by Madencilik Türkiye

Mining Turkey

Mining & Earth Sciences Magazine

ISSN: 2146-9423

01 March 2012 | Vol 2 | Number 2 | www.madencilik-turkiye.com

- Mineral Potential of Turkey
- Energy, Lignite and the Role of Turkish Coal Enterprises
- Mining in Turkey 2012 Report
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Address: Fe-Ni Mining Co. Ankara, Turkey

Phone: +90 312 284 71 28-29, Fax: +90 312 284 71 33

Web: www.fenimining.com, Mail: info@fenimining.com

contents

Mining Turkey is published biannually by Mayeb Madencilik ve Yer Bilimleri Basım Yayın Dağıtım Ltd.
1042. Cd. 1335. Sk. Vadi Köşk Apt. No: 6/8
A. Öveçler / ANKARA / TURKEY
Tel : +90 (312) 482 18 60
Fax : +90 (312) 482 18 61
info@madencilik-turkiye.com
www.madencilik-turkiye.com

General Coordinator
Onur Aydın
onur@madencilik-turkiye.com
Editor - International Relations
O. Çağım Tuğ
cagim@madencilik-turkiye.com
Administrative Affairs
Volkan Okyay
volkan@madencilik-turkiye.com
Graphic Design
M. Anıl Tuğ
anil@madencilik-turkiye.com
Merve Mallı
merve@ideakup.com
Web Technologies
Bilgin B. Yılmaz
bilgin@madencilik-turkiye.com
Legal Adviser
Av. Evrim İnal
evrim@madencilik-turkiye.com
Academical Advisers
Prof. C. Okay Aksoy
Prof. Erol Kaya
Assoc. Prof. Ali Sarıışık
Assoc. Prof. Hakan Başarır
Assoc. Prof. M. Emin Candansayar
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Assist. Prof. Melih Geniş
Assist. Prof. Melih Iphar
Assist. Prof. Niyazi Bilim
Assist. Prof. Nuray Demirel
Dr. Mete Kun
Advertising Sales
reklam@madencilik-turkiye.com
Annual Subscription Enquiries
abonelik@madencilik-turkiye.com

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New Targets for Old Needs

O. Çağım Tuğ | cagim@madencilik-turkiye.com

As we all know, world mining products prices are dependent on China especially in copper, coal, rare earth minerals, aluminium etc. China consumes 40 % of world copper production and can affect the prices easily. On the other hand, if we take a look at the rare earth minerals, being one of the biggest producer in the world, China uses this commodity even for political reasons besides driving the prices. The world needs new importers and exporters these days to rebalance and stabilise the mining products prices.

Gold prices are still on not too far from the last years record of 1896.50 USD. Alongside of Turkey's high potential for gold exploration, Turkey has become the most important gold producer in Europe and more projects are on the way to start in 2012. Natural stones have always been Turkey's most important export products of the mining industry. Copper, chromium, boron chemicals & equivalent products and industrial minerals are the other commodities in which Turkey plays an important role in the international market.

This year, despite the economic crises all over the world and instability in the Middle-East, Turkey's export sales value hit the record high of Turkish Republic history. The goverments production-oriented policies for the mining industry encouraged the sector last year with the high metal prices at the begining of the year. This year is an important year for the mining industry in Turkey. If Turkey reaches and passes the 2011 numbers (which is highly expected to be), the country's reputation will continue to grow up in the international arena in terms of mining activities and will also take important roles in the production of some new commodities.

Since our first issue in September 2011, we have recieved very positive and encouraging feedback from our subscribers and companies. The first issue was a special edition for the foreigner visitors of 22. World Mining Conference which was held in İstanbul, for the second time after 32 years. We, now, decided to publish Mining Turkey which will be a brief outlook to the Turkish mining industry, every 6 months. In this issue we covered up the past 6 months of mining sector in Turkey since September 2011, including important mining news, introductions and developments of some important mining companies, 2011 export sales report summary of Turkey and mining potential of Turkey. Under an agreement with E&MJ, Turkey Mining Report 2012 by Global Business Reports will also take place in this issue of Mining Turkey.

This second issue, as well as the forthcoming issues, will be distributed to all our subscribers and at the events that Mining Turkey will attend i.e. 65th Geological Congress of Turkey, Metso & Madencilik Türkiye Magazine "Mineral Processing Equipments & Process Technologies" Seminar and others. To take a part in this adventageous biannual with your articles, editorials or advertisements, please feel free to contact us. ●

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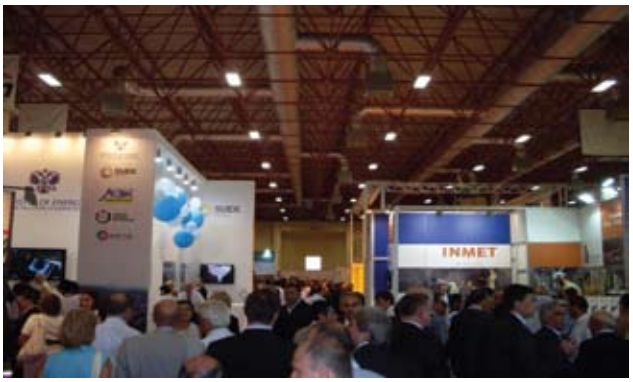
22nd World Mining Congress Organised in Istanbul

September 2011

22nd World Mining Congress which was held between 11 - 16 September, hosted in Istanbul, Turkey. Total 1175 delegate attended to this important event from 51 different countries. First day of the congress was crowded due to the opening speeches and show but the interest to the event diminished throughout the last days. Nevertheless, 290 verbal and 44 poster presentations has been successfully took place. Safety and environmental - ecological issues were the most important topics in the 22nd World Mining Congress with the theme of "natural resources of a country are indisputably heritage of each nation".



Çaldağ Nickel Mine Sold to Turkish VTG Holding

September 2011

On October 2011, European Nickel Spain S.L and European Nickel Holding Iberia S.L, both of which are wholly owned subsidiaries of ENK Plc, agreed to sell their interests in the Caldag Nickel Project in Turkey to VTG Nikel Madencilik San. ve Tic. AŞ. within the VTG Holding. With this agreement, ENK sold 100 % rights of Çaldağ Project for 40 million USD in cash to VTG Nikel Madencilik.

VTG Holding was founded by Turkish entrepreneurs on the purpose of exploring and operating underground resources and turning those into value. Oremine Resources (Gold), VTG Nikel (Nickel), VTG Bakır (Copper) and VTG Kömür (Coal) are the subsidiary companies established under VTG Holding. VTG Holding has been also increasing its cross-border strength and investing in mining at South Africa and Colombia.

Oyak Group's Erdemir Maden Started Production at Ekinbaşı Iron Mine

September 2011

Erdemir Maden (Ermaden), mining branch of OYAK Group announced that Ekinbaşı underground iron mine is ready for production after two years of construction process. The company invested around 33 million TRY (18.75 million USD) starting from October 2009 till September 2011. The mine will provide ore for the Ermaden Iron Plant and the plants operating life will be increased from 4 to 6 years. The plant expected to produce 200,000 tonnes of magnetite in 2011. Total production of the plant is planned to be 5.4 million tonnes. Its also said by the company that the health & safety procedures were applied seriously at the site and no work accidents happened during two years.

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6500 Years Old Ancient Mine Found in Middle Anatolia *October 2011*

An ancient underground copper mine found after 3 years of work near Derekutuğun village, at Bayat county of Çorum. Prof. Ünsal Yalçın from Geology Department of Bochum University, who carries out the works, said that some evidences has been found while they were doing a surface survey near Derekutuğun village in 2007 and following detailed observations, they noticed that there is an ancient underground mine in the area. Yalçın stated that this underground copper mine adit could be the world's oldest known mine and added "World's oldest known ancient mines were at Tokat, Erbaa in Turkey and Bulgaria dated around 4,000 BC but we dated this adit around 5,000 BC. We didn't knew that ancient people were digging adits for mine circa 5,000 BC".

Turkey's First Ferro Silicone Mangan Plant by Mangan Maden *December 2011*

Mangan Maden AŞ, announced that the construction of the Turkey's first ferro silicone mangan plant is finished, at Tosya county, Kastamonu. Turkey was fully foreign-dependent on ferro mangan and ferro silicone mangan production by this time. The plant's ferro silicone mangan production capacity is 15,000 tonnes per year.

Mangan Maden AŞ is planning to increase ferro silicone mangan production to 150,000 tonnes/year in order to meet at least 25 % of Turkey's iron-steel industries 600,000 tonnes/year need. To reach that level, the company aims to work with total 10 different mines, including their manganese mine near Ortalıca, Tosya and their second manganese mine project.

