His Majesty the King Mohammed VI may God assist Him
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Global economic growth slowed in 2019, with a declining of global exploration and production investment after a slight recovery in 2017.

In this context, ONHYM has strengthened its efforts to support its partners to carry out their programs. The Office also continued its promotion strategy to attract new petroleum companies to invest in Morocco. In this framework, ONHYM organized the "Moroccan Oil and Gas Summit". This Summit enabled Morocco to be recognized as a destination of choice for hydrocarbon exploration in Africa, thanks to a favorable geology, a proactive promotion strategy as well as a highly attractive regulatory and fiscal framework. The Office’s efforts were crowned with the signing of six new petroleum agreements.

This year saw the launch of a "Play Fairway Analysis" on the Atlantic offshore from Tangier to Lagouira in order to define prospective zones with lower geological risk. In addition, and in order to increase the attractiveness of Moroccan sedimentary basins, studies have been launched for the characterization of reservoirs in partnership with CGG Services SAS and for structural reconstruction and geochemical modeling in the two conjugated margins of Morocco and Nova Scotia.

Regarding mining, ONHYM continued its strategic campaigns on 45 targets for base metals, precious metals and industrial rocks and minerals. The polymetallic potential of the southern provinces was thus confirmed and a major integrated project has been launched in the Jebilet-Guemassa region, in partnership with CMG (MANAGEM). The Office has also accelerated the diversification of the substances sought with the identification of new prospects for CO2, natural hydrogen and geothermal energy.

The mining partnership was strengthened by the signing of three transfer contracts and 5 memoranda of understanding.

On the environmental level, and as part of a continuous improvement process, ONHYM and its partners strictly complies with the regulations in force, and have also adopted performance standards in line with international best practices in the hydrocarbon and mining industry. 2019 Annual Report is published in the context of the health crisis related to COVID 19 and its severe social and economic impacts, both nationally and internationally, are unprecedented.

The hydrocarbon sector was heavily impacted with a significant reduction in investments in exploration and numerous restructurings. While this unprecedented crisis causes many challenges, it also offers several opportunities, particularly in terms of changes to be initiated for a better evaluation of the different processes of mineral and hydrocarbons exploration.

Although hydrocarbon and mining exploration is a long, risky and highly capital intensive process, ONHYM remains determined to achieve its objectives and fully contribute to the socio-economic development of our country under the enlightened leadership of His Majesty the King, Mohammed VI, may God assist Him.

Amina BENKHADRA
"... ONHYM organized the Moroccan Oil and Gas Summit ..."
CONJUNCTURE

International conjuncture

The global economy recorded a growth rate of 2.9% in 2019, its fastest pace since the global financial crisis. Uncertainty with regard to trade policies, geopolitical tensions and specific difficulties of the main emerging countries have weighed on world economic activity, particularly in manufacturing and trade sectors.

In 2020, the global health crisis is expected to have a severe impact on economic activity. According to the IMF, the global economy is expected to contract sharply by this year due to the coronavirus pandemic. In a baseline scenario, which assumes that the pandemic subsides in the second half of 2020 and that containment efforts can be phased out, the global economy is expected to rebound slightly in 2021 as economic activity normalizes.

### Economic growth by region

<table>
<thead>
<tr>
<th>Region</th>
<th>2018</th>
<th>2019</th>
<th>2020(p)</th>
<th>2021(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>3.6%</td>
<td>2.9%</td>
<td>-3.0%</td>
<td></td>
</tr>
<tr>
<td>United states</td>
<td>5.8%</td>
<td>2.9%</td>
<td>2.3%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Euro zone</td>
<td>4.7%</td>
<td>1.9%</td>
<td>1.2%</td>
<td>-7.5%</td>
</tr>
<tr>
<td>China</td>
<td>6.6%</td>
<td>6.1%</td>
<td>9.2%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>Emerging &amp; Developing Countries</td>
<td>4.5%</td>
<td>3.7%</td>
<td>6.6%</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

Source: International Monetary Fund

During 2019, the oil markets were confronted with numerous constraints and uncertainties on the supply side (political and military tensions in Libya and Middle East, effects of possible new American sanctions against Venezuela, production increase of shale oil in the United States...). The same situation was noticed on demand (economic risk, impact of the trade conflict between the United States and China on demand growth...).

During 2019, the Brent price averaged 64.16 US$ per barrel, down 10.5% compared to 2018.
After the slight recovery that began in 2017 and following two years of sharp decline, global investment in exploration-production (E&P) fell again in 2019, with a decline of around 1% compared to 2018 according to IFP Energies Nouvelles.

Global E&P investment is estimated at $540 billion in 2019, down $5 billion from 2018 and 40% below the 2014 record. This slowdown is mainly due to North America, which had boosted growth in 2018. In 2019, the region posted investments down 7% while in the rest of the world, they rose modestly by 2%. Offshore represents 29% of investments, the remaining 71% being dedicated to onshore, including 25% to shale oil.

In 2020, the decline in global investment should accelerate with an estimated decline of 17%, the continued decline in North America accompanied by a downward reversal in the rest of the world under the effect of the global health crisis of Covid19.

Sources: IFP Energies Nouvelles
Rystad Energy
In mineral exploration, global investments fell 3% in 2019 to reach $9.9 billion (S&P Global Market Intelligence).

Indeed, the prices of most metals fell and the amount of funds raised by mining companies fell sharply from November 2018 to February 2019, which led to a drop in activity at the beginning of 2019. Although the financing activity has started to strengthen and the prices of certain metals - mainly gold, silver, palladium and nickel - have recently experienced positive momentum, gains have been too late to influence 2019 budgets.

In 2020, the global economic impacts of the covid19 pandemic are expected to have a major impact on the mining sector and the exploration budgets will probably reach US $6.9 billion, down 29% from 2019 according to S&P estimates.
Finally, metals’ average prices fell during 2019, with the exception of gold (+9.77%), silver (+3.18%) and palladium (+49.75%). The latter benefited from strong demand by several sectors, including in particular the automotive sector.

### Metal prices 2012 - 2019

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gold ($/Oz)</strong></td>
<td>1,669</td>
<td>1,410</td>
<td>1,266</td>
<td>1,160</td>
<td>1,250</td>
<td>1,257</td>
<td>1,269</td>
<td>1,393</td>
<td>(+9.77%)</td>
</tr>
<tr>
<td><strong>Silver ($/Oz)</strong></td>
<td>31.2</td>
<td>23.8</td>
<td>19.1</td>
<td>15.7</td>
<td>17.1</td>
<td>17.04</td>
<td>15.7</td>
<td>16.2</td>
<td>(+3.18%)</td>
</tr>
<tr>
<td><strong>Lead ($/t)</strong></td>
<td>2,059</td>
<td>2,140</td>
<td>2,094</td>
<td>1,784</td>
<td>1,872</td>
<td>2,317</td>
<td>2,242</td>
<td>2,000</td>
<td>(-10.81%)</td>
</tr>
<tr>
<td><strong>Zinc ($/t)</strong></td>
<td>1,944</td>
<td>1,908</td>
<td>2,164</td>
<td>1,928</td>
<td>2,095</td>
<td>2,896</td>
<td>2,922</td>
<td>2,546</td>
<td>(-12.86%)</td>
</tr>
<tr>
<td><strong>Copper ($/t)</strong></td>
<td>7,943</td>
<td>7,321</td>
<td>6,858</td>
<td>5,494</td>
<td>4,863</td>
<td>6,166</td>
<td>6,523</td>
<td>6,000</td>
<td>(-8.02%)</td>
</tr>
<tr>
<td><strong>Tin ($/t)</strong></td>
<td>21,071</td>
<td>22,289</td>
<td>21,868</td>
<td>16,070</td>
<td>17,994</td>
<td>20,105</td>
<td>20,153</td>
<td>18,643</td>
<td>(-7.49%)</td>
</tr>
<tr>
<td><strong>Palladium ($/Oz)</strong></td>
<td>643</td>
<td>725</td>
<td>803</td>
<td>690</td>
<td>613</td>
<td>869</td>
<td>1,028</td>
<td>1,539</td>
<td>(+49.75%)</td>
</tr>
<tr>
<td><strong>Platinum ($/Oz)</strong></td>
<td>1,552</td>
<td>1,486</td>
<td>1,384</td>
<td>1,052</td>
<td>988</td>
<td>949</td>
<td>880</td>
<td>864</td>
<td>(-1.83%)</td>
</tr>
</tbody>
</table>
National conjuncture

National economic growth slowed in 2019 to reach 2.3% from 3% recorded in 2018, thus showing a growth rate among the lowest since 2007, after that of 2016.

Agricultural added value in 2019 fell 5.4% compared to an increase of 4% the previous year. Taking into account a 7.6% improvement in maritime fishing activities instead of an 11% decrease in 2018, the primary sector recorded a 4.3% decline instead of an increase of 2.7% a year earlier.

The growth of non-agriculture activities recorded a slightly faster pace of 3.3% in 2019 instead of 2.8% in 2018, mainly due to the strengthening of the tertiary sector. However, these activities were influenced by unfavorable trends in secondary activities, notably the sharp slowdown in mining and processing industries. Therefore, secondary activities, excluding energy, recorded a growth rate decrease, from 2.8% in 2018 to 2.3% in 2019.

As for the tertiary sector, whose activities are more focused on the domestic market, it retained its support for economic growth, posting an increase of 3.2% in 2019 instead of 2.7% a year earlier.

Regarding the mining sector, extractive activities slowed to 3% in 2019 instead of 4.7% in 2018 particularly after the deceleration of the commercial production of phosphate rock. In addition, the resumption of Chinese fertilizer exports and the decrease in imports from India impacted demand for the phosphate branch, in a context marked by an international drop in phosphate rock and phosphate fertilizer prices.

According to the Exchange Office “Office des Changes”, the energy bill reached 76.4 billion Dirhams at the end of December 2019 and the petroleum bill was 38.8 billion Dirhams, down 7% respectively from 2018.
MAJOR FACTS

Hydrocarbons

- Investment of 661 million MAD by partners and 38.90 million MAD by ONHYM
- Follow up of 26 projects, of which 10 own projects including 4 special projects, and 16 projects in partnership
- Drilling of 5 wells in the Gharb onshore
- Signature of 6 new petroleum agreements, 3 confidentiality agreements, 3 cooperation agreement, 4 amendments to petroleum agreements, 1 addendum to reconnaissance contract, and 1 application for the exploitation concession.

