien des Phosphates (OCP), *OCP, Rapport d'activité du groupe*, 2014. Available on: www.ocpgroup.ma (Last Access: October 2024).

Office Chérifien des Phosphates (OCP), *Rapport d'activité de développement durable de l'OCP*, 2014. Available on: www.ocpgroup.ma (Last Access: October 2024).

Office Cherifien des Phosphates (OCP), *L'aventure OCP*, Available on: www.ocpgroup.ma (Last Access: October 2024).

Office Chérifien des Phosphates, *Office Chérifien des Phosphates. 1921-1946*, Éditions Africaines Perceval, Rabat, 1948.

Office National des Hydrocarbures et des Mines du Maroc (ONHYM), *Annual report 2022*. Available on: www.onhym.com/en/publication (Last Access: October 2024).

Ouassak Fatima, *Per un'ecologia pirata. E saremo liberi!* Tamu Edizioni, Napoli, 2024.

OujdaCity, *La Province de Jerada, relance son Programme de Developpement Local 2018-2020*, 19/06/2018. Available on: www.oujdacity.net/ (Last Access: October 2024).

Outahyoun Siham, Boulguid Aya, Sabi Safaa, *Analyse paysage de la ville minière de Khouribga (Maroc)*, Projet de fin d'études, Master Paysage, École d'Architecture et de Paysage de Casablanca – EAC, 2024.

Palacios Labrador Luis, Alonso Romero Beatriz, *When a Patio Becomes a City: (In)volution of Carrières Centrales, Casablanca (1953–2018)*, in "Architectural Research in Finland", vol. 5, n. 1, 2021, pp. 62–82.

Papyrakis Elissaios, Rieger Matthias, Gilberthorpe Emma, *Corruption and the Extractive Industries Transparency Initiative*, in "The Journal of Development Studies", 2, 53, 2017, pp. 295-309.

Pascon Paul, Lazarev Grigori, *Les villages miniers de la région de Khouribga (1960),* in "Bulletin économique et social du Maroc (BESM)", n. 155-156, 1986, pp. 157-184. Available on: www.cinumed.mmsh.univ-aix.fr/collection/item/86598-les-villages-miniers-de-la-region-de-khouribga-1960?offset=9 (Last Access: October 2024).

Pauty Edmond, *Tradition et modernisme à Casablanca*, in "*L'Architecture"*, n. 4, 15 April 1939, p. 140.

Peghin Giorgio, Sanna Antonella (eds.), *Carbonia. Città del Novecento*, Skira, Milano, 2009.

Peghin Giorgio (ed.), *Quartieri e città del Novecento. Da Pessac a Carbonia. La tutela del patrimonio urbano moderno*, Franco Angeli, Milano, 2010.

Peghin Giorgio, Sanna Antonello (eds.), *Il patrimonio urbano moderno. Esperienze e riflessioni per la città del Novecento*, Umberto Allemandi & C., Torino, 2011.

Peghin Giorgio (ed.), *Paesaggi Minerari. Tecniche, politiche e progetti per la riqualificazione del Sulcis-Iglesiente*, Letteraventidue, Siracusa, 2016.

Peghin Giorgio (ed.), *Paesaggi Minerari. Un progetto per la miniera di Monteponi*, Letteraventidue, Siracusa, 2018.

Pellegrini Giorgio (ed.), *Città di fondazione italiane 1928-1942*, Novecento, Latina, 2011.

Petruccioli Attilio (ed.), *After Amnesia: Learning from the Islamic Mediterranean Urban Fabric,* ICAR, Bari, 2007.

Petruccioli Attilio (ed.), *Dar-al-Islam: architetture del territorio nei paesi islamici,* Carucci, Roma, 1985.

Petruccioli Attilio (ed.), *Il giardino islamico: architettura, natura, paesaggio,* Electa, Milano, 1994.

Petruccioli Attilio, Khalil K. Pirani (eds), *Understanding Islamic Architecture,* Routledge, London, 2002.

Petruccioli Attilio, *New Methods of Reading the Urban Fabric of the Islamicized Mediterranean,* in "Built Environment", special issue: Islam and Built Form: Studies in Regional Diversity, vol. 2, n. 3, 2002, pp. 202-216.

Piaton Claudine, Godoli Ezio, Peyceré David (eds.), *Building Beyond the Mediterranean: Studying the Archives of European Businesses (1860-1970)*, Honoré Clair, Arles, 2012.