Gold Production Reached 24.4 Tonnes in 2011 *January 2012*

The estimations of 25 tonnes of gold production for 2011 in September made by Turkish Gold Miners Association, appears to be a realistic expectation, showed the end of the year production results. The total gold production of Turkey reached to 106.5 tonnes since 2001 and the production increases every year associated with the number of new gold mines. Turkey's gold production in 2011 was 24.4 tonnes, increased around 43 % from last years production of 17 tonnes.

The bannerbearer, Turkey's first gold mine Bergama - Ovacık of Koza Gold produced 3.9 tonnes for which the closing procedures has been started. The flagship of Turkey's gold production, Kışladağ Mine of Tüprag (subsidiary of Eldorado Gold) poured 8.8 tonnes last year. The following producers are Alacer Gold's İliç Mine with 5.8 tonnes, Koza Gold's Mastra Mine 5.1 tonnes and Kaymaz Mine 0.43 tonnes, Pomza Export's Sardes Gold Mine with 0.41 tonnes. The Government's positive outlook to the mining sector and Turkey's annually 150 - 250 tonnes of gold demand, will definetely continue to encourage local and international investors.

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Kümaş Kütahya Manyezit AŞ Acquired by Kobin Madencilik *January 2012*

Turkey SDIF (Saving Deposit Insurance Fund) announced the retail of KÜMAŞ (Kütahya Magnesite Corp) late December which was taken over by the Fund due to the depth of some banks in Turkey. KÜMAŞ was the 384th biggest company of the list of 2010's Top 500 Industrial Enterprises, the largest producer and supplier of refractory products for steel, cement, glass, lime, nonferrous and some other industries in Eastern Europe and Turkey. The estimated price of the company was 320 million USD and the highest bid came from Kobin Madencilik with 285.5 million USD which is a joint venture of construction company Siyah Kalem İnşaat and iron ore producer Hekimhan Madencilik's owner Kolin İnşaat. At the end of the auction, the company didn't raised the value during the one-on-one negotiations and after the Fund Board's and Competition Authority's approvals Kobin Madencilik will be the formal owner of KÜMAŞ.

Canadian Mining Roundtable Meeting *February 2012*

The Canadian Consulate in Istanbul organized a Mining Roundtable lunch meeting at the Sheraton Hotel in Ankara for the Canadian companies active in the Turkish mining sector. The main purpose of the function was to discuss with Canadian companies the highlights of the Canadian Government's approach to Corporate Social Responsibility (CSR) issue and to review the CSR activities undertaken by the Canadian companies in terms of environmental preservation and community services in Turkey. The discussions were also aimed at reviewing the challenges faced by Canadian firms in Turkey.

Officials from Canadian mine exploration and operation companies attended the meeting and they expressed their satisfaction with the exchange of views. In his welcoming remarks, John Holmes, the new Ambassador of Canada, who chaired the meeting mentioned that environmental sustainability as well as healthy community relations based on mutual trust are essential elements which the companies should make priority. Mr. Shawn Steil, the Consul of Canada in Istanbul, made an overview of the CSR guidelines of the Canadian Government and the incentives available for CSR programs both in Canada and overseas.

The company representatives who participated in the event shared their experience in implementing their CSR projects with reference to the specific regions and communities where they operate. Discussions also covered the elements of successful CSR programs to ensure harmonious relationship with host communities. The emphasis was made on the mutual trust, transparency and utmost respect to the environment and the livelihood of the communities they interact. It was unanimously agreed that satisfactory CSR programs are indispensible elements for sustainable mining activity. Successful track record of the Canadian companies was cited as the proof of this concept.

Akın Kösetorunu, Trade Commissioner at the Consulate of Canada in İstanbul stated that discussions in these functions are very productive and Canadian firms expressed their wish to repeat it more frequently than once a year.

Cerrattepe Copper-Gold Deposit Found Its Producer *February 2012*

The tender for one of the Turkey's most important deposit, located at the north-east of Turkey, in the Black Sea Region has been finalised. Özaltın Holding, originally works for construction and energy sector, took a big step to the mining industry after the company won the tender for around 95.7 million TRY (54 million USD). According to the agreement, Özaltın Holding should start the production in three years after the operation license has been granted. The company should produce minimum 500,000 tonnes of run-of-mine and 10,000 tonnes blister copper annually, in the borders of Turkey. If Özaltın Holding could not meet the requirements, all the exclusive rights will be transferred to the second highest bidder, Eti Bakır (Cengiz Holding) according to the tender agreement.

DEDEMAN'S PRINCIPLES OF SUSTAINABLE MINING

1 Create prosperity for your country

We exploit the mineral wealth of the country for the economic growth and well being of our society without comprimising the ability of future generations to meet their needs.

2 Never lose the future out of sight

We target and develop high quality, long life mineral resources that enables us to operate for generations to come, as did our founder 65 years ago.

3 Provide opportunities for individuals

We believe that high calibre employees contribute to our goal of being sector leader. We help improve their skills through continuous professional development programmes.

4 Respect for the environment

We realize that the Earth's resources are more than just minerals and our survival on this planet depends on them. Our policy is to mitigate and remediate wherever possible our impact on environment and show zero tolerance for any abuse of it.

5 Commitment to local communities

We are aware that building enduring relationships with neighbours requires respect for their rights and dignity. Good management of those relationships ensures our business success.

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Turkey's 2011 Exports Sales Figures

2011 was an extraordinary year for Turkey's export volume. US's debt-ceiling financial crisis, Central and Eastern Europe's economic downturn, China's decreased export - import numbers of commodities didn't effected Turkey's production and export in all goods. In other words, Turkey turned this regressive trade climate into an advantage and broke the record of export both in the manner of value and volume. The announced 2011 export value of 134.6 billion USD is 18.2 % more than last years 114 billion USD.

	2009	2010	2011	Change (2010 - 2011)
	Value (USD)	Value (USD)	Value (USD)	Value (USD)
Natural Stone	1.240.942.451	1.561.021.463	1.661.521.534	% 6,44
Metallic Ore	709.906.367	1.303.165.218	1.267.533.792	% -2,73
Industrial Minerals	437.674.975	590.512.746	703.721.099	% 19,17
Ferro Alloy and Other Mining Products	120.085.850	202.601.188	243.688.597	% 20,28
Mining Industry Total	2.508.609.643	3.657.300.615	3.876.465.022	% 5,99

Table 2: Mining export by main product class (2009 - 2010 - 2011)


İskenderun Port

Mining products export value has increased compared to the last years value, to 3.88 billion USD. As mentioned above, due to Turkey's record high export revenue in 2011, the mining products percentage from the overall export value has decreased 3 %. In view of the decreasing mining products prices 2011 except gold, silver and rare earth minerals which are not in the list of important products that Turkey exports, the raise of the total value indicates that the volume of the production has also been increased. Table 1 shows the total annual export sales of Turkey and mining industry products share in the total value.

In the Table 2, Turkey's mining products export information can be seen. Export of natural stones have always been an important income group for Turkey, increase of natural stones export volume continued in 2011. The value of metallic ores shows a decrease in the value, probably due to low prices for the metals in the Turkey's export list. The detailed list of the mining products with the highest volume can be seen in the Table 3. The most remarkable decrease in the metallic minerals observed in copper (24 %) and aluminium (54 %). Regarding to the drop of the aluminium price around 15 % and copper price around 22 % in one year, Turkey had difficulties to find clients for these commodities. The most important metallic minerals consumer China's cautious import policies for copper and aluminium, especially at the second half of the year due to the economic crises around the world, may be the reason for this decrease. ●

	2004	2005	2006	2007	2008	2009	2010	2011
Total Export (x 1,000 USD)	64,026,635	73,444,821	85,774,644	105,964,665	132,027,195	102,142,612	113,883,219	134,571,338
Mining Products Export (x 1,000 USD)	1,207,826	1,525,094	2,080,486	2,715,825	3,241,019	2,508,609	3,657,431	3,876,383
Mining Products Exports Share in Total Exports (%)	1.9	2.0	2.4	2.5	2.4	2.4	3.2	2.9