Mining

Mining research over 45 projects located in the most promising areas of the country. ONHYM’s own work concerned 31 projects, including 8 for precious metals, 9 for base metals and uranium, 4 for industrial rocks and minerals, 6 for mining reconnaissance and 4 special projects (geothermal energy and hydrogen). Partnership activity concerned 14 projects, including 4 for precious metals, 6 for base metals and 4 for industrial rocks and minerals.

Organization of the Moroccan oil and gas summit

The Moroccan Oil and Gas Summit was held in Marrakech on February 6 and 7, 2019 and focused on the Oil Exploration activities carried out in Morocco by ONHYM and its partners as well as on the prospects and evolution of investments in the oil sector on a global scale and in Africa in particular. This conference was marked by the participation of 250 delegates and representatives from African delegations (Mali, Guinea Conakry, Senegal and Mauritania).
Information system

The information system was developed in accordance with the strategic objectives set out in the 2017-2021 IS Master Plan, in order to support the evolution of the activities and projects of the various functions, to face the new risks and challenges in the fields of physical security and cybersecurity, and to support the digital transformation of the Office. These actions were accompanied by upgrade projects to modernize and secure the IT technical infrastructure, and to enhance its capacity in terms of availability, performance and security.

With regard to the technical documentary heritage of the Office, efforts have continued to ensure the management, safeguard and preservation of heritage and to meet the demands of business users and partners of ONHYM in terms of technical data. In the continuity of the e-ONHYM dematerialization process and the improvement of ONHYM and its collaborators security’s identity, ONHYM has implemented authentication certificates for ONHYM’s public services (electronic) by an international certification authority.

In addition, electronic signatures have been acquired from the same certification authority. These individual electronic signatures will be used for planned dematerialization actions as part of the Office’s digital transformation.
PROMOTION AND SOUTH-SOUTH COOPERATION

As part of its policy in terms of promoting mining and hydrocarbon assets, ONHYM aims to involve national and foreign private operators more closely in research and development of mining and oil projects and carries out many actions to promote the potentialities and investment opportunities in Morocco.

ONHYM has conducted a study to review its promotional strategy.

Hydrocarbon promotion

In 2019, ONHYM participated in several international events and conferences to promote hydrocarbon assets:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morocco Oil &amp; Gas Summit</td>
<td>February 6th to 7th</td>
<td>Marrakech</td>
</tr>
<tr>
<td>Egypt Petroleum Show</td>
<td>February 11th to 13th</td>
<td>Cairo</td>
</tr>
<tr>
<td>APPEX London International Prospect &amp; Property Expo</td>
<td>March 5th to 7th</td>
<td>London</td>
</tr>
<tr>
<td>Offshore Mediterranean Conference</td>
<td>March 27th to 29th</td>
<td>Ravenna</td>
</tr>
<tr>
<td>AAPG Annual Convention and Exhibition</td>
<td>May 19th to 22nd</td>
<td>San Antonio</td>
</tr>
<tr>
<td>81th EAGE Conference &amp; Exhibition</td>
<td>June 03rd to 06th</td>
<td>London</td>
</tr>
<tr>
<td>Africa Assembly</td>
<td>June 24th to 25th</td>
<td>Paris</td>
</tr>
<tr>
<td>Presentation of offshore and onshore opportunities ONGC VIDESH</td>
<td>July 26th to 27th</td>
<td>New Delhi</td>
</tr>
<tr>
<td>AAPG International Convention and Exhibition ICE (présentation du bassin de Zag)</td>
<td>August 27th to 30th</td>
<td>Buenos Aires</td>
</tr>
<tr>
<td>Energy Day - London (Moroccan Embassy)</td>
<td>September 24th</td>
<td>London</td>
</tr>
<tr>
<td>Russia - Africa Economic Forum</td>
<td>October 22nd to 24th</td>
<td>Sotchi</td>
</tr>
<tr>
<td>Africa Oil Week</td>
<td>November 04th to 08th</td>
<td>Cape Town</td>
</tr>
<tr>
<td>World Energy Capital Assembly</td>
<td>December 02nd to 03rd</td>
<td>London</td>
</tr>
</tbody>
</table>
ONHYM also organized data room and technical presentations with 13 international companies for different onshore and offshore basins.

**Mining promotion**

The promotion activity concerned the participation in the international mining conferences PDAC in Toronto - Canada and INDABA in Cape Town - South Africa. During these events, ONHYM booths were set up to promote mining projects to the international mining industry. ONHYM also participated in the first edition of the Marrakech Mining conference in collaboration with the MEME as well as in the Mining Symposium of Guinea in the framework of African cooperation.

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDABA</td>
<td>04 - 07 February</td>
<td>South Africa</td>
</tr>
<tr>
<td>PDAC</td>
<td>03 - 06 February</td>
<td>Canada</td>
</tr>
<tr>
<td>Marrakech Mining Convention</td>
<td>17 - 19 April</td>
<td>Morocco</td>
</tr>
<tr>
<td>SMG</td>
<td>24 - 26 April</td>
<td>Guinea Conakry</td>
</tr>
</tbody>
</table>

The efforts of promotion efforts led to the reception of several expressions of interest from mining companies wishing to conclude partnership agreements with ONHYM. Thus, three memoranda of understanding with the companies Amethyst (subsidiary of LIDYA) and North American Nickel «NAN» relating respectively to carrying out studies and works for the evaluation of the mining potential of Taghdout and Imilchil domains were concluded this year.

In anticipation of the launch by ONHYM of a fund dedicated to mineral exploration to finance mining projects, the Office has identified a portfolio of projects to promote to national public and private and international investors interested in this sector. The launch of the Call for Expressions of Interest for the selection of the company that will be responsible for the management of this fund is scheduled for 2020.
Cooperation

In accordance with the will of His Majesty the King Mohammed VI, May God Assist Him, to establish a multiform cooperation, based on solidarity with African partners, ONHYM reinforced its cooperation with African organizations. Several new amendments, relating to the programs of actions for 2019-2020 in petroleum and mining exploration sectors and management.

<table>
<thead>
<tr>
<th>Country</th>
<th>Partner</th>
<th>Type of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin</td>
<td>SOBEH and OBRGM</td>
<td>Cooperation agreement and amendment n° 1</td>
</tr>
<tr>
<td>Mauritania</td>
<td>SMHPM</td>
<td>Amendment n° 1 to C.A</td>
</tr>
<tr>
<td>Mali</td>
<td>DNGM</td>
<td>Amendment n° 4 to C.A</td>
</tr>
<tr>
<td>Congo</td>
<td>CRGM</td>
<td>Amendment n° 1 to C.A</td>
</tr>
<tr>
<td>Guinea Conakry</td>
<td>SOGUIPAMI</td>
<td>Amendment n° 4 to C.A</td>
</tr>
<tr>
<td></td>
<td>ONAP</td>
<td>Amendment n° 3 to C.A</td>
</tr>
<tr>
<td>Mauritania</td>
<td>OMRG</td>
<td>Cooperation agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amendment n° 1 to C.A</td>
</tr>
<tr>
<td>Nigeria</td>
<td>NGSU</td>
<td>Amendment n° 1 to C.A</td>
</tr>
</tbody>
</table>

Working visits

2019 was also marked by the continuation of short term trainings for staff and engineers from African organizations (DGS, Geological Survey Directorate of South Soudan, ONAP of Guinea Conakry, OMRG and SMHPM of Mauritania, DNGM of Mali, CNGM of Congo). The total number of Persons days training was 166 person-days at the end of December 2019.

ONHYM received high level delegations for business visits from Guinea Conakry, Sierra Leone, Senegal, Burkina Faso, Côte d’Ivoire and Australia.
HYDROCARBON EXPLORATION

ONHYM’s own activity

Control of the play concepts in the Mesorif Structural domain

Within the project framework, studies focused on the interpretation of 1350 km of 2D seismic data and a Play Fairway Analysis on the scale of the entire structural domain of the Rif, in order to define the prospective zones as well as prospects and leads with lower geological risk. These studies have made it possible identifying and mapping 18 leads represented by anticline structures associated with overlapping faults in the Jurassic and Cretaceous sections. In addition, four (4) paleogeographic maps of Toarcian and Cenoman-Turonian source rocks and of Domerian and Callovo-Oxfordian reservoir rocks were provided. These maps show that the Jurassic source rocks are located in the oil and gas window in almost the entire Rif domain, while those of the Cretaceous are located in the oil window in the Mesorif and the internal Rif only.

The integration of geological, geophysical and geochemical data confirms the promising potential of the Mesorif area, proven by the numerous seeps on the surface and previous oil discoveries made in the area.

Control of the play concepts in offshore Tangier - Tarfaya segments

The purpose of this project is to conduct a comprehensive analysis of the spatial distribution of the existing petroleum systems (Play fairway analysis), in order to establish a ranking of the zones according to their prospectivity and the associated geological risk.

Therefore, the studies conducted focused on the interpretation of potential reservoir levels of the Mesozoic over 10,000 km of 2D seismic and on the calculation and analysis of the seismic attributes over 15,000 km³ of 3D seismic. Preliminary results of these analyzes indicate the probable presence of turbiditic and carbonate reservoirs of Jurassic age on two leads in the Safi Deep block, and turbiditic reservoirs of Upper Jurassic age - Lower Cretaceous and Miocene on two leads in the Mazagan block. The analysis will be continuing for other previously identified prospects and leads in the study area. In addition, the representative chronostratigraphic chart of the northern offshore has been finalized based on three regional cross sections.
Control of the play concepts of the offshore Tarfaya - Lagouira segments

Through this project, the Play Fairway Analysis included the interpretation of 2,000 km of 2D seismic data and 1,000 km² of 3D seismic in the Dakhla Offshore area. Interpretation and mapping are focused on the potential reservoir level of Maastrichtian age, the sedimentary systems of the Paleocene, the Upper Cretaceous and the Lower Cretaceous.

Following this work, 10 leads and prospects (mainly stratigraphic), were identified in the Paleocene, the Upper Cretaceous and the Lower Cretaceous, in particular distribution channels crossing the continental shelf and supplying the turbiditic sequences at the continental slope and the basin.