Pinson Daniel, *Modèles d'habitat et contre-types domestiques au Maroc*, Fascicule de Recherche n. 23, Centre d'Etudes Recherches URBAMA – Urbanisation du Monde Arabe, Laboratoire associé au C.N.R.S. n. 365 et Université Tours, Tours, 1992.

Privitera Francesca, Métalsi Mohamed (eds.), *Le signe de la Médina. La morphologie urbaine selon Roberto Berardi,* Firenze University Press, Firenze, 2016.

Raffak Tarik, Agouzoul Mohamed, Mabsate Mustapha, Chik Abdellah, Alouani Abdelkader, *Etude expérimentale d'un four rotatif de séchage des phosphates*, in "Revue des Energies Renouvelables SMSTS'08 Alger", n. 249-254, 2008, pp. 249-256.

Raymond André, *The Spatial Organization of the City, in* T*he City in the Islamic World,* edited by Salma Jayyusi, Renata Holod, Attilio Petruccioli, André Raymond, Brill, Leiden, Boston, 2008, pp. 47-70.

Responsible Mining Foundation - RMF, *Harmful impacts of mining: when extraction harms people, environments and economies*, 2021. Available on: www.responsibleminingfoundation.org (Last Access: October 2024).

Ricardo David, *The Principles of Political Economy and Taxation*, John Murray, London,1821.

Roesler Sasha (ed.), *Habitat marocain documents. Dynamics between Formal and Informal Housing. Tensions entre Logement Formel et Informel*, Park Books, Zurich, 2015.

Rogers Ernesto Nathan, Sert José Luís, Tyrwhitt Jaqueline (eds.), *CIAM. Il Cuore della Città: per una vita più umana delle comunità*, Hoepli, Milano, 1954.

Rouissi Karim, *Inhabiting Casablanca's Worker Quarters of Cosuma & Socica*, in The Funambulist magazine, March 9, 2018.

Ruiz Canovas Carlos, Macías Francisco, Perez-Lopez Rafael, Basallote María Dolores, Millan-Becerro Ricardo, *Valorization of wastes from the fertilizer industry: current status and future trends,* in "Journal of Cleaner Production", n. 174, 2018, pp. 678-690.

Sadiqi Fatima, Ennaji Moha, *The feminization of public space: women's activism, the family law, and social change in Morocco*, in "Journal of Middle East Women's Studies", vol. 2, n. 2, special issue: Women's Activism and the Public Sphere, Spring 2006, pp. 86-114.

Sahsah Mohammed, *Khouribga. Genèse d'une ville minière 1921-1994*, Université de technologie de Belfort-Montbéliard, Belfort, 2010.

Sahsah Mohammed, *Naissance et développement d'une ville minière marocaine: Khouribga*, PhD Thesis, Université Saint-Etienne, 1996.
Scarpa Federica, *Imparare dalla Medina. Interventi di completamento nei quartieri operai dell'Altopiano dei fosfati in Marocco*, Thesis, Università degli Studi di Firenze, Scuola di Architettura, 2022.

Scarpa Federica, *Learning from the medina. The workers' districts of the Phosphate High Plain,* in "*D'ar*" n. 4, Milano, 2023, pp. 91-102.

Smith Brock, *The resource curse exorcised: Evidence from a panel of countries*, in "Journal of Development Economics", 116, 2015, pp. 57-73.

Smith Shirley, Shepherd Derek, Dorward Peter, *Perspectives on community representation within the Extractive Industries Transparency Initiative: Experiences from south-east Madagascar*, in "Resources Policy", 2, 37, 2012, pp. 241-250.

Suberbiola Xabier Pereda, Bardet Nathalie, Jouve Stéphane, Iarochène Mohamed, Baâdi Bouya Baâdi, Amaghzaz Mbarek, *A new azhdarchid pterosaur from the Late Cretaceous phosphates of Morocco*, in "Geological Society, London, Special Publications", 217, 1, 2003, pp. 79-90.

Suter Karl, *Marokko in der Nachkriegszeit*, in "Geographica Helvetica", 31 December 1947, vol.2, pp. 229–242.