Table 1: Comparison between Turkey's total export and mining products export

	2010	2011	Change
COMMODITY	Value (USD)	Value (USD)	(%)
Salt	18,583,043	29,051,013	56.33
Sulfur	3,007,622	10,919,170	263.05
Grafite	194,778	1,064,417	446.48
Quartz, Quartzite	30,022,171	38,211,874	27.28
Kaolin & Clay with Kaolin	5,082,415	3,094,388	-39.12
Bentonite	29,512,758	35,816,774	21.36
Other Clays	3,460,895	4,394,617	26.98
Barite, Witherite	19,597,054	17,137,173	-12.55
Silicified Soils	2,892,766	1,987,787	-31.28
Pumice	11,813,640	8,706,521	-26.30
Grindstone & etc.	3,917,956	3,208,794	-18.10
Dolomite	1,919,187	2,648,540	38.00
Magnesite	69,520,770	91,198,156	31.18
Gypsum	67,629,611	68,789,604	1.72
Natural Steatite,Talk	1,222,512	1,058,176	-13.44
Natural Borats & Concentrates	167,732,551	204,721,205	22.05
Feldspars	106,115,328	134,453,526	26.71
Perlite	15,805,362	17,591,837	11.30
Other Industrial Minerals	30,629,498	28,224,002	-7.85
Iron Ores	18,806,245	29,744,686	58.16
Manganese Ores	7,579,568	15,812,735	108.62
Copper Ores	492,485,247	371,672,406	-24.53
Nickel Ores	7,253,973	16,724,900	130.56
Cobalt Ores	577	574,967	99,599.41
Aluminium Ores	11,376,640	5,146,959	-54.76
Lead Ores	63,284,040	88,834,308	40.37
Zinc Ores	194,608,084	202,676,844	4.15
Chrome Ores	475,860,865	467,731,323	-1.71

	2010	2011	Change
COMMODITY	Value (USD)	Value (USD)	(%)
Molybdenum Ores	1,186,586	1,334,089	12.43
Tungsten, Uranium, Thorium & Titanium Ores	128,639	545,443	324.01
Zirconium, Niobium, Tantalium, Vanadium Ores	6,137	74,003	1,105.89
Precious Metals (Gold, Silver, Platinum)	650,270	557,106	-14.33
Antimony Ores	13,394,122	26,312,929	96.45
Granulated Cinder	11,242,026	33,466,766	197.69
Metallic Ashes	4,631,285	6,077,927	31.24
Mineral Fuel	6,993,181	6,570,811	-6.04
Natural & Artificial Abrasive Dust, Rubber	26,377,704	33,001,434	25.11
Cinder Wool, Rockwool & Other Mineral Wools	19,782,544	19,577,660	-1.04
Refined Mica & Products	304,445	422,612	38.81
Other Rock and Mineral Products	21,428,151	35,901,851	67.55
Ferro-chromium	93,171,703	110,842,615	18.97
Other Ferro Alloys	24,818,123	23,164,195	-6.66
Raw & Rough-hew Granite	701,089	3,035,929	333.03
Marble - Travertine, Raw & Rough-hew	363,314,508	245,661,091	-32.38
Rectangular Blocks or Slabs of Granite	8,896,617	8,930,503	0.38
Rectangular Blocks or Slabs of Marble - Travertine	370,896,641	539,531,511	45.47
Processed Marble	654,355,814	622,391,249	-4.88
Processed Travertine	123,268,553	197,191,362	59.97
Processed Granite	18,345,663	12,729,121	-30.62
Other Processed Construction Rocks	18,376,553	29,050,531	58.08
Processed Black Chalk	3,566,053	3,000,019	-15.87
Pavement Stones	2,289,899	4,618,496	101.69
Tile Stones & Dusts	6,681,591	8,922,391	33.54

Important Developments From Junior Nickel - Iron Producer: Fe-Ni Mining

Being one of the main nickel ore producer of Turkey, Fe-Ni Mining took a "great step for a beginner" by their words. Until last year, the increasing prices of nickel appetized many companies in Turkey like around the world and Fe-Ni Mining did a great job over a decade, exporting a decent number of nickel ore every year. We've met with Birol Kaya, the general manager, at their office in Ankara and asked about Fe-Ni Mining's future and past.

Fe-Ni Mining's Adatepe - Belek Nickel Mine

Can you provide us an introduction for the company? Which minerals are in the interest of Fe-Ni Mining?

Birol Kaya (BK): SENKA Company, as a pioneer of Fe-Ni Mining Company is established in 1987 and engaged in the areas of mining, construction and contracting businesses. The company began to produce iron ore from its licenced areas around Karaçam village, Eskisehir in 2000. From that date forward, raw materials such as limestone, clay, gypsum, trass and iron ores were provided for several cement factories and state owned companies throughout Turkey. In accordance with developing mining activities and technologies, plans and programs have been preparing for exploration, exploitation and marketing of all kinds of metallic ores and industrial raw materials.

Due to acceleration at world nickel prices in recent years, exploration activities

A View From Belek Nickel Ore Mine

for nickel ores have been drastically increased in Turkey. In this context, nickel silicate grades in lateritic iron-nickel ores (limonitic and hematitic ores) at Karaçam concession areas became important.

Nickel ores are produced as testing purposes from the above mentioned areas between 2005 and 2008 years and re-exported as the amounts of 10,000 wmt to 60,000 wmt. Within this period, it is observed that the demands to our nickel ores to be processed by foreign companies were grown.

For all above mentioned reasons, in order to follow significant developments at mining sector of Turkey and other countries, to produce ores within the sensibility of social and environmental merits and to contribute to the country's economy by exporting ores, Fe-Ni Mining Company is founded. Except the supplier workers upon the contracts, the number of technical and administrative staff and all kinds of laborer of the company is arrived to 100.

What is the size of the ore production of Fe-Ni Mining?

(BK): After the foundation of Fe-Ni Mining Company, exploration activities for tonnage and grade estimations improved at the licenced areas around Karaçam, Eskişehir. By revising the geological maps of the areas, in addition to known and presently operating Adatepe sector, significant new reserves from Belek and Ağılın Sivrisi sectors have been discovered.

Beginning from mid-2011, proven reserves have been exposed on the basis of core drilling activities at Adatepe and Belek sectors. According to geological data and core logging and analysis, evaluation studies are carried out by a mining software, thus the reserve and grade potential of ores and development of mine have been determined.

Produced and exported nickel ore amounts are respectively 100,000 and 155,000 wmt in 2009 and 2010 years and 300,000 wmt in 2011. Exportation in last three years is implemented from two seaports of Marmara Sea.

What are the reserves for iron and nickel ores?

(BK): Keeping on searching for nickel ores by core drilling activities, possible and probable reserves are substituted by proven reserves. Up to now, on the basis of geological and analytical data collected from both licenced areas, total reserves are estimates as 6,000,000 wmt.

Could you give us some information on the geology of your mine? Do you have any other mineralization in the field besides nickel and iron?

(BK): Mainly serpantinized peridotites of ophiolitic melange crop out in mining areas as host rocks. Lateritic (residual) type nickel and iron deposits formed by processes of weathering lie at the top of those rocks. Limonitic and hematitic zones are observed in mineralization areas. Nickel ores in these zones consist of some cobalt bearing nickeliferous limonites and rarely garnierite veins. There is no other mineralization in the study areas.

What are Fe-Ni Mining's expansion plans?

(BK): In respect of 25 year experiences and taking into account of developments at mining sector both in Turkey and the world, A Research and Development Department and one Foreign Affairs Department are constituted in order to apply modern exploration and production techniques and marketing processes. Within this framework, project

based studies have been implementing by the Geological and Mining Engineering Departments of Hacettepe University - Ankara, Ankara University and Dokuz Eylül University - İzmir.

Furthermore, besides the present licenced areas, prospecting and discovering of new metallic, mainly iron and nickel, ores and industrial raw material areas can be counted among our future expectations.

We believe the efficacy of enriched nickel ores by ore processes which will be gained both from our licenced and newly discovered and produced areas by us.

How is Fe-Ni Mining trying to engage with local communities and how do you deal with the environmental consequences of mining?

(BK): As a company embracing basic rights principle of "respect to community and nature", we are in close and warm relationships with the local communities managing the localities of villages in and around of our licenced areas. As an example, we can proudly announce that the halves of our laborers are employed from the nearest vicinity.

Within the context of new Turkish Mining Law, published on June 24, 2010 with the number of 5995 give great importance on environmental consequences of mining areas. Within this framework, in order not to damage the community health and environment, scientifically and technically designated exploration and exploitation activities and infrastructural facility formations are inherited. Abiding to this arbitrament of the mining law, our company is implementing all the responsibilities in the proper sense.

Where would you like to see Fe-Ni Mining in 5 years' time?

(BK): Making the proven reserves definite at our present open pit areas, to progress increasingly production activities and achieving of new iron and nickel ore areas throughout Turkey constitute our main goals. Additionally, instead of raw ore, marketing of enriched nickel ores by establishing ore processing plants is our future expectation.

Currently, as you just mentioned there is no nickel enrichment facility in our country. Being one of the few companies in our country engaged in nickel production, what do you think about enrichment of your nickel ore before exporting it?

(BK): Looking at this matter as Turkey' point of view, the concept of marketing of nickel ores after enrichment processes becomes economically important.

What do you think about the general trending of nickel prices and production in the world? Do you have any short term expectations in order to demand of the market and prices?