At the same time, seismic attributes were calculated on the 3D block of the Dakhla Offshore zone, in order to characterize the reservoir levels of the Cretaceous: Maastrichtian, Turonian and Albian. Distributary systems have been interpreted in the Turonian and Albian reservoirs.

In addition, seven (7) paleogeographic and distribution maps of potential source and reservoir rocks as well as petroleum system maps were established on the basis of this study, as well as the representative chronostratigraphic chart of the south offshore and the distribution map of prospective plays. The established maps show that the potential source rock and reservoir rock levels are expanded throughout the study area and extend from the Jurassic to the Tertiary.

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Oil systems off Tarfaya
Regional synthesis of unconventional hydrocarbon potential: shale gas and shale oil

To address these two projects, work focused on the study of the Paleozoic shale gas potential of the Boudenib - Errachidia basin and the oil shales of the Upper Cretaceous. A total of 6,700 km of 2D seismic data was interpreted targeting the Frasnian, the Silurian, the Ordovician and the Senonian. Seismic interpretation has shown shale gas potential in the western and southern parts of the Zag basin, in the southern part of the Boudenib basin and in the Rissani depression.

For the oil shales project, seismic interpretation of the Cenomanian-Turonian and the entire Senonian of the Boudenib basin, shows that these formations extend in the subsurface and thicken along the contact with the southern border of the Central High-Atlas. As a result of interpretation and mapping efforts, five (5) isochronous and isopach maps of Paleozoic shale gas levels, and a distribution map of TOC richness of Silurian play throughout Morocco have been achieved.

In addition to this work, three (3) field missions for geological and geochemical studies of the Zag basin (Paleozoic outcrops), Errachidia - Tinhir basin (Cretaceous) and Beni Mellal - Aghbala Cretaceous outcrops were carried out. As a result, fifteen (15) lithostratigraphic sections, four (4) structural sections, and two (2) regional geological sections were performed. The field study of the Cenomanian-Turonian outcrops has revealed new evidence of oil shale in the western part of Errachidia and in the Beni-Mellal High Atlas area. The synthesis of geochemical data made it possible to produce a shale gas potential map of Silurian plays. This map shows a maximum richness from 7 to 12% in the center part of the Tadla basin, from 2 to 8% in the Boudenib basin, especially in its eastern part, and from 3 to 6% in the Zag basin.

Delimitation of the Moroccan continental shelf

This project was marked by ONHYM’s participation in the 29th Meeting of States Parties to the United Nations Convention on the Law of the Sea and the preparation of responses to formal requests concerning the International Seabed Authority and the Division for Ocean Affairs and the Law of the Sea. In addition, ONHYM contributed to the draft decree concerning the procedures for granting research authorizations in the fields of hydrography, oceanography and national cartography. At the same time, technical and scientific monitoring is ongoing.

Geoseismic Cup in the northern part between Rabat and Tarfaya
Illustrating the types of play concepts
ONHYM’s own activities: 2019 achievements

Objectives: Triassic, Jurassic & Cretaceous Mesorif Basin:
- Interpretation of 1,350 Km² of 2D seismic;
- Identification of 18 leads in the Jurassic & Cretaceous.

Objectives: Unconventional hydrocarbons
- Interpretation of 6,700 Km² of 2D seismic (Hercynian unconformity, Frasnian, Silurian, Ordovician & Senonian);
- Finalization of the Silurian TOC distribution map throughout Morocco;
- Realization of three field trips for geological survey and geochemical sampling.

Objectives: Studies and promotion Tangier - Tarfaya Offshore:
- Interpretation of 10,000 Km² of 2D seismic;
- Calculation and analysis of seismic attributes over 15,000 Km² of 3D seismic data;
- Finalization of the northern offshore segment chronostratigraphic chart;
- Identification of turbiditic reservoirs in the Jurassic and Cretaceous.

Objectives: Studies and promotion Tarfaya - Lagwira Offshore:
- Interpretation of 2,000 Km² of 2D seismic and 1,000 Km² of 3D seismic;
- Calculation of seismic attributes for reservoir characterisation in the Cretaceous;
- Identification of 10 stratigraphic leads in the Cretaceous.

ONHYM’s 2019 achievements
- Interpretation and mapping of 20,050 Km² of 2D seismic and 16,000 Km² of 3D seismic on different sedimentary basins;
- Realization of three field trips;
- Identification of stratigraphic and structural leads;
- Realization of offshore chronostratigraphic charts, regional maps and regional cross sections.
## Partners’ activities

### Offshore zones

<table>
<thead>
<tr>
<th>Area</th>
<th>Partners</th>
<th>Category</th>
<th>Achievements</th>
</tr>
</thead>
</table>
| Mohammedia Offshore | Chariot Oil & Gas                          | Exploration permit  | • Interpretation of 2D and 3D seismic.  
• Integration of the well RSD - 1 results in the 2D regional seismic and the geological model.  
• Realization of one field trip targeting Miocene and Jurassic sandstone reservoirs and Mesozoic source rocks.  
• Reprocessing of 2D seismic data. |
| Kenitra Offshore   | Chariot Oil & Gas                          | Exploration permit  | • Interpretation of 2D and 3D seismic.  
• Finalization of the petrographic study and the review of biostratigraphic dating of the RSD - 1 well.  
• Reprocessing of 2D seismic data. |
| Lixus Offshore     | Chariot Oil & Gas                          | Exploration permit  | • Evaluation of the petroleum potential.  
• Prospects and leads portfolio update.  
• Reprocessing of 1,735 km² of 3D seismic data. |
| Sidi Moussa Offshore| GENEL                                     | Exploration permit  | • Processing (ongoing) of 3,500 Km² of 3D seismic data on the two blocks.(83% for the block A and 74% for the block B)  
• Processing of Grav - Mag data. |
| Tarfaya Offshore   | ENI                                       | Exploration permit  | • Reprocessing of 500 Km² of 3D seismic data.  
• Interpretation of seismic data. |
| Boujdour Maritime  | Kosmos on behalf of ONHYM                  | Exploration permit  | • Finalization of processing and interpretation of 9,624 Km² of 3D seismic data acquired in 2017 - 2018. |
## Onshore zones

<table>
<thead>
<tr>
<th>Area</th>
<th>Partners</th>
<th>Category</th>
<th>Achievements</th>
</tr>
</thead>
</table>
| Lalla Mimouna Norda     | SDX Energy        | Exploration permit  | • Technical and economic feasibility study of a gas pipeline connecting Lalla Mimouna with the existing pipeline network in the Gharb in case of drilling success of the LM - 2 well.  
• Preparations for the continuation of the drilling campaign in the block. |
| Sebou Central           | SDX Energy        | Exploration permit  | • Drilling of 3 wells: SAH-4, CGD - 15 and CGD - 16.                                                                                         |
| Rharb Occidental        | SDX Energy        | Exploration permit  | • Processing and interpretation of 3D seismic data.  
• Drilling of 2 wells: CGD -14 and SAH - 6.                                                                                     |
| Grand Tendrara          | Sound Energy/Schlumberger | Exploration permit | • Processing and interpretation of 2D seismic data.  
• Post mortem study of the TE - 10 well.                                                                                           |
| Anoual                  | Sound Energy/Schlumberger | Exploration permit | • Evaluation of the petroleum potential.                                                                                                         |
| Sidi Moktar Onshore     | Sound Energy      | Exploration permit  | • Finalization of seismic interpretation.  
• Evaluation of scenarios for the next phase.                                                                                       |
| Haha Onshore            | PEL/FORPETRO      | Exploration permit  | • End of drilling operations with a deep of 4729 m in the Trias.                                                                                       |
| Tanfit                  | REPSOL/SHELL      | Exploration permit  | • Reprocessing of 1,564 km of 2D seismic data.  
• Seismic interpretation and geological model update.  
• Evaluation of the petroleum potential.  
• Acquisition of 4,893.88 Km of aero - gradiometric data.                                                                                      |
Offshore zones

- **Chariot (Mohammedia offshore):**
  Interpretation of 2D and 3D seismic data, integration of RSD -1 results, and realization of one (1) field trip. Reprocessing of 2D seismic data.

- **Chariot (Kenitra offshore):**
  Interpretation of 2D and 3D seismic data, reprocessing of 2D seismic data.

- **Chariot (Lixus offshore):**
  Evaluation of petroleum system potential, reprocessing of 3D seismic data, prospects portfolio update.

- **Genel (Sidi Moussa offshore):**
  Processing of 3D seismic and Grav - Mag data acquired in 2018.

- **ENI (Tarfaya offshore shallow):**
  Reprocessing and interpretation of vintage seismic data.

- **Kosmos (Boujdour Maritime on behalf of ONHYM):**
  Finalization of the processing and interpretation of 3D seismic data acquired in 2017 - 2018.

Onshore zones

- **SDX (Lalla M'mouina, Sebou Central & Rharb occidental):**
  Drilling of 5 wells and preparations for the continuation of the drilling campaign.
  Processing and interpretation of 3D seismic data.

- **Sound Energy/Schlumberger (Grand Tendrara):**
  Processing and interpretation of 2D seismic acquired in 2018, post-mortem study of the TE -10 well.

- **Sound Energy (Anoual):**
  Interpretation of 2D seismic data and evaluation of the petroleum potential.

- **Sound Energy (Sidi Moktar):**
  Evaluation of the petroleum potential.

- **PEL/FORPETRO (Haha):**
  End of drilling operations.

- **Repsol/Shell (Tanfif):**
  Evaluation of the petroleum potential, reprocessing of seismic data, and acquisition of 4,893 Km of aero - gradiometric data.

**Partners’ 2019 achievements**

- Acquisition of 4,893 Km of aero-gradiometric data;
- Drilling of 5 Wells in the basin of Gharb onshore
HYDROCARBON COOPERATION AND PARTNERSHIP

At 2019 year end, 16 companies operate in partnership with ONHYM, conventional hydrocarbon exploration projects on a total surface area of 153,663.25 km² divided into 34 onshore permits, 51 offshore permits (including 17 owned by ONHYM), 1 onshore reconnaissance license and 9 exploitation concessions (including 1 owned by ONHYM).