Tamblé Donato, *Fonti archivistiche per la storia dell'architettura e della città*, 283-289, in Tamblé Donato, Guidoni Enrico (eds.), *I centri storici di Graffignano, Monterosi, Roccalvecce. Gli abitanti e le case nel catasto gregoriano (1819-1820)*, Davide Ghaleb Editore, Vetralla, 2002.

Troin Jean-François, Naciri Mohamed, Troin Florence (eds.), *Maroc: régions, pays, territoires*, Maisonneuve et Larose, Paris, 2002.

United Nations Conference on Trade and Development – UNCTAD, *Achieving the sustainable development goals in the least developed countries. A Compendium of Policy Options*, United Nations, 2018.

United Nations Development Programme (UNDP), *Africa Human Development Report,* 28 August 2016. Available on: www.undp.org (Last Access: October 2024).

Vacherot P., *Note technique sur l'exploitation des phosphates a Khouribga*, Imprimerie officielle du Protectorate de la République Française au Maroc, Direction générale des travaux publiques, Service des mines et de la carte géologique, Rabat, 1937.

Vallet Nathalie, El Boujjoufi Mohamed, *Exploring ways to measure the socio-economic impact of NBS: the use of the SROI*, pp. 51-57, in Centro de Estudos Sociais Laboratório Associado Universidade de Coimbra (ed.), *Making urban regeneration inclusive through nature-based solutions: contributions from the solidarity economy,* Cescontexto Publishes, Coimbra, 2023.

Veltz Pierre, *Paris, France, Monde: Repenser l'économie par le territoire,* Editions de l'Aube, La Tour d'Aigues, 2013.

Venables Antony J., *Using natural resources for development: Why has it proven so difficult?*, in "Journal of Economic Perspectives", 30, 1, 2016, pp. 161-184.

Verrax Fanny, *Exploitation de lithium dans l'Allier: une mine responsable est-elle possible?*, in "The Conversation", 4 July 2024. Available on: www.theconversation.com/exploitation-de-lithium-dans-lallier-une-mine-responsable-est-elle-possible-231093. (Last Access: October 2024).

Wadjinni Ahmed, *Le plomb au Maroc: cas des districts de Touissit et de Jbel Aouam*, in "Chronique de la Recherche Minière", 531-532, 1998, pp. 9-28.

Weber Alfred (ed.), *Alfred Weber's Theory of the Location of Industries,* The University of Chicago Press, Chicago, 1929.

Western Sahara Resource Watch (WSRW), *P for plunder. Morocco's exports of phosphates from occupied Western Sahara,* in "WSRW report", April 2023, pp. 1-47.

Willm Frédéric, *Accumulateur en béton armé pour le stockage et le chargement du phosphate de chaux, à Kourigha (Maroc),* exctract from "Journal de Genie Civil", 24 January 1925.

Yans Johan, Amaghzaz M'Barek, Bouya Baadi, Cappetta Henri, Iacumin Paola, Kocsis László, Mouih Mustapha, Selloum Omar, Sen Sevket, Storme Jean-Yves, Gheerbrant Emmanuel, *First carbon isotope chemostratigraphy of the Ouled Abdoun phosphate. Basin, Morocco; implications for dating and evolution of earliest African placental mammals*, in "Gondwana Research", n. 25, 2014, pp. 257-269.

Zine Hamza, Hakkou Rachid, Elmansour Abdelhak, Elgadi Sara, Ouhammou Ahmed, Benzaazoua Mostafa, *Native plant diversity for ecological reclamation in Moroccan open-pit phosphate mines*, in "Biodiversity Data Journal", n. 11, luglio 2023, pp. 1-26.

Zouhri Samir, Kchikach Azzouz, Saddiqi Omar, El Haïmer Fatima Zahra, Baidder Lahssen, and Michard André, *The Cretaceous-Tertiary plateaus*, pp. 331-358, in: Michard André, Saddiqi Omar, Chalouan Ahmed, Frizon De Lamotte Dominique (eds.), *Continental Evolution: The Geology of Morocco. Structure, Stratigraphy, and Tectonics of the Africa-Atlantic-Mediterranean Triple Junction*, Lecture Notes in Earth Sciences, n. 116. Springer, Berlin, Heidelberg, 2008.

Glossary

References

1 Amar Hicham, Benzaazoua Mostafa, Elghali Abdellatif, Hakkou Rachid, Taha Yassine, *Waste rock reprocessing to enhance the sustainability of phosphate reserves: a critical review*, in "Journal of Cleaner Production", n. 381, 2022, pp. 1-17.