(BK): According to the 2011 LME's statistical data, average nickel price of 99.80 % purity (minimum) was around 22,000 USD. In recent years, export ratio of nickel ores increased and pure nickel consumption also raised accordingly. In the continuation of increasing demand, it can be expected that the nickel ore prices will remain at these levels or may be a bit higher. Therefore, we save our optimism that there will be no drastic changes of prices in short-terms. ●

Fe-Ni Mining
Ankara - Turkey

CONTACTS

Birol Kaya
General Manager
Fe-Ni Madencilik Ltd. Şti. Ankara, Turkey
Tel: +90 (312) 284 71 28 - 29
Fax: +90 (312) 284 71 33
E-mail: info@fenimining.com
Website: www.fenimining.com

"Within The Next Few Years We Expect Additional Mining Success Stories"

The just ended year of 2011 was an exciting and busy year for Anagold, owner and operator of the Çöpler Gold Mine near İliç, Erzincan Province in Turkey. Early in the year, the company ownership changed significantly through the merger of Anatolia Minerals Development, the original developer of Çöpler, and Avoca Resources Limited, an Australian gold mining company with three operating mines in Australia. This merger produced Alacer Gold Corp., a mid-tier international gold producer, with Anagold Madencilik Sanayi ve Ticaret AŞ as a Turkish subsidiary. Anagold itself is a joint venture between Alacer and the Turkish company, Lidya Madencilik San. ve Tic. AŞ, ("Lidya Mining"), a subsidiary of Çalık Holding AŞ

At the end of 2011, the already strong and successful joint venture relationship between Alacer and Lidya was enhanced by Lidya's decision to exercise their option to increase their ownership in Anagold from 5 % to 20 %. Their decision to do this shows their confidence in the future of this company.

However, the most exciting news for our company was the very successful completion of the first full year of operation for the Çöpler Mine. Çöpler made its first gold pour in December 2010 and it has been all good news since then. Due to the high quality of this deposit joined with hard work and professional skill of our employees we were able to exceed our production expectations for 2011, almost unheard of for a large scale mine in its first year of operation.

At the beginning of the year the company projected total gold production for the year of approximately 150,000 ounces. By the end of December we had poured over 180,000 ounces, a 20 % improvement. Our cash costs were excellent averaging below $ 400 US/oz. Just as important during the year we trained and encouraged our employees to operate in a safe and environmentally aware condition. We are proud that we completed the year with no serious injuries or environmental incidents.

For 2012 we expect to continue this success. Our planned production is in excess of 190,000 ounces of gold. During this year, we will also finalize a feasibility study to expand the mine through mining and processing the sulfide ores. This will increase the annual gold production as well as adding significantly to the mine life.

However, in addition to the successful development and operation of the Çöpler Mine, the company intends to be more than a one mine company in Turkey. We want to grow our business and believe that Turkey has an excellent future for mining. The government has recently revised its mining laws to encourage mining development, while also insisting on following international safety, environmental, and social standards. This is the type of environment that our company can be successful in. To meet our growth goals we have formed other joint venture companies, also in partnership with Lidya, for mineral exploration and development of deposits in many areas of Turkey. Within the next few years we expect this will result in additional mining success stories, both for our company and for the Turkish mining industry. ●

CONTACTS

ALACER GOLD

Calvin Joseph McKee
Country Manager
Alacer Gold Turkey
Website: www.alacergold.com

Çöpler Gold Mine

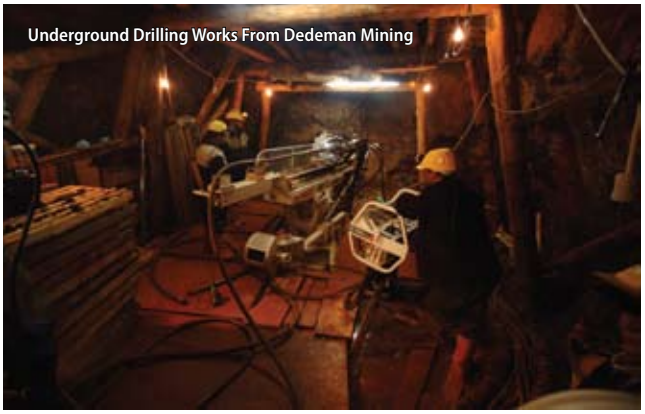
Dedeman Mining Invests In Future

Dedeman Mining known as a pioneer in the Turkish mining industry since its foundation 65 years ago, has always been one of the biggest chromite producers in the country. Dedeman Madencilik, founded at Pınarbaşı - Toruntepe, Kayseri by Kemal Dedeman in 1947, adopted a new understanding to their mining activities lately and increased their standarts to the international levels. Especially the company's recent undertakings and projects, seem to bring a new perspective to the Turkish chromite mining.

The company was the third biggest chromite exporter in 2010 and the company's 2011 production is 125,000 tonnes, mostly from Pulpınar and Toruntepe deposits at Pınarbaşı, Kayseri province. These mines have very rich orebodies and have already been developed down to 400m. depth. Low grade ores which are not directly saleable, are enriched at the Pulpınar plant. With the experience gained along production at Pınarbaşı in years, Dedeman Mining started to explore different parts of Turkey. After successful exploration campaigns, the company started to produce chromite concentrate at two of its plants near Aladağ, Adana with a capacity of 500 tonnes/day each. In 2011, Dedeman Mining secured its position of being one of the important chromite producers in Turkey with its new concentration plant at Beyazaltın village, Eskişehir with a capacity of 800 tonnes/day.

Dedeman Mining focused on exploration in recent years alongside its tight production schedule. In 2011, chromite exploration continued at Islahiye - Gaziantep, Artova - Tokat and Palandöken - Erzurum. As the result of these successful projects, the company will start pilot scale mining at Palandöken. The focus is not only on chromite, Kırkpavlı and Aktutan - Gümüşhane concessions are considered very promising gold prospects. These two areas are already in the 2012 drilling programme. Dedeman Mining, with its 13 drill rigs, can drill up to 60,000 meters per year.

The company decided to update its database management system as part of its drive for sustainable and responsible mining. All the geological and resource/reserve estimation data collected throughout the half century since its foundation has been updated by South African and Canadian experts in accordance with international standarts The lesser known activity of the company is its lead and zinc mining. Delikkaya - Yahyalı, lead and zinc mine restarted its production in 2012 after being shut down due to the global crisis in 2008. The ore extracted from this mine will be processed at the company's Çadırkaya flotation plant near Yahyalı oxidized zinc ore will be exported directly. As well as Dedeman's Delikkaya mine, Tekneli AŞ, a joint venture with Çinkom, also plans to start production at the same region. Following positive drilling results at Balya, Balıkesir, the company will develop the underground mine and construct a lead and zinc flotation plant with a 200 tonnes/day capacity at this locality in 2012. The company's international project on the Rehova Copper Deposit, in Albania is suspended in 2012 and the project is being reassessed.


Underground Drilling Works From Dedeman Mining

The company began to implement corporate governance principles in 2012 which are basically those adopted by OECD, as well as by the İstanbul Stock Exchange. The company management guide that covers all aspects of the business, has been issued to that effect. The operations of the company have been certified with ISO 9000 Quality Management ,along with ISO 14001 Environmental Management and OHSAS 18001 Health & Safety Standards by TÜV Thuringen. All the organization has been equipped with ERP (Enterprise Resource Planning) software.

Dedeman Mining with its approximately 700 employees, continues to grow in Turkey, as well as in the international mining scene. The adventure started in the heart of Anatolia by Kemal Dedeman still follows its founder's mission; "Leave wealth for the times ahead". ●

CONTACTS

DEDEMAN MADENCİLİK

Dündar Ergunalp
CEO, Dedeman Madencilik San. ve Tic. AŞ
Yıldız Posta Cad, No:52/10 34340 Esentepe İstanbul
Tel: +90 (212) 337 29 00
Faks: +90 (212) 288 48 49
E-mail: dundar.ergunalp@dedeman.com
Web: www.dedemanmadencilik.com

Mineral Potential of Turkey

INTRODUCTION

Turkey, an important segment of the Alpine - Himalayan tectonic belt, has potential for the discovery of a wide range of economic mineral deposits including energy raw materials, geothermal energy resource and also gold - base metal, rare earth element (REE), trona - gypsum, kaolin - feldspar and strontium salts - sodium sulphate deposits.

The complex geologic structure of Turkey makes it more difficult for mine exploration and mining facilities. Despite this, Turkey is one of the few countries which can provide most of their raw materials. It is the world's leading producer of boron mineral, pumice, feldspar and also barite, bentonite, chrome ore, kaolin, lignite and magnesite. Nearly 60 types of minerals have been produced in Turkey and it is in the 10th place throughout the world according to mineral variety and 28th for its production of underground resources of 132 countries. Only 13 of all the 90 minerals traded all over the world do not exist in Turkey. These minerals do not have enough quality and quantity to be exploited. 50 types of minerals are found adequately but 27 types of minerals lack the desired quality and reserves for exploration. Moreover, Turkey has 2.5 % of the industrial raw material, 1 % of the coal and 0.8 % of the geothermal and 0.4 % of the metallic mineral reserves of the world. It also has a significant potential for natural stone and holds the 30% of known natural stone reserves of the world. Marble, granite and travertine are all currently being exploited in Turkey (3.8 billion m^3 marble, 2.7 billion m^3 travertine and 995 million m^3 granite).