The following table summarizes the situation of the hydrocarbon exploration mining domain at the end of December 2019:

<table>
<thead>
<tr>
<th>Designation</th>
<th>ONHYM</th>
<th>Partnership</th>
<th>Acreage (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore Permits</td>
<td>34</td>
<td></td>
<td>54,397.73</td>
</tr>
<tr>
<td>Offshore Permits</td>
<td>17</td>
<td></td>
<td>33,733.90</td>
</tr>
<tr>
<td>Offshore Permits</td>
<td>34</td>
<td></td>
<td>60,342.27</td>
</tr>
<tr>
<td>Offshore reconnaissance license</td>
<td>1</td>
<td></td>
<td>4,989.90</td>
</tr>
<tr>
<td>Exploitation Concessions</td>
<td>1</td>
<td></td>
<td>38.71</td>
</tr>
<tr>
<td>Exploitation Concessions</td>
<td>8</td>
<td></td>
<td>160.74</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
<td><strong>8</strong></td>
<td><strong>153,663.25</strong></td>
</tr>
</tbody>
</table>

At the end of December 2019, 6 new petroleum agreements, 3 confidentiality agreements, 3 cooperation memorandums of understanding, 4 amendments to petroleum agreements, 1 addendum reconnaissance contract, were signed, and application for exploitation concession was submitted.
## Petroleum Agreements

<table>
<thead>
<tr>
<th>Area</th>
<th>Date of signature</th>
<th>Partner</th>
<th>Work program</th>
</tr>
</thead>
</table>
| LALLA MIMOUNA SUD           | 04/02/2019        | SDX ENERGY MOROCCO (UK) LIMITED              | • Acquisition of 3D seismic data.  
                              |                   |                                              | • Drilling of exploration wells.                |
| MOULAY BOUCHTA OUEST        | 04/02/2019        |                                              | • Reprocessing of 2D seismic data.  
                              |                   |                                              | • Acquisition of 3D seismic data.  
                              |                   |                                              | • Drilling of exploration wells.                |
| GUERCIF ONSHORE             | 19/03/2019        | PREDATOR GAS VENTURES LIMITED                 | • Reprocessing of 2D seismic data.  
                              |                   |                                              | • Drilling of an exploration well.              |
| LIXUS OFFSHORE              | 02/04/2019        | CHARIOT OIL & GAS HOLDINGS (MOROCCO) LIMITED | • Reprocessing of 2D seismic data.  
                              |                   |                                              | • Reprocessing of 3D seismic data.              |
| INEZGANE OFFSHORE           | 17/09/2019        | EUROPA OIL AND GAS (NEW VENTURES) LIMITED    | • Processing of 3D seismic data.  
                              |                   |                                              | • G&G works and studies.                        |
| MOGADOR OFFSHORE            | 14/11/2019        | HUNT OIL COMPANY MOROCCO                     | • Reprocessing of 2D seismic data.  
                              |                   |                                              | • Reprocessing of 3D seismic data.              |
                              |                   |                                              | • G&G works and studies.                        |

## Amendments to Petroleum Agreements

<table>
<thead>
<tr>
<th>Area</th>
<th>Date of signature</th>
<th>Partner</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TARFAYA OFFSHORE SHALLOW</td>
<td>31/10/2019</td>
<td>ENI MAROC B.V QATAR PETROLEUM INTERNATIONAL UPSTREAM L.L.C</td>
<td>• Assignment of 30 % of ENI percentage interest to QATAR PETROLEUM.</td>
</tr>
</tbody>
</table>
| ANOUAL                      | 04/02/2019        | SOUND ENERGY MOROCCO EAST LIMITED (SEM) SOUND ENERGY MERIDJA LIMITED (SEM) SCHLUMBERGER SILK ROUTE SERVICES LIMITED (SLB) | • Assignment of 100 % of SEM percentage interest to SEM.  
                              |                   |                                              | • Assignment of 27,5 % of SEME percentage interest to SLB.         |
| MOHAMMEDIA OFFSHORE         | 29/04/2019        | CHARIOT OIL & GAS INVESTMENTS (MOROCCO) LIMITED | • Extension of 12 months of the duration of the Initial period of the permits. |
| KENITRA OFFSHORE            | 29/04/2019        |                                              | • Extension of 12 months of the duration of the Initial period of the permits. |
### Addendum to reconnaissance contract

<table>
<thead>
<tr>
<th>Area</th>
<th>Date of signature</th>
<th>Partner</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOUKKALA ABDA</td>
<td>14/06/2019</td>
<td>OLYMPUS ENERGY INTERNATIONAL INC.</td>
<td>Third extension of the reconnaissance licence for a period of 9 months.</td>
</tr>
</tbody>
</table>

### Exploitation concession

<table>
<thead>
<tr>
<th>Area</th>
<th>Date of signature</th>
<th>Partner</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>OULAD N’ZALA CENTRAL</td>
<td>06/03/2019</td>
<td>SDX ENERGY MOROCCO (UK) LIMITED</td>
<td>Exploitation concession to produce the well ONZ - 7.</td>
</tr>
</tbody>
</table>

### Confidentiality Agreements

<table>
<thead>
<tr>
<th>Area</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediterranean Offshore</td>
<td>TOTAL E&amp;P ACTIVITES PETROLIERES</td>
</tr>
<tr>
<td>Onshore and Offshore open acreage</td>
<td>APACHE EXPLORATION LTD</td>
</tr>
<tr>
<td>Asilih, Loukos Offshore, Gharb Offshore Nord, Gharb Offshore Sud</td>
<td>BP EXPLORATION OPERATING COMPANY LIMITED</td>
</tr>
</tbody>
</table>

### Memorandums of understanding

<table>
<thead>
<tr>
<th>Partner</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSC KELDYSH RESEARCH CENTER</td>
<td>Analysis of Tarfaya oil shale</td>
</tr>
<tr>
<td>UNIVERSITY OF ADELAIDE</td>
<td>Scientific cooperation</td>
</tr>
<tr>
<td>TRANSNEFT</td>
<td>Technical cooperation</td>
</tr>
</tbody>
</table>
Agreements under negotiation

<table>
<thead>
<tr>
<th>Area</th>
<th>Partner</th>
<th>Type of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boujdour Offshore Shallow</td>
<td>TEREDO MOROCCO LTD</td>
<td>Petroleum agreement</td>
</tr>
<tr>
<td>Boujdour Onshore</td>
<td></td>
<td>Petroleum agreement</td>
</tr>
</tbody>
</table>

Amendments being finalized

<table>
<thead>
<tr>
<th>Area</th>
<th>Partner</th>
<th>Type of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendrara Lakbir</td>
<td>SOUND ENERGY MOROCCO EAST LIMITED&lt;br&gt;SOUND ENERGY MERIDJA LIMITED&lt;br&gt;SCHLUMBERGER SILK ROUTE SERVICES LIMITED</td>
<td>Amendment to petroleum agreement</td>
</tr>
<tr>
<td>Tanfit</td>
<td>REPSOL EXPLORACIÓN TANFIT, S.L.&lt;br&gt;SHELL EXPLORATION ET PRODUCTION DU MAROC GMBH</td>
<td>Amendment to petroleum agreement</td>
</tr>
</tbody>
</table>

New Expressions of Interest

<table>
<thead>
<tr>
<th>Area</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mir Left and Ifni Deep Offshore</td>
<td>PANOCEANIC</td>
</tr>
<tr>
<td>Mesorif</td>
<td>WOODSIDE</td>
</tr>
<tr>
<td>Mediterranean and Mesorif</td>
<td>CONOCOPHILLIPS</td>
</tr>
<tr>
<td>Asilah, Loukos Offshore, Gharb Offshore Nord and Gharb Offshore Sud</td>
<td>BP</td>
</tr>
<tr>
<td>Open acreage</td>
<td>APACHE</td>
</tr>
</tbody>
</table>
HYDROCARBON DEVELOPMENT & PRODUCTION

Petroleum drilling

- Monitoring of TAMANAR-2 well drilling operations conducted by the partner PEL;
- Monitoring of wells drilling operations in the GHARB basin: CGD-14, CGD-15, CGD-16, SAH-4, SAH-5 and SAH-6 carried out by the partner SDX ENERGY;
- Monitoring and implementation of instructions for the evacuation of surface gas from the water well located at Douar Maourou Commune AMJAOU Cerde DRIOUCH - NADOR.

Reservoirs studies

- Reservoir monitoring of producing wells in Gharb and Essaouira Bassins;
- Reserves evaluation and establishment of short and mid-term production forecast for producing wells in Gharb basin;
- TE-07 well test data interpretation based on the latest pressure measurements;
- Follow up of TE-10 well test operations;
- Follow up of CGD-14 well test operations as well as estimating reserves initially in place.

Development studies

- Preparation of Technical and economic studies of the proposed financing scenarios for the development of Tendrara field in partnership with Sound Energy;
- Finalization of Tendrara treatment unit Front-End Engineering Design (FEED) study;
- Preparation of Technical and economic studies related to Mescal’s possible development scenarios;
- Preparation of Study of possible scenarios to connect LTU-1 and DOB-1 wells to the existing network;
- Creation of a database for natural gas transport facilities of ONHYM and its partners;
- Launch of Gas and condensate market study.

Reservoirs Exploitation

As part of the maintenance of the Gharb and Essaouira hydrocarbon reservoirs exploitation installations, ONHYM has launched several projects related to the upgrading of natural gas production and transport infrastructures, namely:

- Upgrading the cathodic protection of the Gharb and Essaouira gas pipeline networks;
Upgrading the 8” gas pipeline linking the MESKALA unit to the OCP Youssoufia drying unit: At the end of December 2019, 100% of lot N° 2 consisting in repairing coating defects and measuring the thickness of the gas pipeline has been completed. Concerning the lot N°1, the 8” gas pipeline deviation works are ongoing, in particular the welding and civil work with an overall completion percentage of 70%.

Hydrocarbons delivery

At the end of December 2019, the overall turnover generated by hydrocarbons sale was 164.2 million MAD HT compared to 141.3 million MAD HT reached in 2018, which represents an increase of 16.2%. This positive evolution is due to the revision of OCP’s gas sales price as well as to the supply of new customers in GHARB region, and this despite the drop in condensate sales due to an unexpected ONEE demand interruption.

Furthermore, ONHYM continued to provide various operating services for its partners.