2 Ashley Ken, Cordell Dana, Mavinic Donald, *A brief history of phosphorus: From the philosopher's stone to nutrient recovery and reuse*, in "Chemosphere", n. 84, 2011, pp. 737-746.

3 Bleuchot Hervé, *Une ville minière marocaine: Khouribga*, in "Revue de l'Occident musulman et de la Méditerranée", n. 6, 1969, pp. 29-51.

4 Cambridge Dictionary.

5 Collins Dictionary.

6 Nour Dados, Raewyn Connell, *The Global South*, pp. 12–13, in "Contexts", 11, 1, 2012.

7 De Jorge Huertas Virginia, *La Cristallizzazione del 'Grande Numero'. La XIV Triennale di Milano del 1968*, pp. 258-274, in Doimo Martino, Pogacnik Marko (eds.), *Fare mostre Italia, 1920-2020: colpi di scena e messinscena, Quaderni della Ricerca, Dipartimento di Culture del Progetto*, Università Iuav di Venezia, Mimesis, Milano, 2020.

8 Dizionario De Mauro.

9 Dizionario Sabatini Coletti.

10 Edixhoven J. D., Gupta Joyeeta, Savenije Hubert H. G., *Recent revisions of phosphate rock reserves and resources: reassuring or misleading? An in-depth literature review of global estimates of phosphate rock reserves and resources*, in "Earth System Dynamics", n. 4, 2013, pp. 1005-1034.

11 El Asli Hamdi, *MARCHE N. CMPM 3741K/3742K/3743K/3744K/08 - Projet laverie MEA a Khouribga lot n. 8.1: Fourniture et montage de la step*.

12 El Bamiki Radouan, Raji Otmane, Ouabid Muhammad, Elghali Abdellatif, Khadiri Yazami Oussama, Bodinier Jean-Louis, *Phosphate Rocks: a Review of Sedimentary and Igneous Occurrences in Morocco*, in "MDPI Minerals", n. 11, 1137, 2021, pp. 1-23.

13 Enciclopedia Treccani.

14 Eyssautier Louis (ed.), *L'Industrie minière au Maroc: zone française*, Editions du Service Géologique du Maroc, Rabat, 1952.

15 Futura Science.

16 Hadda Lamia (ed.), Médina. *Espace de la Méditerranée*, Firenze University Press, Firenze, 2021.

17 Harroud Tarik, *"Sustainable" Entrepreneurial Urbanism in Morocco: What Change(s) for Mining Cities?*, in "Justice spatiale/Spatial Justice", n. 15, September 2020.

18 Jest Camille, *Habitat du personnel journalier permanent de l'Office Chérifien des Phosphates*, in "Bulletin économique et social du Maroc (BESM)", n. 76, 1957, pp. 435-462.

19 Sahsah Mohammed, *Khouribga. Genèse d'une ville minière 1921-1994*, Université de technologie de Belfort-Montbéliard, Belfort, 2010.

20 Naser Eslami Alireza, A*rchitettura del commercio e città del Mediterraneo. Dinamiche e strutture dei luoghi dello scambio tra Bisanzio, l'Islam e l'Europa*, Mondadori, 2011.

21 OCP group official web site (www.ocpgroup.ma/history).

22 Oxford English Dictionary.

23 Oxford Languages.

24 Peghin Giorgio, Sanna Antonella (eds.), *Carbonia. Città del Novecento*, Skira, Milano, 2009.

25 Pennacchi Antonio, *Fascio e martello. Viaggio per le città del Duce*, Laterza, Roma-Bari, 2009.

26 Ruiz Canovas Carlos, Macías Francisco, Perez-Lopez Rafael, Basallote María Dolores, Millan-Becerro Ricardo, *Valorization of wastes from the fertilizer industry: current status and future trends*, in "Journal of Cleaner Production", n. 174, 2018, pp. 678-690.