Although the complex geologic and tectonic structure of Turkey contributes to mineral diversity of the country, most of mineral deposits in Turkey are moderate in size. However, with the increase in raw material prices due to the economic condition in the world, low graded mineral deposits with technological problems and also buried / conceptual deposits have gained value. Accordingly, Turkey, which already has an important place in the world mining industry, has become even more important since it hosts a great potential for such mineral deposits.

MINING AND ECONOMY IN TURKEY

Mineral products produced approximately 150 million tons a year in Turkey are commonly used in building industry and as a raw material in other industries providing 5 - 6 billion USD per year. Minerals such as boron, chrome, celestite, magnesite, barite, marble, pumice, feldspar are considerably exported whereas coal, which is produced approximately 60 million tons a year and is consumed mostly by thermal power plants in Turkey.

When analyzed the total mineral production of Turkey between 2003 and 2009, production of energy raw materials (coal) increased nearly 69.6 million tons, metallic raw minerals increased 10.5 million tons and production of industrial raw materials increased 27 million tons. Moreover, total production of building raw materials and natural stones increased 211 and 15 millions tons, respectively.

Total export value in 2002 was only 0.335 billion USD and this amount was increased and reached to nearly 2.5 billion USD in 2009 (Table 1). An accurate indicator of the contribution of the mining sector to economy that has great importance in terms of industrialization and national development is the role of this sector in the gross national product (GNP). It depends on mineral potentials and financial capacities of the countries. In developed countries, the parts of the mining sector as GNP are 4.2 % in the USA, 4.0 % in Germany, 7.5 % in Canada and 8.7 % in Australia. However, GNP ratios of mining sector in total GNP in Turkey varied from 1 % to 1.5 % between 2002 and 2009 years

Year	Mineral Export Value ($)	Change (%)
2000	568,945,463	-1.45
2001	574,882,846	0.89
2002	684,659,766	19.26
2003	847,249,000	23.96
2004	1,207,714,995	42.54
2005	1,525,279,014	26.29
2006	2,080,719,636	36.43
2007	2,715,484,019	30.52
2008	3,240,901,932	19.33
2009	2,508,425,000	-24.55
2010	3,658,875,000	45.86
2011	3,876,000,000	0.60

Table 1: Mineral export statistics of Turkey between 2000 and 2010[2].

In 2010, mine production of Turkey reached 10 billion USD and total mining production is about 150 million tons per year. Moreover, mining sector in Turkey constitutes nearly 1.4 % of GNP. The import and export values have increased compared to previous years. In 2010, the revenue from mineral export was nearly 3.65 billon USD and natural stones constituted the major portion of this amount (near 1.5 billion USD). The other exported products were metallic (near 1.17 billion USD) and industrial raw materials (near 530 million USD). On the other hand, mineral import value was nearly 4.5 billion USD and 3.420 billion USD of the total amount was from energy raw materials (coal).

In 2011, the total export values have increased nearly 6 % compared to 2010 and reached 3.876 billon USD in 2011[2]. As in previous years, natural stones, especially marble, constitute the major portion of

this amount (Figure 1). While the export value from natural stones was nearly 1,690,859,379 billon USD, the export value from industrial raw materials and metallic minerals were 0.531 and 1.254 billon USD, respectively (Figure 1; Table 2). On the other hand, mining sector constitutes only 1.3 % of total GNP in 2011

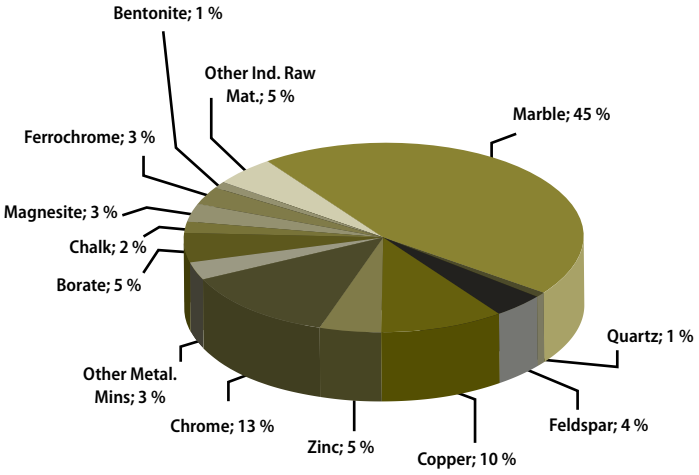


Figure 1: Export ratios of some important minerals in 2011[1].

	IMPORT		EXPORT	
	Amount (t)	Value ($)	Amount (t)	Value ($)
Energy Raw, Materials*	24,096,781	150,146,701	60,091,875	6,758,679
Metallic Minerals**	6,948,665	1,265,599,375	4,299,692	1,254,616,564
Natural Stones	349,185	191,874,449	7,972,925	1,690,859,379
Ind. Raw Materials	3,132,325	458,492,267	8,069,946	531,086,448

Table 2: Total export and import amounts and values of energy raw materials, metallic minerals, natural stones and industrial raw materials in 2011[3,1] .* except coal, except ferro-chorme**

SOME IMPORTANT MINERAL DEPOSITS OF TURKEY

Boron is the most abundant mineral in Turkey and it has 72 % of all the world reserves. Some other minerals that are low in quality and/or reserve are copper, lead, zinc, iron, nickel, manganese, arsenic, sulphur, phosphate, grafite, talk, asbest, mica and coal. On the other hand, diamond, Platinum Group Elements (PGE), tin, titanium, zircon, potassium salts, lithium minerals, magnesium salts, bromine and iodine are not enough in quantity to be exploited.

In Turkey, main mineral resources can be classified as energy raw materials, metallic mineral deposits and industrial raw materials. Some of the important mineral deposits in Turkey are briefly summarized below (Table 3).

Mineral	Reserv (proven+problable) (tons)
Boron	3,066,300,000 (24.4 - 35 % B_2O_3)
Chrome	26,000,000 (over 20 % Cr_2O_3) and over 400,000,000 low grade
Gold	609 (Metal Au) (800 ton with potential)
Salt	5,733,708,770 (88.5 % NaCl) (200,000,000 Lake Salt)
Clay	354,362,650 (ceramic+refractory)
Trona	836,317,680 (Over 56 %)
Zeolite	345,148,845 (Clinoptilolite+heulandite)
Feldspar	239,305,500 (Albite+oligoclase)
Fluorite	2,538,000 (40 - 80 % CaF_2)
Iron	122,000,000 (55 % Fe) (82,458,750 Metal Iron), (1,000,000,000 with low grade ore)
Zinc	2,294,479 (Metal Zn)
Perlite	5,733,708,017
Lignite	12,000,000 (868 - 5000 kcal/kg)
Silica Sand	1,307,414,250 (over 90 % SiO_2)
Lead	860,387 (Metal Pb)
Pumice	1,479,556,876 (m^3)
Copper	1,786,000 (Metal Cu)
REE	30,000,000 (3 % REE)

Table 3: Some important minerals of Turkey and their reserves3,8.

ENERGY RAW MATERIALS

COAL: Exploration facilities for coal were stopped because of economic reasons and mine exploration policies around 90's in Turkey. Due to increasing energy need in the world, coal has gained value in Turkey. After 90's, coal exploration programs have been started again with new 19 target areas. Coal exploration programs were more accelerated in following years. Between 2005 and 2011, total 850,000 m drilling program was conducted. Nearly 5 billion tons of coal reserves were added with these studies and coal reserves (8.3 billion tons total reserves) of Turkey were increased by about 50 % and 75 % of coal production is consumed at power plants and also industry and heating.

Exploration efforts for coal in Turkey have targeted Neogene basins mainly composed of lagoonal sediments. Neogene units cover approximately 110,000 km^2 areas and have big potential for the coal deposits. For this reason, M.T.A (General Directorate of Mineral Research and Explorations) carried out prospection studies in the Neogene units and organized 1,520,000 m drilling program in total.

LIGNITE: The major lignite deposits are in the Kahramanmaraş - Elbistan, Muğla - ▶

Yatağan, Manisa - Soma, Kütahya - Tunçbilek - Seyitömer, Ankara - Beypazarı and Sivas - Kangal basins (Figure 2). Turkey has nearly 11.5 billion tons lignite reserves and 1.1 tons of lignite has been produced[4]. Turkey is in the 7th place for its reserves and in the 6th place for lignite production.