<table>
<thead>
<tr>
<th>Designations</th>
<th>2018</th>
<th>2019</th>
<th>Gap 2018/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL GAS IN MILLIONS NM3</td>
<td>45.7</td>
<td>47.3</td>
<td>3.50%</td>
</tr>
<tr>
<td>CONDENSATE IN TONS</td>
<td>4,508.6</td>
<td>3,496.1</td>
<td>-22.45%</td>
</tr>
</tbody>
</table>

Maghrebian Europe Gas Pipeline «GME»

Regarding the MEP royalty collected by the Moroccan Government for the transit of natural gas to European customers “SAGANE & TRANSGAS”, the volume of Algerian natural gas transited through the MEP at the end of December 2019 was reduced by 43.2% compared to 2018. Indeed, it has decreased from 9.5 Billion NM3 to 5.4 Billion NM3. This significant decrease results from the reduction in European customers’ consumption of pipeline transported gas in favor of liquefied natural gas, whose prices have reached very low levels.

<table>
<thead>
<tr>
<th>Designations</th>
<th>2018</th>
<th>2019</th>
<th>Gap 2018/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantities of natural gas transported for SAGANE and TRANSGAS, in billion NM3</td>
<td>9.50</td>
<td>5.40</td>
<td>43.2%</td>
</tr>
<tr>
<td>Total amount of the royalty, in Million NM3</td>
<td>680.43</td>
<td>381.63</td>
<td>43.9%</td>
</tr>
<tr>
<td>Quantities of gas consumed by ONEE power plants “Tahaddart &amp; ABM”, in Million NM3</td>
<td>388.60</td>
<td>300.09</td>
<td>22.8%</td>
</tr>
</tbody>
</table>

Petroleum laboratories

- 350 geochemical analysis, 5 evaluation and characterization studies of the potential in bedrocks and 2 geochemical syntheses and compilations, were carried out by the Organic Geochemistry Laboratory.
- 276 Pyrolysis and Petrochemical Analysis tests were carried out at the Bituminous Shale Laboratory, for its own projects and those in cooperation with Moroccan universities.
- 79 biostratigraphic, petrographic, petrophysical, palynological and palynofacies analysis including 4 samples were analyzed on behalf of the oil shale and shale gas projects for oil exploration, and 75 within the framework of cooperation with African countries, Moroccan universities and research projects specific to Petroleum Laboratories.
- A training and technical support mission to OMNIS (Madagascar) for the Malagasy Chronostratigraphic Charter project, within the framework of cooperation with African countries.
MINING EXPLORATION

ONHYM’s Own Activities

Precious Metals

Chenna (Au, Cu)

The Chenna prospect is located in the Province of Oued Ed-Dahab about 180 km south of Dakhla. The gold and copper mineralization, hosted in sandstone and pelitic formations, is related to centimetric to decimetric horizons of silicified sandstone, with grades up to 9 g/t Au and 10% Cu.

A field magnetometric geophysical survey was conducted over an area of approximately 2.8 km² and identified several magnetic anomalies, particularly in the eastern part of the sector. A resistivity/chargeability measurement was also carried out over a length of 750 m and allow describing the resistivity contrast in line with a bipolar magnetic anomaly. Gravity measurement were also carried out on the magnetic anomalies and showed negative gravimetric anomalies in line with them. A drilling campaign totaling 696m at the end of December 2019 was then carried out.

Twihinate Centre (REE, Nb)

The Twihinate Centre project is located in the Bir Gandouz region, about 250 km South of the city of Dakhla. It is an annular volcanic structure consisting of a central mass of about 2.5 km in diameter, mainly composed of breccias of silica and iron oxides. The 4 drilling campaigns carried out over the last few years (4,547 m), have defined resources of the order of 584.5 Mt at 0.7% REE, 0.37% Nb₂O₅ and 193 ppm U₃O₈. Resources in the Central area are estimated at about 100 Mt at 1.47% REE and 0.49% Nb₂O₅.

In order to better estimate the resources of this area, a 22-hole drilling campaign totaling 1,885.20 m was carried out in 2018, the preliminary results confirm those of previous campaigns. A re-estimation of the resources of the central part of Twihinate is planned to be carried out after receiving all the chemical analysis results.

Tlayha (U)

The Tlayha project (Aousserd Province) is located about 150 km SW of Aousserd. The multi-kilometre of Tlayha structures show uraniferous calculètes with grades up to 900 ppm U. These structures have been the subject of two core drilling campaigns totaling 1,840.40 m. The results of the first campaign allow a resource estimation of 10.7 Mt at 292 ppm U₃O₈.
The results of the second campaign show grade varying between 159 and 606 ppm U₃O₈ with a thickness that vary between 1.6 and 4.4 m.

In parallel, a reconnaissance survey by radiometry, small pits and sampling was carried out to follow up the airborne uranium anomalies located at the extreme north of Tlayha. The results of this work allowed the definition of favorable zones of hectometric to kilometric extension that were recognized by a third core drilling campaign totaling 672 m. Sampling and chemical analyses are currently underway. A re-estimation of Tlayha’s resources is planned after the reception of all the results of chemical analyses.

**Al Warma (Au)**

Al Warma Project (Aousserd Province) is located about 80 km to the NW of the town of Aousserd. The gold soil anomalies highlighted by the strategic geochemistry were further controlled by geological mapping and sampling. The laboratory results showed grade of gold up to 2.9 ppm. These grades are associated with decimetric to metric lenses of quartz with iron oxides and traces of malachite and pyrite.

The work continued by geological control of the gold soil anomalies identified East of Al Warma, by lithogeochemical sampling with the collection of 153 rock samples whose chemical analysis results yielded gold grades up to 681 ppb and 168 soil geochemical samples whose results highlighted some gold anomalies. In parallel, resistivity/chargeability and magnetometric geophysical surveys were carried out.

Subsequently, 4 cored drill holes totaling 920.80 m were performed and the results of the chemical analyses of the first hole show grade ranging from 0.4 to 1.8 g/t Au over a thickness of 0.3 to 3.3 m. Cores from the other holes is currently being sampled. The mineralogical study shows a paragenesis consisting of pyrite, chalcopyrite and traces of covellite, zircon and rutile.

In addition, a tactical geochemical campaign was carried out in the Al Warma region over an area of 70 km² with the collection of 1,224 soil, 24 rock and 11 alluvial samples. The chemical analyses revealed gold soil anomalies to the East of Al Warma.

**Ait Baha Sud (Au, Ag, Pb, Zn, Cu)**

Ait Baha South project is located in the province of Chouka Ait Baha, about 80 km SE of Agadir and about 30 km NW of Tafraout. It covers part of the Paleo-Proterozoic basement of the Kerdous inlier, consisting of granites, migmatites, micaschists and a pelitic-sandstone series. These formations are unconformably surmounted by Late Proterozoic quartzites, then by Late and Terminal Proterozoic volcano-detrital formations (Pll-III and Pll).

The work carried out focused on the geological follow up of alluvial gold geochemical anomalies grading between 2 and 7 g/t Au. These anomalies coincide with those of BLEG geochemistry grading between 5 and 9.46 ppb Au. Their control was carried out by a 1/10,000 geological mapping over an area of 3.09 km² with the collection of 106 lithogeochemical samples. The results of chemical analyses show gold grades up to 1.29 ppm. A 1/2000 geological survey was carried out with the collection of 70 samples that are currently undergoing chemical analysis.

In the Tagdicht area, a control of geochemical anomalies was carried out and consisted of detailed geological mapping over an area of 2.4 km² with the collection of 141 rock samples which are currently undergoing chemical analysis.
Tidili (Au, Cu)

Tidili project is located approximately at 90 km west of the city of Ouarzazate, in the Neoproterozoic basement formations of the Ouzalagh promontory. The work carried out mainly focused on the copper-gold Aoudid showing by carrying out 4 core drill holes totaling 593.4m for additional reconnaissance of copper-bearing volcanic breccia and gold-bearing quartz veins. They were distributed over a mineralized envelope with an extension of about 300 m and 150 m of rooting. A total of 679 core samples were collected from the holes, with preliminary results showing average grades of up to 0.2% Cu over 5.4 m, and 1.8 g/t Au over 1.6 m. The other samples are currently undergoing chemical analysis.

In parallel, a geological control of the geochemical anomalies in the Tighermt sector allowed the collection of 94 lithogeochemical samples whose chemical analysis results showed grades up to 750 ppb Au, 2.4% Cu and 10 ppm Ag.

Acdif – Agadir Melloul (Au, Ag, Cu)

This project is located in the province of Ouarzazate and covers part of the Zenaga inlier, which is mainly composed of Paleo-Proterozoic (P1) micaschists and granites with some Neo-Proterozoic (PIII) rhyolitic outcrops, basic dykes (dolerites) and rhyolitic dykes.

The work carried out consisted in a geological follow up of the alluvial geochemistry and BLEG anomalies highlighted to the South of the Twiyyine gold occurrence, by a geological mapping at 1/2000 over an area of 25 hectares and the collection of 100 samples from the quartz structures.

Aguelmous – Oulmes (Au, Ag, Pb, Zn, Cu)

Aguelmous - Oulmes project is located in the province of Khenifra, about 10 kilometers west of the town of Aguelmous. The work carried out focused on the Zayan sector, located a few hundred meters from the Ment granite. The Zayan’s structure is embedded in metamorphosed schists, sandstones and consists of a subvertical quartz vein, with a general direction N60° and with a thickness that can exceed 4 m. The work done consisted in a geological mapping at 1/2000 over an area of 4.2 km² with the collection of 107 samples whose chemical analyses did not show significant grades. In the Oued Grou sector, the work consisted in a geological follow up of the geochemical anomalies highlighted in this sector by a geological mapping over an area of 1900 ha and the collection of 200 samples. The chemical analyses are in progress.

General research in the Southern Provinces

The general research for precious metals in the Southern Provinces focused on the areas of Imatlane, Al Malhate, Bir Gandouz, West Tichla and Al Warganate. The work carried out consisted of surveys and geological mapping accompanied by sampling (243 rock and 261 soil samples).
The Imatlane area showed interesting gold grade between 0.5 and 64 g/t in decimetric to metric quartz structures. The results of chemical analyses of samples taken at the Al Malhate sector revealed gold grades up to 1.83 ppm with copper grades between 0.10 and 0.24%. In the Bir Gandouz sector, the gold grades are relatively high. To the West of Tichla, the results of chemical analyses show a remarkable alignment which will subsequently be the subject of a detailed geological survey. Soil geochemistry also gave gold anomalies reaching 120 ppb. In the Al Warganate area, the results of chemical analyses of samples taken from the main structures did not show any significant results.