27 XIV Triennale di Milano – 1968 Il grande numero, www.archivi.triennale.org/archive/archivi-triennale/14.

Chicane
Term used to define the entrances to dwellings entrances to dwellings offset from the dwelling in front and internally have a double flap to avoid direct glances into spaces private.
→ 16

Colonialism
The imposition, by the colonising power, of its own language in the colonised country, either as an official language, identical to the metropolitan one, for hierarchical and administrative relations, or in a simplified and hybrid form for everyday exchanges, resulting in a situation in which the indigenous languages were superimposed on an external language, known only by a very small percentage of people, and yet the language of greater prestige.
→ 13

Company town
A city revolving around a large company, administered according to a model of corporate efficiency. It is a form of settlement specific of the capitalist mode of production, a planned community that, through the definition of a preordered urban scheme, fixes the relationships between production plants, residences and infrastructures.
→ 13, 24

Dam
A barrier that is built across a river in order to stop the water from flowing, used especially to make a reservoir (a lake for storing water) or to produce electricity.
→ 22

Drying (*Séchage*)
Process involving the partial or total removal of moisture from a substance that is in a solid state. Normally this consists of inducing an increase in temperature of the material to remove the aqueous percentage through evaporation.
→ 19

Drying factory (*Usine de Séchage*)
Industrial complex used, among other functions, for drying a certain type of substance. It is often characterised by the presence of drying kilns and chimneys to expel the gases produced during combustion.
→ 19

Encampment (*Douar*)
Semi-stable settlement intermediate between tribal-type habitat and medina-type habitat, defined by the grouping of twelve or fifteen huts (*nouala*) or tents (khaïma) surrounded by an open space. In each *douar* a tent/hut served as a mosque and Koranic school. The name of the *douar* derives from that of the land's owner or from the presence of particular infrastructures (e.g., The Douar du Concasseur in Khouribga was located near a stone crushing plant south of the *Cité du Séchage*).
→ 18

Executives town (*Cité des Cadres*)
Low-density residential district located in the south-west area of Khouribga inspired by the garden city model and developed from the early 1920s to accommodate OCP mining executives. It features diagonal and radiocentric roads, green spaces, villas European-style architecture, facilities for sports and leisure, squares, schools and a church.
→ 3

Exploitation
Reckless use of a resource, which may be an object or a person, although there is awareness of the damage this action may cause.
→ 13

Extraction
Action involving the removal of something from its original site. In mining, the term takes the meaning of bringing underground resources to the surface, either by open-cut excavation or by the construction of tunnels to evacuate the material.
→ 13, 19

Extraction site (*Recette*)
Place where the extraction of a mineral resource takes place. It often has a limit, determined by a physical or institutional boundary, which separates it from other territorial areas.
→ 19

Fertilizer
Substances that by their content in nutrients or by their chemical, physical and biological characteristics contribute to the improvement of soil fertility. the main elements that make up fertilisers are nitrogen, phosphorous and potassium. For two thousand years, it was thought that the effectiveness of fertilisers was due to the organic component, only in the 19th Century was discovered that plants feed on mineral and inorganic substances and that traditional fertilisers could be replaced by water-soluble mineral compounds.
→ 13

Fossil
Any remnant or trace of an animal or plant organism preserved in the layers of the earth's crust, which has undergone a process of mineralisation and lived in an era before the present.
→ 9, 13

Founding town
Quite extensive settlement linked to the work and activity of founding, in the proper sense. It is connected to a "city-problem", which exists when the realisation of a new settlement has as its exclusive or prevalent purpose the constitution of a new urban organism, conceived in its specific constructive and functional articulations. This excludes both any settlement that has arisen through synoecism or spontaneous aggregation and then rationalised, and any allotment that does not envisage functional articulations and public and social spaces from its arising.
→ 9, 13, 25

Global South
Term that refers broadly to the regions of Latin America, Asia, Africa, and Oceania. It is one of a family of terms, including "Third World" and "Periphery", that denote regions outside Europe and North America, mostly (though not all) low-income and often politically or culturally marginalized. The use of the phrase Global South marks a shift from a central focus on development or cultural difference toward an emphasis on geopolitical relations of power.
→ 6

Glipstach or *Terril*
Artificial hill of tailings waste, near a mine.
→ 13, 15

Hut (*Nouala*)
Semi-semipermanent housing structure similar to a cylindrical hut, built of rudimentary materials such as reeds and branches, with conical thatched roof and a wooden board door. The first *noulas* appear in Khouribga around 1920. Generally the hut is surrounded by a closed courtyard defined by a low dry wall (*zeriba*).
→ 18

Impasse (*Darb*)
It is a characteristic feature of the urban fabric of a medina; it is a narrow, often closed-bottomed alleyway onto which the entrances to dwellings face.
→ 16