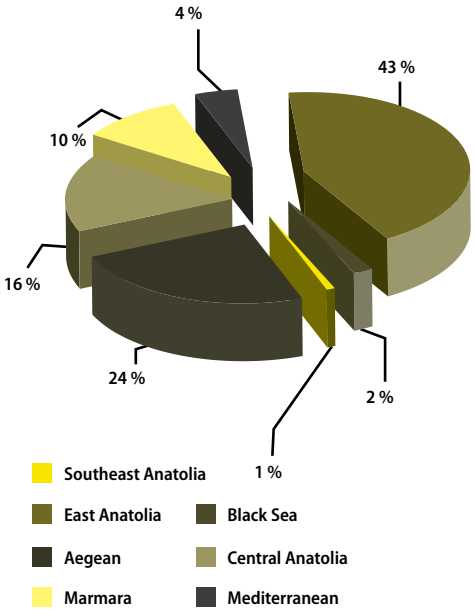


Figure 2: The distributions of lignite on regional basis.

world. Potential areas are mainly located in western Anatolia (Figure 3). Denizli - Kızıldere power plant, the only power plant of Turkey using geothermal energy, generates 114 MWe electricity. In Afyon, Kütahya, Balıkesir, İzmir - Balçova, Ankara - Kızılcahamam and Manisa - Salihli areas, geothermal energy has been used for heating.

METALLIC MINERAL DEPOSITS

IRON: Turkey has nearly 900 iron deposits (Figure 4), whereas only 31 of them are in exploitable condition or some of them are currently being exploited. The annually total iron ore production ranges from 3.9 to 4.9 million ton in Turkey[5]. However, iron resources of Turkey can supply the demand of the country only for the next 10 years. Turkey's annual iron need is around 10 million tons and half of this is supplied by import. Thus, Turkey currently needs iron ore. For this reason, effective exploration programs for iron ore should be planned and production should be increased.

500 of these deposits were examined in detail and were genetically subdivided into 6 types; contact metasomatic (Kayseri, Erzincan, Malatya), hydrothermal metasomatic (Adana - Feke), volcano-sedimentary (Malatya, Balıkesir), marine-sedimentary (Sakarya), lateritic (Sivas - Eskişehir) and placer deposits (Sivas).

Turkey's total iron reserve is nearly 150 million tons with 50 - 55 % Fe and Turkey can produce 4 - 4.5 million tons of iron ore per year. However, Turkey has nearly 1.5 billion tons problematic iron ore reserves.

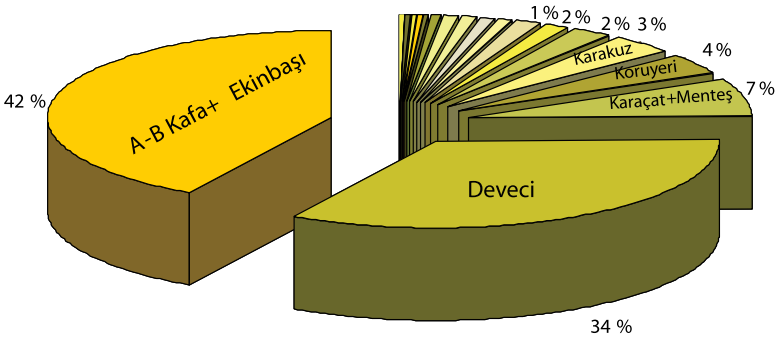


Figure 4: The exploitable iron ore Reserves of Turkey

GEOTHERMAL ENERGY RESOURCES: More than 600 hot water resources with 102 ^{0}C have been discovered in recent years in Turkey and also nearly 183 new geothermal areas (35 - 40 ^{0}C) have been revealed with drilling programs carried out by M.T.A. Turkey, according to its geothermal energy, comes first in the EU and is 7th in the

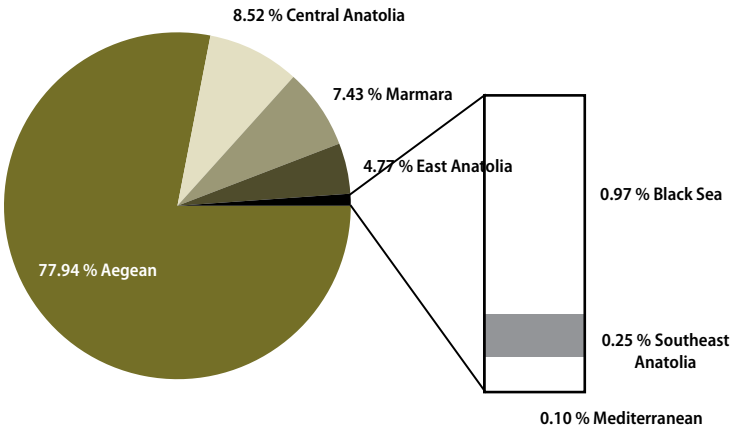


Figure 3: The distributions of geothermal energy resources on regional basis.

CHROME: Chrome mining started in 1850 in Turkey, which has taken an important place in world chrome mining since then. Chrome deposits are genetically Alpine-type and this type of deposits are defined as small volume with high grade mineralizations. Deposits related to the ophiolitic rock types and mineralizations are located in the top and bottom of ophiolitic sequences. Chrome deposits in Turkey are geographically clustered in 6 different regions. These are Elazığ - Guleman comes first in production and Sivas - Erzincan, Erzincan - Erzurum - Kopdağ, Bursa - Kütahya, Mersin - Adana - Kayseri and Muğla - Denizli (Figure 5).

Turkey is one of the most important countries to produce or export chrome ore. The Chrome reserves of Turkey with over 20 % Cr_2O_3 are about 26.6 million tons. Moreover, Turkey has nearly 400 million tons with low

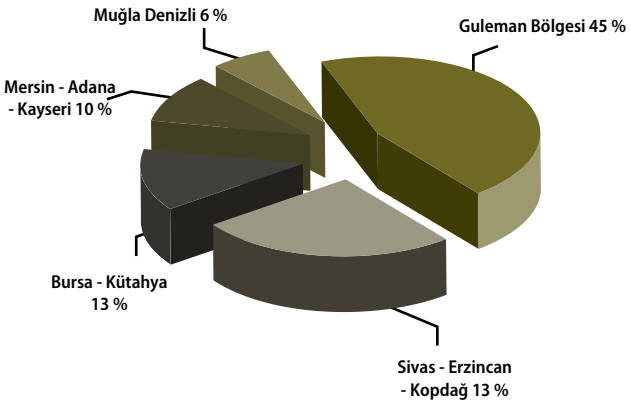


Figure 5: Chrome reserve distribution of Turkey.

grade chrome ore potential. Production depends on demand in world markets and production has recently reached 1 - 1.5 million tons per year. Chrome ore export value of Turkey in 2011 was nearly 467 million USD and ferro- chrome export value was nearly 110,841 million USD in 2011[2].

COPPER: Copper deposits in Turkey are genetically classified as ophiolites related, volcano-sedimentary related, skarn-hydrothermal type, porphyry type and red bed type (sedimentary). Economic deposits are generally related to ophiolites and volcano-sedimentary units. Total copper reserve of Turkey is about 1,462 million tons as metal concentration[6]. When low grade uneconomic copper resources included, the total copper reserves as metal concentration amount to 3.5 million tons. 60,000 ton metallic copper and 350,000 ton ore concentration are produced per year. Bilister copper production is about 35,000 tons/year. Rize - Çayeli - Madenköy copper deposit, with its 485,000 tons of reserves, is the most important deposit of Turkey (Figure 6). The annual copper consumption is about 200,000 tons. The available copper production can only cover 20 % of copper consumption. Turkey's annual blister copper production is about 35,000 tons. The capacity of the facilities producing blister copper (38,760 tons/year) is quite below the needs. The copper export value of Turkey was 371,484 million USD in 2011[2]

GOLD: Turkey has a big potential for gold deposits. Since 1980, many gold projects have been carried on especially in western Anatolia. According to these exploration studies, several small and large gold deposits have been discovered. Ovacık - İzmir, the first gold mine in Turkey, and also Uşak - Kışladağ, Erzincan - Çöpler, Gümüşhane - Mastra, Eskişehir - Kaymaz, Efemçukuru - İzmir are the most important gold projects (Table 4).

Turkey has potential for genetically different type gold deposits including epithermal, gold in skarns, gold in VMS, orogenic gold, placer gold and also Carlin-type and detachment fault related gold. For this reason, Turkey is a candidate for the leadership in gold with effective exploration strategies.