A soil geochemistry campaign was carried out in the Al Malhate sector over an area of 70 km² with the collection of 1,224 soil samples and 35 rock samples.

A trenching campaign was carried out in the sector of Sidi Abbad (South of Lamlaga) to follow up gold and molybdenum anomalies. A total of 500 meters of trenching was carried, representing a volume of 1,000 m³ of excavation. This work allowed the collection of 595 samples that are currently undergoing chemical analyses.

**General research in the Northern Provinces (Au, Ag, Cu, Pb, Zn)**

The general research for precious metals in the Northern Provinces concerned the northern part of the Palaeozoic massif of Tazekka, located SW of Taza city and the north-eastern part of Sagho (Imti imler - Ikis sector) in Tinghir Province.

In the Tazekka massif, the work carried out concerned three sectors (Bab Sedra, Aslil and Ouljama) and consisted of geological mapping at 1/500, 1/1,000 and 1/5,000 over a total area of 6.7 km² and the collection of 98 samples in the various structures encountered. Preliminary results of chemical analyses show indicative grades of gold and silver (up to 969 ppb Au, 24 g/t Ag, 1.9% Pb and 4,923 ppm Sb).

At Ikis, the work carried out consisted of a 1/5000 geological mapping over an area of 3.66 km² and 1/500 survey of the vein structures. A total of 88 rock samples were taken from the quartz structures whose chemical analyses are in progress.

In the Tighmi sector, a geological control of the BLEG and soil geochemistry anomalies, by mapping at 1/5,000 scale and the collection of 338 rock samples was carried out. The samples are currently undergoing chemical analysis.

**Base metals and uranium**

**Tiouli West (Zn, Pb)**

In the Tiouli West project (Jerada province) located 35 km south of the city of Oujda, geological and geophysical work continued on the 4 mineralized structures, trending ENE-WSW and over extensions of up to 1.2 km.
The results of the drilling campaign carried out in 2018 (1,500 m) to recognize the main structure of Soltana show grade varying between 1.03 and 5% Zn with a thickness between 0.66 and 6.10 m. The overall result of this drilling campaign allowed to estimate the preliminary resources of the Soltana structure at approximately 1 Mt at 2% Zn with a continuity of the structure towards East and West.

Geological work was also carried out on the El Menjel Lakhal structure to the North of the Soltana structure by geological mapping and sampling. 144 samples were taken showing grades ranging from 0.1% to 13.4% Zn and 0.1% to 8.2% Pb. A mineralized sample taken at Bled Belkacem South structure located to the South of the main Soltana structure, show grades about 3.2% Zn, 17% Pb and 59g/t Ag.

On the other side, the results of the soil geochemistry campaign carried out during 2018 revealed zinc and lead geochemical anomalies distributed parallel to the alignment of the mineralized structures.

Following the results of the geological, geophysical and geochemical work and those of the first campaign drilling, 31 additional drill holes were completed during the first quarter of 2019, totalling 2,000 m. These holes focused on the 4 mineralized structures identified in the West Tiouli area and all of them intersected the targeted structures.

The drill hole targeting the North-East extension of Soltana’s structure intercepted this structure over 7 m with grades of 2% Zn and 1% Pb. This drill hole increased Soltana’s resources to 1.4 Mt at 2% Zn and 1% Pb. On the other hand, the Southern part of the sector was the subject of geophysical work by resistivity and induced polarization that highlighted an area of basement uplift with the presence of border faults. These zones may be favorable for the presence of stratiform MVT-type mineralization, which will be controlled during the third drilling campaign (2,500 m) scheduled during the first quarter of 2020. An expert assessment on the overall state of the project will be conducted in 2020.

**Merija (Cu)**

Merija project is located about 20 km NW of Talsint (Figuig province), the results of the drilling campaign (2,000m) carried out in 2018 allowed to characterize the sedimentary horizon that consist of sandstones and microconglomerates, alternating with passes of red sandstone and argillites. The mineralization intersected up to 8.40 m of disseminated malachite.

The results obtained of these drill holes show grade not exceeding 0.1% Cu. Centimentric passes showed grades up to 1.1% Pb and 0.6% Zn. An expert assessment on the overall state of the project will be conducted in 2020.

**Awark (REE, U)**

Awark project is located about 200 km SE of the town of Ed-Dakhla (Aousserd province). A radiometric survey was conducted in this project with a spacing of 50 m x 50 m in the Lamlilyssa sector over an area of 4.5 km², accompanied by sampling of radioactive facies. A total of 73 samples were collected for chemical analysis and 11 for petrographic study. The results show rare earth contents ranging from 0.03 to 5.3%, with an exceptional grade reaching 11%.

Subsequently, a core drilling campaign totaling 600m was carried out during the second half of 2019. All the holes intersected the mineralization structures and are currently under chemical analysis.
Western Anti-Atlas (Cu)
For the Western Anti-Atlas project located within Taroudant province, work has started in the Ighill n’Issensiden sector located 10 km north of Igherm. A geological mapping at 1/25,000 scale covering an area of 32 Km² was carried out with the collection of 112 samples. The chemical analysis results show grades that can reach 4.4% Cu on mineralization structures not exceeding 50 cm of thickness.

In addition, geophysical work was carried out on Touflaazt and Ait Ifrane targets in order to evaluate the ZTEM geophysical anomalies. For this purpose, a total of 6 electric sounding and 8 electromagnetic sounding were conducted. This work showed that the Ait Ifrane sector is more promising than the Touflaazt sector, which should be confirmed by the completion of two core drill holes for reconnaissance on this ZTEM anomaly. These drill holes totaling 1,000 m will be drilled as part of the Tizoula project.

Bou Izagane (Cu, Ag)
The Bou Izagane project is located 12 km SE of Ouarzazate. In this area, the work continued with geological mapping and sampling. Mineralization occurs as malachite, chrysocolla and azurite, generally impregnated in fractures, or disseminated in andesite and/or trachy-andesite. Chemical analyses show grades up to 3.3% Cu and 152 ppm Ag.

In the North Marghoute sector, a geophysical survey by magnetometry was carried out over an area of about 1.7 km² with resistivity/chargeability measurements. 6 geological cross sections at 1/1000 were carried out to interpret the chargeability and resistivity data and 7 trenches were subsequently executed over a total length of 55 m with the collection of 52 samples. Chemical analyses showed grade up to 2.3% Cu and 26 ppm Ag.

On the other hand, in the South Marghout sector, a geological survey at 1/500 of the Kadi Aissa sector was carried out over an area of 2.4 ha with the collection of 35 samples whose chemical analyses show grades up to 2.42% Cu and 125 ppm Ag. In addition, another geological survey at 1/500 was conducted in the same area, covering 119 ha and with the collection of 31 samples. The chemical analyses showed grades up to 3.4% Cu, 393 ppb Au, 1.1% Pb, 0.1% Zn and 125 ppm Ag.

Following the encouraging results of the geological and geophysical work, a program of 21 drill holes totaling 1342.40 m was carried out. They all intersected the targeted structures with mineralization consisting of malachite, chalcocite, chalcopyrite and pyrite in the form of veins and disseminations in chloritized and porphyry andesites. The samples from those drill holes are currently undergoing chemical analysis. In addition, south of the Bouizagane sector, 9 samples were taken from the manganiferous Tifernine East and West sector and yielded grades up to 54% MnO and 43% Fe₂O₃.

Ait Tamellil (Cu)
The Ait Tamellil project is located about 50 km South of Demnate (Azilal province). In this area, a campaign of 6 drill holes totaling 400m was carried out during the 2nd quarter of 2019. The drill holes intersected a mineralized zone formed by quartz veins and schists with chalcopyrite and pyrite, with a thicknesses varying from 1.30m to 3.45m. A total of 464 core samples were collected and show grades up to 5.8% Cu over 3.10m of thickness from the hole HD4.
**Taadant (Cu)**

The Taadant project is located 50 km South of Taroudant (Taroudant province). In this area, a 1/10,000 scale geological mapping was carried out covering an area of 3.5 km² with the collection of 26 samples. The results of chemical analyses show copper grades up to 0.6% Cu. 3 core drill holes totaling 800 m were carried out and intersected the targeted mineralized horizon.

A total of 387 samples were taken from the cores and show low copper grades not exceeding 0.4% over decimetric thicknesses.

**Tizoula (Cu)**

The Tizoula project is located 27 km SW of Igherm (Taroudant province). 3 drill holes totaling 300 m were completed and intersected the targeted mineralized structure. A total of 177 samples were taken from the cores. The first results of chemical analyses show copper grades up to 1% Cu over decimetric thicknesses.

**General research (base metals)**

The general research for base metals concerned the sectors of Tizi N'Ouchene (Chichaoua province), Tagdid N'Oufella (Al Haouz province) and Sisdi (Jerada province).

In the sector of Tizi n'Ouchene (Central High Atlas) located 35 km SE of the city of Imi n'Tanout, the work carried out consisted in geological mapping with the collection of 137 samples. The chemical analysis results show grades ranging from 50 ppm to 1.25% Co and from 100 ppm to 4.3% Cu over decimetric thicknesses.

In the Tagdid N'Oufella sector located 24 km East of Ijoukak, the work carried out consisted in a 1/25,000 scale mapping with the collection of 24 samples. The chemical analyses show grades up to 1.5% Cu over decimetric thicknesses.

On the other hand, in the Sisdi sector located 18 km south of the town of Oujda, the work carried out consisted of geological mapping at 1/25,000 with the collection of 29 samples. The mineralization appears as pyrolusite impregnating a carbonate layer over 15 to 20 cm with grades up to 39% Mn and 57% Fe.

**Industrial rocks and minerals**

**Toulal (siliceous sands)**

As part of the Toulal project for the research of extra-siliceous sands in the region of Meknes, mapping, core sampling and technological characterization work was carried out. A campaign of 6 core drill holes totaling 323 m was carried out and a total of 232 samples were taken and are currently undergoing chemical analysis.