Industry
Large-scale organized manufacturing and production of goods requiring the investment of capital.
→ 9, 13, 22

Land
Part of the Earth's surface that is not covered by water. The term is generally used as a synonym for soil.
→ 13

Large number
Architecture for a large spatial dimension, a large number of people, a large production, a great obsolescence, large economic investments and for a solution to the serious social problems. The theme was addressed at the XIV Triennale di Milano in 1968 with the aim of reflecting on the problems related to industrialization and the changes caused by quantitative increase through different types of urban environment, suitable to accommodate the nascent society of the "Large Number".
→ 8, 7

Laverie
Industrial plant for phosphate washing. It is usually characterised by large collection basins for water and circular tanks for washing. The purpose is to separate the various components, using water treated with surfactants. In some cases, the *laverie* also provides for the storage of the material in special areas.
→ 11

Madrasa
Name given in Muslim countries to the school of middle and higher education for Islamic legal-religious sciences, having buildings in which students are also housed. These buildings are usually defined by an open courtyard overlooked by two or four atria (īwān or līwān) with pointed vaults, and with dwelling cells built between one atrium and the other.
→ 13

Medina
In Arabic, the word "medina" means "city" or "urban centre", referring to the old part of the Islamic city, often surrounded by fortified walls, characterized by an intricate urban fabric of narrow alleys, buildings leaning against each other, *souks* (markets), mosques, *hammams* (public baths) and koranic schools.
→ 13

Mine
Place where mineral or other resource extraction activities are carried out, with the works and equipment necessary for the work may be present. The deposit can be open pit or underground depending on its depth.
→ 9, 13

Green Mine (*Mine Verte*)
Project promoted by the OCP group in the early 2000s which involves the rehabilitation of mining areas around the former drying plant of Khouribga through a new urbanization with green areas, a sewage treatment plant, a central media library and a large residential, commercial and tourist complex.
→ 17

Mining town
A company town (see related lemma) related to the mining industry. It is characterised by being a quite extensive settlement concerning mines and the minerals extracted from them.
→ 9, 13, 24

Office Chérifien des Phosphates
A Moroccan parastatal company founded in 1920 with all the characteristics of a private company holding a monopoly on mining. In 2008, the company became OCP Group SA, owned by the Moroccan government and the Banque Populaire du Maroc. OCP is a leading player in the production of phosphate and phosphoric acid worldwide.
→ 14, 21

Phosphate
Phosphate PO_4 is a raw material for the chemical industry. There are deposits of organic origin (guano) and of igneous origin (apatite). It is obtained from sedimentary rocks in the form of phosphate rock, all marine sediments and especially carbonate sediments contain a percentage of phosphate. Phosphate is essential for the proper functioning of the human body, it is found within the tissues of living beings.
→ 1, 2, 26

Phosphorus
Phosphorus P (from the Greek *phôs*: light and *phoros*: carrier) is a non-renewable resource essential for all forms of life. it is the eleventh most abundant element in the earth's crust. It is not found in nature as a free element because of its high reactivity, but it can be found as an ion in phosphate rocks.
→ 1, 2, 26

Phosphate accumulator
System used to store and accumulate phosphates, which are important for different biological and industrial processes. Their stockage can be useful in several contexts, such as in agriculture, fertilizer production, or water treatment.
→ 11

Phosphate humid
State in which the phosphate presents itself before drying. The moisture content in the material is normally around 15%.
→ 11

Phosphate rock
Phosphate rock is the world's only significant phosphate resource, containing at least 15-20% phosphate ions (PO_4^{3-}). It has an organogenic origin, is found in the form of layers interspersed between other sedimentary rocks and is mined from open-pit or underground mines, depending on the geological and morphological properties of the site.
→ 10, 12, 26

Phosphoric acid
Phosphoric acid H_3PO^4 also known as orthophosphoric acid, is a colourless, odourless and non-volatile mineral acid It is produced by treating phosphate rock with sulphuric acid and is mainly used as a component in fertilisers used for food crops worldwide.
→ 12

Pipeline
A linked series of pipes with pumps and valves for flow control, often underground, used to carry liquid or gas for long distances.
→ 4

Production
The action of making or manufacturing from components or raw materials, or the process of being so manufactured.
→ 9, 23