Deposit Name	Grade		Reserve (ton)
	Au (g/t)	Ag (g/t)	
Artvin - Cerattepe	4.0	140	8,2000,000
Balıkesir - Havran	6.43	11.8	1,410,000
Erzincan - İliç - Çöpler	3.3	-	34,000,000
Eskişehir - Kaymaz	6.04	5.3	974,000
Gümüşhane - Mastra	12.0	-	1,000,000
İzmir - Bergama - Ovacık	9.0	11.0	2,980,000
İzmir - Efemçukuru	12.65	-	2,500,000
Manisa - Salihli - Sart	96 mg/m^3	-	20,000,000 m^3
Uşak - Eşme - Kışladağ	1.43	-	74,000,000

Table 4: Important gold deposits and their reserves and also grades[3]

Turkey's gold reserves determined by feasibility and pre-feasibility studies are 328 tons (Table 3). However, Turkey's total (exploitable, potential and also by-product) gold reserve is about 609 tons[3].

BAUXITE: Bauxite deposits in Turkey are located in Silifke - Taşucu, Zonguldak - Kokaksu, Islahiye - Payas, Yalvaç - Şarkikaraağaç, Milas - Muğla, Alanya, İçel - Bolkardağ, Tufanbeyli - Saimbeyli regions. In these deposits; Seydişehir - Akseki, Silifke - Taşucu and Zonguldak depoists are boehmitic type, Islahiye - Payas, Yalvaç - Şarkikaraağaç depoists are iron-bauxite type and Milas - Muğla, Alanya, İçel - Bolkardağı, Tufanbeyli-Saimbeyli deposits are diasporitic type. The bauxite reserves are about 87 million tons. These reserves are suitable for aluminum production. Moreover, Turkey holds the 0.4 % of world bauxite reserves and 0.3 % of annual production of the world. Besides Aluminum production, bauxite is also used in the production of cement with alumina. The bauxite reserves of Turkey are enough for nearly 60 years, but the modernization and production capacities of the current facilities should be improved.

ZINC-LEAD: Turkey has 0.795 million tons lead and 1,659 million tons zinc reserves. Turkey exported nearly 64 million kg lead and 392 million kg zinc ore in 2010. To-

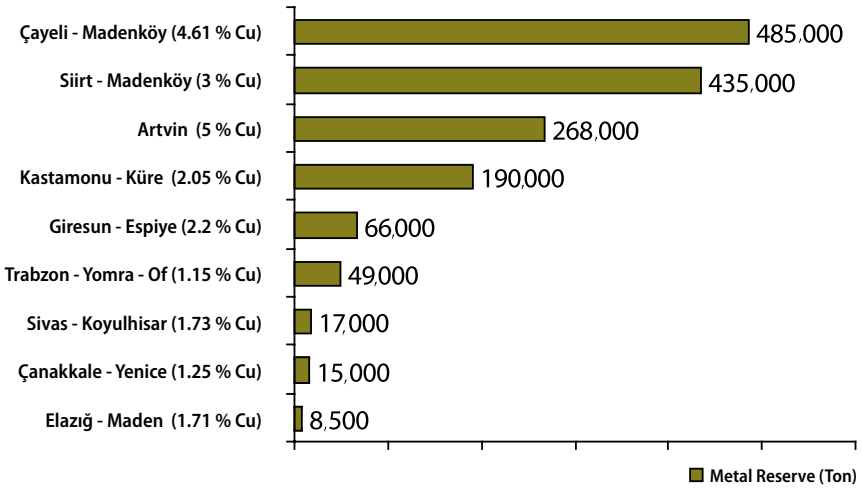


Figure 6: Copper reserves of Turkey.

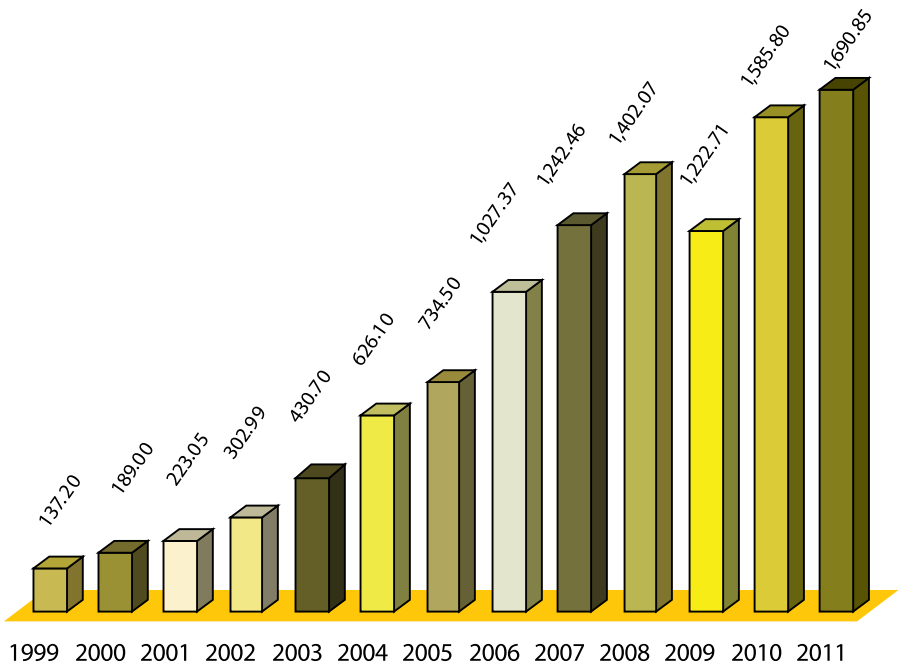


Figure 7: Total export revenue for natural stones and marble between 1999 and 2011[1,2].

tal export value of lead was 88,834 million USD; on the other hand this value was 202,676 million USD for zinc in 2011. Rize - Çayeli copper-zinc ore reserve accounts for 35 % of all Turkey's total reserves. Total consumption of zinc metal is 60,000 tons and lead metal is about 35,000 tons. Rize - Çayeli, Şebinkarahisar - Dereli, Artvin - Seyitler, Sivas - Koyulhisar and Çanakkale - Koru depoists are currently being operated. Turkey has big potential for base metal deposits, especially in Black Sea and Aegean region. However, these areas have not been properly explored yet. Turkey's geological structure is available for small volume deposits and it is generally accepted that lead and especially zinc demands will increase for the developing countries. For this reason, exploration programs in Black Sea and Aegean region should be replaned for zinc-lead deposits.

INDUSTRIAL RAW MATERIALS

BORON: Boron is the most abundant mineral and Turkey has 72 % of all the world reserves. Boron reserve of Turkey is around 3.05 billion tons. Nearly 3 million tons of boron is produced in Bursa - Kestelek, Balıkesir - Bigadiç, Kütahya - Emet and Eskişehir - Kırka regions. In 2005, boron products of 400 million USD were exported. 117 million USD of it came from ores and concentrations. About 72% of borate production is exported and remained is consumed domestically. Boron production is exported as mainly concentrate. However a lesser amount is converted refined boron products.

In total, 57.669.60 meter drill programs in 180 different location were completed as part of boron exploration project which has been carried out by M.T.A and Eti Mine since 2002. Totally, 8.846.65m boron-rich zone was detected in 99 locations via the drilling programs carried out between 2002 and 2009.

TRONA: Ankara-Beypazarı is the most important trona deposit of Turkey. It is the second largest natural trona deposit of the world with its 233 million tons of reserves. Besides this, in Ankara-Kazan, there is another trona deposit with 603 million tons of reserve owned by a foreign company. The total reserves of Beypazarı and Kazan deposits are nearly 836 million tons.

MARBLE AND NATURAL STONES: Turkey has important natural stones and marble deposits in 80 regions and 150 different deposits with various colors, patterns and qualities. Turkey's marble export amount has reached nearly 1.25 billion USD. Marble production of Turkey was 3 million m^3 and also natural stone production was 12 million tons by the end of 2008; on the other hand, total production reached 15.3 million tons for natural stones and 3.84 million USD for marble in 2009. Turkey's marble potential was estimated at 5.1 billion m^3. Turkey export amount of natural stones and marble in 2008 was 1.4 billion USD, on the other hand in 2009; export amount decreased nearly 1.2 % and total export revenue declined to 1.2 billion tons (Figure 7). In 2011, marble and natural stone export value was 1.5 billion USD, while this amount reached nearly 1.69 billion USD in 2011[1,2].

CERAMIC AND GLASS RAW MATERIALS: The main raw materials of the sector are quartz, quartzite, silica sand, feldspar, clay and kaolin. Turkey ranks in the 3rd place in ceramic production in the EU and 6th in the world. The abundance of the country's raw material sources is the main reason for it. Turkey has 89 million tons of kaolin, 354 million tons of ceramic and refractor clay, 239 million tons of feldspar, 1.3 billion tons of silica sand and 2.3 billion tons of quartz-quartzite. The production capacity of Turkey in ceramic is 180 million m^2 per year. The glass sector also shows great development. The sector uses 1.4 million tons of silica sand per year. Glass raw materials have great potential; nevertheless, the production and export have not reached the desired level because of the lack of grinding and enrichment facilities. In ceramic and glass sector, good quality clay, kaolin, feldspar, and silica sand are imported.