A mineral processing was developed and consists of granulometric separation of the silica sands followed by attrition and then by magnetic separation. This process allowed the concentration of silica sand to grades of around 99% silica, 0.05% iron and with a weight yield of 90%.
Dorsale Calcaire (dolomites)
Geological mapping and sampling work was conducted in the Tetouan and Chefchaouen region, in the “Dorsale Calcaire” of the Western Rif, for the research of industrial dolomites. The occurrences of the Bou Zaitoune area located 8 Km South of Tetouan and Izmamene located 14 Km North of Chefchaouen were mapped and sampled. They contain massive light grey to white dolomites from the Upper Triassic. A total of 47 samples were collected and chemical analyses show that the dolomites in the area are of good quality with MgO contents ranging from 18% to 21.5%, and low iron contents.

Jbel Kharrou (clays)
Within the framework of the Jbel Kharrou project located 25 km East of Skhour Rehamna, a 1/1000 geological survey was carried out to study the illitic clays of Jbel Demja. The mapping was accompanied by the realization of 40 linear meters of trenches. 50 samples were collected and are currently undergoing chemical analysis.

Jbel Assila (Siliceous sands)
Within the framework of the Jbel Assila project located 5km North of Ain Defalli (Ouazzane region), the research concerned silica sands that occur in Pliocene formation with thicknesses reaching up to 15m. A total of 77 samples were collected, the first results gave silica contents reaching 96%.

General Research (Rocks and Industrial Minerals)
The general exploration work conducted for industrial rocks and minerals was devoted to the study for lithium related to pegmatites and smectite-type clays.
Concerning the research for lithium related to pegmatites, mapping and sampling work continued on the pegmatites of the Zenaga inlier in Taznakht region and concerned the greisens of the Rass Labied and Sidi Bahlil granites in Rehamna region. For lithium related to clays, mapping and sampling of ghassoul horizons in the Tertiary Missour Basin and bentonitic clays in the Neogene Basin of Nador were carried out. A total of 377 samples were collected and the first result in the Missour basin show Li contents reaching 2,405 ppm in the ghassoul horizons.
Moreover, the exploration work in the Southern Provinces concerned silica sands and lithium respectively in the Laayoune basin and in the Sebkhas brines of the Dakhla Oued Dahab region. A total of 120 rock samples and 10 salt water samples were taken and chemical analyses are in progress.
Strategic exploration projects

Integrated Mining Exploration Project in the Southern Provinces
The integrated mining exploration project in the Southern Provinces was carried out with external support. The objective aimed at evaluating in an integrated manner all the work carried out in this area since 2002. The project has been completed. It allowed the re-evaluation of identified prospects and the identification of new potential targets.

Integrated project in the Anti-Atlas
This project concerns the entire Anti-Atlas with the compilation, processing and interpretation of all available geoscientific data (geological, geochemical, geophysical and hyperspectral) in order to identify metallogenic targets favorable for mining exploration. The phase 1 of the project has been completed and consisted on the collection, structuration, compilation, analysis and interpretation of the data. The phase 2 consisting on the study of the thematic groups is in progress.

Study of geo-scientific data and targeting in central area of Morocco (Maroc Central)
This project began with the collection and synthesis of available geoscientific data from previous exploration work in the area. The first phase of this study identified all types of known mineralization in the Central Moroccan region and highlighted their geological and metallogenic characteristics.

Subsequently, a processing of geoscientific data was carried out in order to individualize exploration criteria that will be used during the targeting phase. The second phase of the project will focus on field evaluation of the most promising targets.

General geochemical exploration
Within the framework of this project, geochemical work concerned the sectors of Oum Tlayha (Aousserd Province) and Al Malhat (Aousserd and Oued Eddahab Provinces). In the sector of Oum Tlayha, 1,802 soil samples were collected over an area of 200 Km². These samples show grades up to 679 ppb Au; 262.8 ppm Cu; 121.5 ppm La and 59 ppm U. The work undertaken in the Al Malhat sector for the research for Au, Cu, Ni, REE and U consisted in the collection of 35 rock samples and 1224 soil samples over an area of 70 Km².

Geological campaign in the central High Atlas
An alluvial and stream sediment geochemistry campaign is being finalized in the Central High Atlas over an area of 10,000 km². The phase 1 concerning the orientation test has been carried out. The Phase 2 related to the field work (stream sediment and alluvial sampling) is completed with the collection of a total of 21,306 samples including 10,153 stream sediment and 11,173 alluvial concentrates including 1,020 samples for the mineralogical study.

Geothermal projects
Three special projects are launched:

- The "Geothermal of Morocco" project relating to the evaluation of Morocco’s geothermal potential. It consists in the acquisition of new data, their compilation and the verification of hypotheses in order to make a preliminary evaluation of the geothermal potentialities of Morocco. This project continued with the delimitation of new promising areas in order to target them for detailed studies.
The project "Study of the geothermal potential of North-East Morocco" was completed at the end of June and enabled the identification and study of potential geothermal targets in the study area. A roadmap was drawn up with the action plan to be carried out for the development of each target in a view to exploiting the geothermal resource according to two scenarios; direct use or electricity production. Promotional files for each of the potential targets are currently being finalized.

The project "Study of geothermal potential in the Southern Provinces" is in progress. The phase I relating to the collection, compilation and synthesis of existing geoscientific data has been completed. The phase II relating to field work and chemical and isotopic analyses of water and gas is under way. Five geothermal zones have been identified and will be the subject of field work during Phase II. A field mission to collect samples, acquire accessible drilling data and carry out in situ measurements of physico-chemical parameters has been carried out.

Research for Natural Hydrogen
A support and expertise for natural Hydrogen research in Morocco was launched by external service. The 1st phase of this project relating to the collection, compilation and synthesis of existing geoscientific data has been completed. The preliminary results of this phase are promising and show the presence of natural hydrogen flow.

Several targets have been delineated, the most promising will be the subject of detailed work during Phase II, which is currently underway.

Prospectivity study in the CADETAF area
A prospectivity study in the CADETAF area was carried out by a multidisciplinary ONHYM team and highlighted promising zones for several types of mineralization:
- Vein-type mineralization Cu, Pb, Zn, Ba, Ag (Oumjrane type);
- Gold mineralization (Tamellalt type);
- Lead-Zinc mineralization (Atlas limestone type) (Boudhar type);
- Ordovician oolitic iron mineralization (Imi n'Tourza type);
- Ni, Co, Cu mineralization (M'fish type);
- Sedimentary copper mineralization (Tazougart type).

Partner’s Activities
Jebilet, Guemassa and Tekna (polymetallic) - MANAGEM (Morocco)
The exploration strategy for VMS-type mineralization in the Marrakech area was reviewed this year. It is based on two levels: the use of advanced geophysics (VTEM and SQUID) allowing great depth of investigation and the integration of a multidisciplinary expertise specializing in the VMS theme. Thus, during the first half of 2019, two major projects were initiated in the area, namely the airborne electromagnetic survey (VTEM) by GEOTECH and the integrated mining exploration project by CSA Global. The VTEM geophysical survey has been completed and data quality control has been performed. Interpretation of the results is ongoing and will be followed by SQUID ground control of the targets.

On the other hand, the main objective of the integrated project currently underway is to evaluate the VMS exploration work in the region and to identify new targets. The 1st phase of this project has been completed and the consistency of the work of the 2nd phase is being finalized.
**Ighrem domain (Cu)- MANAGEM (Morocco)**

MANAGEM continued the development of the Tizert copper project (Block 1) by carrying out an economic feasibility study and the delineation of new mineral resources estimated at 19 Mt at 0.73% Cu and 17 g/t Ag. Since the start of work in 2012, the overall volume of drill holes to the end of June 2019 is 196,577 m, which allowed the evaluation of the deposit's current resources at 118 Mt at 0.9% Cu and 21 g/t Ag, at a cut-off grade of 0.45% Cu. In addition, MANAGEM has started mining the Tilferki deposit whose resources are estimated at 2.4 Mt at 0.87% Cu and 32 g/t Ag.

Following the recommendations of the ONHYM-MANAGEM technical committees, geophysical work was carried out by ONHYM teams at Tizert to develop an exploration model to be adopted for the exploration of Tizert-type mineralization in the Western Anti-Atlas. Several ground geophysical methods were tested in the Tizert district (gravimetry, resistivity/chargeability, electromagnetism and electromagnetic sounding).

Based on the geological data available in the region, this work allowed to characterize the physical parameters specific to this type of mineralization and to establish an appropriate methodology that can be used to optimize the yield of future exploration work in the region.

In addition, exploration work in Block 2 (Ouaoufengha domain) consisted of geophysical surveys using the induced polarization method over an area of 5.2 km² covering the Alous and Assif Imider sectors.

**Zrahina (F, Ba, Pb, Ag, Zn)-MANAGEM (Morocco)**

Within the framework of the ONHYM-MANAGEM partnership, ground geophysical work was carried out at the Zrahina deposit. A total of 15 measurement profiles were carried out, which allow to follow the variation of resistivity and chargeability parameters down to a depth of 425m.

A preliminary analysis of these results showed the existence of several electrical discontinuities probably related to faults, in addition to the highlighted chargeability anomalies.

**Achmmach ( Tin) – Atlas Tin (Australia)**

The Achmmach deposit resources are estimated at 14.6 Mt at 0.85% Sn. The exploration work carried out concerned the Meknes area in the South and the Western part of Sidi Addi. Complementary exploration works are in progress in the Eastern part of Sidi Addi through the execution of a core drilling campaign totaling 3000 m. The objective of this work is to recognize the extensions of the mineralized zone towards the East.

Moreover, in accordance with the law 33-13, the feasibility and environmental impact studies were carried out and the operating license for the deposit was obtained by Atlas Tin.
Khemisset (potash) - OCP (Morocco)

As part of the partnership agreement between ONHYM and OCP on the Khemisset potash deposit, OCP has started a campaign of 5 drillings totaling 5,000 m and an environmental impact study. The first drill hole intersected the potash mineralization (sylvinite and carnallite) over 5.29 m (from 777.27 to 782.56 m). This drill hole has been stopped at 803.30 m and confirmed the historic data from the hole PZ7 drilled by ONHYM.

The presentation of the environmental impact study to the National Committee of Impact Studies (CNEI) was held on December 24, 2019 with the presence of ONHYM and OCP members.

Zgounder (Silver) – MAYA (Canada)

Zgounder Millenium Silver Mining (ZMSM), in which ONHYM holds a 15% stake and who exploits the Zgounder silver deposit, produced 11,380 Kg of silver metal at the end of September 2019, an increase of 48.3% compared to the same period in 2018.