Renewable resource
A renewable resource is a natural resource that can replenish itself over time through natural processes or sustainable practices, making it available for continuous use. It is a natural resource which – using appropriate technologies – allows energy to be obtained, without affecting its availability. Often these sources come directly or indirectly from the sun's energy, a characteristic that makes them considered virtually inexhaustible.
→ 13

Satellite town
A city whose industrial or commercial economic activity is closely linked to a more developed centre, or even, an urban agglomeration located in the surroundings of a large city, to which it is economically linked.
→ 13

Slum (*Bidonville*)
Term coined in North Africa and later extended to major cities around the world, to describe unplanned, messy and precarious settlements in peripheral urban areas, consisting of shacks and heaps for housing built with waste material (e.g. planks, sheets, bins).
→ 13

Social town
Urban settlement based on a paternalistic-business logic born on the initiative of private entrepreneurs. The idea of the social city has its origins in the 19th Century, in Great Britain. In the following century, the widespread adoption of this administrative model produced exemplary results at international level.
→ 13

Soil
Surface layer of the earth's crust.
→ 9, 13

Souq (*Souk*)
The souk is conceived as a central hub for both economic and social life, often located near the main mosque and designed to facilitate both commercial activities and community interactions. During the Islamic period, these markets evolved from simple trading spaces into comprehensive urban complexes, incorporating areas for religious practices, education, and social activities. This arrangement demonstrates how, in Islamic cities, commerce was closely integrated with spiritual and cultural life, reflecting a deep connection between economic and religious dimensions within society.
→ 20

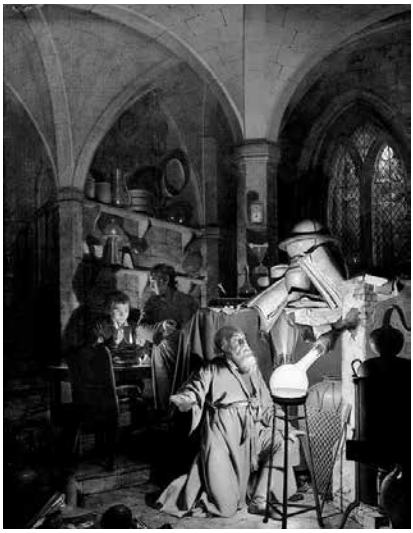
Tent (*Khaïma*)
Nomadic-tribal type of dwelling defined by a tent composed of wide black bands made of woven goat or camel fur. Each family arranged in one or more tents.
→ 18

Water desalination centre
A factory where salt is removed from water to make it suitable for drinking and irrigation.
→ 5

Water treatment station
A process, device, or structure used to improve the physical, chemical, or biological quality of the water in a public water system.
→ 5

Worker town (*Cité ouvrière***)**
Portion of a city having as its historical-social peculiarity that of hosting workers. Similar to worker quarter: in large cities, especially erstwhile, intensively built quarters, usually poor in services, generally close to industrial areas.
→ 8, 9

Water bowling
Condition of a portion of earth's surface that is at a lower level than the average level of the region.
→ 13



Joseph Wright of Derby, *The Alchymist, in Search of the Philosopher's Stone, Discovers Phosphorus, and prays for the successful Conclusion of his operation, as was the custom of the Ancient Chymical Astrologers*, 1771, oil on canvas, 127×101.6 cm Derby Museum and Art Gallery, Derby (UK)

euro 28 979-12-5953-079-0

Discovered in 1920, the Moroccan phosphate extraction site of Ouled Abdoun is the place where are settled the mining hubs and the new towns of Boujniba, Boulanouare, Hattane, Khouribga and Oued Zem.

Phosphatvilles. Territory, Settlements and Architecture in the Moroccan extraction site of Ouled Abdoun is the result of the research project *Villes Minières du Maroc* developed by DA-Department of Architecture, funded by Global South International Cooperation Project of the University of Bologna and led by Annalisa Trentin, Elena Mucelli and Stefania Rössl, which gathers contributions by Mustapha Azaitraoui, Bouamar Baghdad, Chiara Ciambellotti, Francesco Collotti, Federico Diodato, Mohamed El Boujjoufi, Maria El Glaoui, Lahbib El Moumni, Giulia Favaretto, Cecilia Fumagalli, Elena Mucelli, Serena Orlandi, Stefania Rössl, Karim Rouissi, Abdelkader Taleb and Annalisa Trentin, with photographic essays by Stefania Rössl and Massimo Sordi.