The new flotation plant is operating since January 2019 with a capacity of 500 tons per day. A drilling campaign totaling 3,035m has been carried out in the East zone and the first results show grades reaching 3,464 g/t Ag in intervals reaching 8m.

Imilchil domain (Cu, Ni) - NAN (Canada)

A part of the Memorandum of Understanding signed between ONHYM and the Canadian company North American Nickel (NAN), a field mission was carried out in the Central High Atlas for the examination of copper-nickel showings in the Imilchil domain with the collection of 30 samples from the mineralized occurrences.

Mining drilling

During 2019, 166 drill holes totaling 4,764.30 m were completed. All of this work was completed for ONHYM’s own projects.

<table>
<thead>
<tr>
<th>Worksite</th>
<th>Provinces</th>
<th>Number of drill holes (U)</th>
<th>Total coring (ml)</th>
<th>Total of tracks (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM Tlayha P3</td>
<td>Aousserd</td>
<td>123</td>
<td>672</td>
<td>-</td>
</tr>
<tr>
<td>FM Twihinate P6</td>
<td>Oued Ed-Dahab</td>
<td>-</td>
<td>-</td>
<td>12,209</td>
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<tr>
<td>FM Tidili P3</td>
<td>Ouarzazate</td>
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<td>593.40</td>
<td>119</td>
</tr>
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<td>920.80</td>
<td>-</td>
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<tr>
<td>FM Bouizagane</td>
<td>Ouarzazate</td>
<td>21</td>
<td>1,342.40</td>
<td>3,083</td>
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<td>FM Awark P3</td>
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<tr>
<td>FM Chennna P2</td>
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<td>3</td>
<td>636.7</td>
<td>490</td>
</tr>
<tr>
<td>FM Tizoula t</td>
<td>Taroudant</td>
<td>-</td>
<td>-</td>
<td>140</td>
</tr>
<tr>
<td><strong>Total work carried out by ONHYM’s own teams :</strong></td>
<td><strong>166</strong></td>
<td><strong>4,764.30</strong></td>
<td><strong>16,041</strong></td>
<td></td>
</tr>
</tbody>
</table>
As part of the outsourced drilling work, 5 mining drilling campaigns, including tracks preparation, were carried out totaling 3800 m on the following sites:

<table>
<thead>
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<th>Worksite</th>
<th>Provinces</th>
<th>Number of drill holes (U)</th>
<th>Total of coring (ml)</th>
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<td>Ait Tamellil</td>
<td>AZILAL</td>
<td>6</td>
<td>400</td>
</tr>
<tr>
<td>Taadant</td>
<td>TAROUDANT</td>
<td>3</td>
<td>800</td>
</tr>
<tr>
<td>Tizouia</td>
<td>TAROUDANT</td>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>Toulal</td>
<td>MEKNES</td>
<td>6</td>
<td>300</td>
</tr>
</tbody>
</table>

**Total work carried out by external services (outsourcing):**

<p>| | | | |</p>
<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>49</td>
<td>3,800</td>
<td></td>
</tr>
</tbody>
</table>

**Mining laboratories**

As part of the preparation for the transition to the ISO 9001 : 2015, a review of the quality management system (QMS) and targeted training actions have been completed. The documentation associated with the various processes has been revised to conform to the new requirements with the integration of the new organization of the Direction of Technical Services and the mining laboratories division. Internal audits are completed. The annual QMS assessment was carried out followed by a blank audit carried out by an external auditor. The certification audit is planned for the beginning of 2020.

The activity of sample preparation, analysis and study of the mining laboratories is as follows:

- Petrographic and mineralogical analyses of the Mineralogy laboratory: 677 samples are divided into 486 sample confections, 58 petrographic studies and 133 mineralogical studies of artificial concentrates. The confections and studies concerned samples from ONHYM projects, own research projects and third-party customers.

- Mechanical preparation of the samples made by the Mineralurgy laboratory: 13,570 samples (13,273 for ONHYM projects and 297 for Subsidiaries and Third Parties).

- Determinations made by the Mineral Chemistry laboratory: 152,284 (150,729 for ONHYM projects and 1,555 for Subsidiaries and Third Parties). These determinations correspond to 12,469 samples analysed (12,184 for ONHYM projects and 285 for Subsidiaries and Third Parties).
Location map of mining projects 2019

▲ Precious Metals

ONHYM Projects
1- Tlayha (U, Au)
2- Twinhate Centre (REE, Nb, U)
3- Chenna (Au, Cu)
4- Al Warma (Au, Cu)
5- Aït Daf - Agadir Melloul (Au, Ag, Cu)
6- Ait Baha Sud (Au, Ag, Cu)
7- Tidili (Au, Cu)
8- Aguelmouss - Oulmes (Au, Ag)

Projects in Partnership
9- Tichla Awserd (Au, Cu) (ONHYM-Metalex)
10- Zgounder (Ag) (ONHYM-Maya Gold & Silver)
11- Had Iamn (Au) (ONHYM-Manager)
12- Tighmi (Au) (ONHYM-Abaliouglu)

_pb_ Base Metals

ONHYM Projects
13- Anti Atlas Occidental (Cu)
14- Taadant (Cu, Pb, Zn)
15- Tizoula (Cu)
16- Bou Izagane (Cu, Ag, Au)
17- Awrak (REE, U)
18- Tiouli Ouest (Zn, Pb)
19- Merja (Cu, Pb, Zn)
20- Aït Tamel III (Cu, Pb, Zn)

Projects in Partnership
21- Jebilet (Polym) (ONHYM-CMG)
22- Guemassa - Haouz (Polym) (ONHYM-CMG)
23- Tekna (Polym) (ONHYM-CMG)
24- Domaine d’Tghrem (Cu) (ONHYM-MANAGEM)
25- Boumadine (Zn, Pb, Cu, Ag) (ONHYM-MAYA)
26- Tiouine (Mn) (ONHYM-Garrot Chaillac)

● Rocks & Industrial Minerals

ONHYM Projects
27- Toulay (Siliceous sands)
28- Jbel Kharrou (Clay)
29- Dorsale calcaire (Dolomite)
30- Jbel Eoula (Siliceous sands)

Projects in Partnership
31- Tertiary Bassins (Bentonite) (ONHYM-TOLSA)
32- Khemiset (Potash) (ONHYM-OCP)
33- Boudrika (Magnesite) (ONHYM-Inversiones Monte Olpimo)
34- Nqeb (Feldspar) (ONHYM-METCO)

**NB:** The projects of general research, Geothermal, Strategic Campaigns and Integrated Projects concern many regions and are not plotted in the map.
MINING COOPERATION & PARTNERSHIP

Mining partnership activity was marked by the signing of 11 agreements and contracts:

Three assignment contracts
- Contract signed on 25/01/2019, to transfer the mining area “Bloc II of Ighrem” by ONHYM to AGM for its development and exploitation;
- Contract signed on 05/07/2019, to transfer the mining area “Bloc III of Ighrem” by ONHYM to AGM for its development and exploitation;
- Contract signed on 05/07/2019, to transfer the mining area “Had Imawn” by ONHYM to AGM for its development and exploitation.

Two farm-out Agreements
- Agreement between ONHYM and CMMF, signed on 29/07/2019, relating to the mining area “Ait Amar”;
- Agreement between ONHYM and MECTP, signed on 29/07/2019, relating to the mining area “Nkob”

Six Agreements
- Agreement between ONHYM and AMETHYST, signed on 03/01/2019, relating to the mining area “Taghdout”;
- Agreement between ONHYM and TOLSA, signed on 26/04/2019, relating to the mining area ” Sidi Bou Othmane”;
- Agreement between ONHYM and MANAGEM, signed on 05/07/2019, relating to the mining area “Moulay Bou Azza”.
- Agreement between ONHYM and CMO, signed on 05/07/2019, relating to the mining area “Tizi N’ Ossatour”;
- Agreement between ONHYM and NAN, signed on 09/07/2019, relating to the mining area “Imilchil”;
- Agreement between ONHYM and SOCUMA, signed on 09/10/2019, relating to the mining area “Zaida”.

![Image of three people shaking hands]

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HUMAN RESOURCES

The workforce is in steady decline due in particular to massive retirements and very limited recruitments. ONHYM recorded 59 departures.

At the end of December 2019, ONHYM’s staffing was 480 with supervision rate of 38%. Women represent 25% of the global workforce.

During 2019, internal promotion concerned 17 positions.

In 2019, ONHYM recorded 26 new recruitments positions.

Social activities

- Pilgrimage: 4 pilgrims were supported by ONHYM to accomplish the pilgrimage allowances to visit the holy places of Islam;
- Exceptional advances: 107 exceptional advances granted
- Medical assistance: 3,142 cases treatments were granted;
- Transmission of 10,814 diseases cases to the insurance company
- Group care: 120 in addition to 94 medical visits and 400 systematic annual visits;
- Settlement of occupational disease pensions for 740 employees and retirees;

Culture center

The socio-cultural center offers social and cultural activities and courses to ONHYM’s employees ‘and retiree’ children, that spread throughout the year, such in languages, computer, chess, music, manual work, educational outings and community activities.

Holiday camp

In 2009, the summer camp was marked by the continuation of rehabilitation and restoration works on camping equipment. It registered the participation of 113 children, between 10 and 14 years old, of ONHYM and its affiliates' employees, SACEM and COMABAR.
Training
ONHYM has continued its training and capacity building activities in order to ensure a permanent match between skills and core business requirements. In 2019, training activity was marked by:

- 49 short-term continuing training actions totaling 739 P/DT;
- The continuation of 16 long-term training courses for a total of 1,237 P/DT;
- Enrollment of 81 agents from different entities in English courses for 3 sessions, 702 P/DT;
- Participation in 45 conferences, workshops and congresses, a total of 113 actions for 2,910 P/DT.

Safety and Health Committee
The Safety and Health Committee contributes to the protection of the staff’s health, safety and the improvement of their working conditions. The main achievements at the end of 2019 concerned follow-up of the actions taken during regulatory meetings, completion of the call for tender for the acquisition and installation of safety signage at ONHYM’s headquarters, launch of safety signage installation process at ONHYM CAMPUS examination of the samples of Personal Protective Equipment (PPE), visit of the abandoned wells of the company SDX in GHARB’s region.
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