CEMENT AND OTHER BUILDING MATERIALS: The cement industry uses almost 65 million tons of raw materials per year. Turkey has an abundance of chalk, clay, marl, gypsum and trass as the main raw material of cement. Pumice used as light building material and concrete aggregate has a potential of 1.5 billion m^3 reserves,

and export is approximately 15 million USD. Perlite potential is 5.68 billion tons. Nevertheless, production and import levels remain low.

BENTONITE: Turkey has 250 million tons of bentonite reserves mainly found in Ankara, Çankırı, Tokat, Edirne and Ordu. Bentonite production is about 566,000 tons. In 2005, Turkey's export was about 1.35 million USD. Between 2009 and 2010, total bentonite export increased and reached nearly 28 million USD.

MAGNESITE: Turkey has 205,740 million tons of magnesite reserves with 41 - 48 % MgO grade mainly found in Eskişehir, Kütahya, Konya, Çankırı, Erzurum and Erzincan[7]. In 2009, Turkey total export value was 58,358 million USD. However, total import value of magnesite was 42,664 million USD in 2008.

CONCLUSION

Exploration strategies for mineral resources are closely related to many factors such as technology, knowledge, industry's needs, regional development and investment priorities. In Turkey, mining industry has risen over the past 50 years due to rapidly growing industry in the country. For this reason, Turkey is now one of the most dynamic mining destinations in word. Although it has nearly 60 different types of minerals and also it already has an important place in the world mining industry, Turkey is still at an early stage in the mining sector. When all the data are taken into consideration; Turkey's mineral export target should be at least 20 billion USD in the next decades. For this reason, true and effective exploration programs should be planned/re-planned to achieve the export target and reveal the correct mineral potential of the country.

In Turkey almost all of the mineral deposits in shallow environments have been discovered and consumed. For this reason, exploration facilities for buried and conceptual deposits have gained priority. Nevertheless, most of the mine exploration facilities in Turkey have been sustained in the shallow environments (near 200 - 300 m. depth). Hence, explorations are targeting buried deposits in Turkey. On the other hand, with the correct exploration programs, Turkey has potential for the energy raw materials, geothermal energy resources and also iron, gold-base metal, rare earth element (REE), lithium, trona - gypsum, and kaolin - feldspar and strontium salts-sodium sulphate deposits. Existing mineral deposits indicated below, previous studies and available mineral deposits models support this idea.

Furthermore, exploration and capitalization on the mineral deposits with low grade and large volumes are accepted as common strategies because of the economic conditions and consumption of high grade and small volume deposits in the world. Moreover, with the increase in raw material prices due to the economic condition, and also new exploration strategies, low graded mineral deposits with technological problems have gained value. Accordingly, Turkey will become even more important since it hosts high grade/small volume and also undiscovered burial deposits. ●

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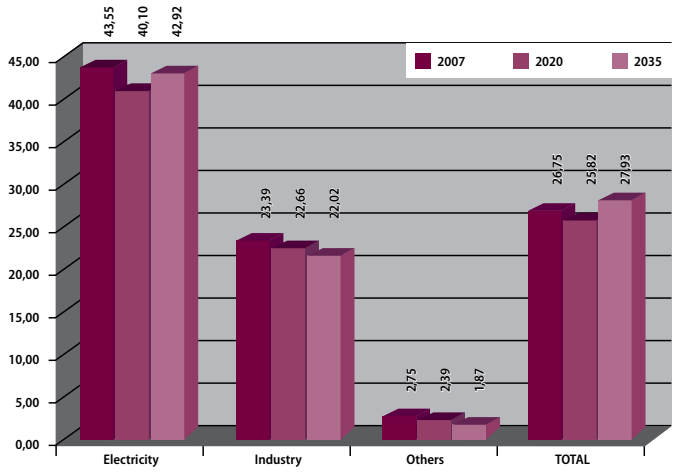
Abdülkerim Yörükoğlu[1], Okan Delibaş[2]
1) Dr., Mineral Research and Exploration (MTA) Deputy General Director., General Directorate of Mineral Research and Exploration, Ankara, 06800, Turkey
E-mail: kerim@mta.gov.tr

2) Dr.,General Directorate of Mineral Research and Exploration, Ankara, 06800, Turkey
E-mail: delibaso@gmail.com

Energy, Lignite and The Role of Turkish Coal Enterprises

Energy, for which makes to turn the world around itself, is the main topic of Turkey nowadays. The price of gas that we buy from Russia, Azerbaijan and Iran, is very high and Energy Minister Yıldız announces that the use of natural gas to produce electricity will be reduced as new measures will be implemented to lower the country's large energy imports. Adding to his speech, 50 percent of Turkey's electricity is provided by natural gas and it is planned to reduce this figure to 30 percent by 2023. Energy Minister Yıldız said also those who use coal in producing electricity will be given special incentives, and there will be limits imposed on future projects that use natural gas to produce electricity.



Graph-1: Coal demand of world 2007 to 2035. Source: EIA, World Energy Projection System Plus (2010)

"Responding to concerns over a reduction in the supply of natural gas through the Western Corridor pipeline, Energy Minister Yıldız said, "We are experiencing the coldest weather of the last 42 years, and there have been no cutoffs in the supply of natural gas." However, he added that the measures being taken will lessen the country's natural gas imports, especially to prevent possible cut-offs of supplies in the future.

Noting that difficulties will be faced during the implementation of such a reduction, Yıldız concluded by saying the details will be announced during the year, and its effects will be discussed. Commenting on Yıldız's announcement, Pamir noted the increasing presence of plants that use imported coal and critically asked how it could be possible to lessen energy dependence while importing coal. He noted energy dependence has risen from 67 percent in 2002 to 74 percent in 2010 and said that even if electricity would be produced through the use of coal, it is important for those plants to be environment friendly." (5 February 2012 - Today's Zaman News "Turkey eyes solution as Iran insists on 'unfair gas price'")

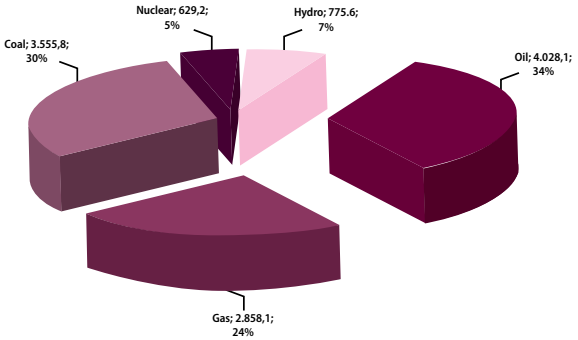
Relevant to speech of the Minister, it is not easy to solve the energy problem in the near future. But if we can least produce the electricity from the use of Turkey's own lignite, of course for those plants to be environment friendly, the current account deficit can be reduced and the use of natural gas for electricity should be lowered.

As seen below from the graph, producing electricity from the use of coal takes the highest place all the times.

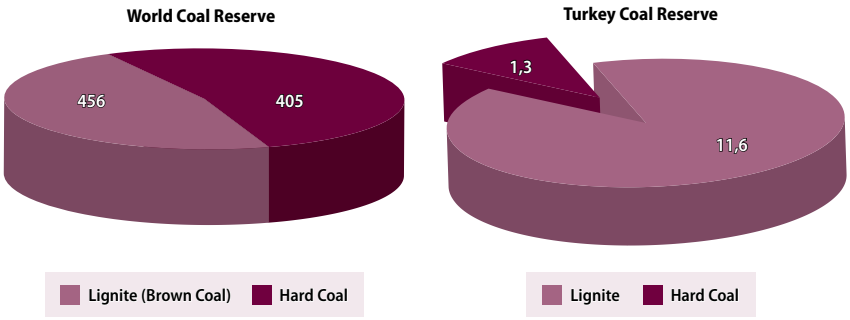
As seen from graph:3, Turkey's coal reserve is 12,9 billion tons. New reserve areas are found and explorations are being continued by the General Directorate of Mineral Research and Exploration.

Lignite takes the great percentage of total. It's not suitable nor as a fuel for home and neither for industry but very suitable for thermal power plants.

The General Directorate of Turkish Coal Mining Administration (TKI) that is a State Economic Enterprise, has been established in 1957 for the purposes of ensuring the utilization of energy raw materials, such as lignite, asphaltite, bituminous schist and peat, meeting the requirements of the country, providing maximum contribution to the economy of the country, arranging, and following



Graph-2: World Energy Consumption to the Resources, percentage and amounts that million tons equel to the oil, end of the year of 2010. Source: BP Statistical World Review of Energy, June 2011



Graph-3: Coal reserves in the world and in Turkey. Source:Turkish Coal Enterprises

up the plans and programs, determining and ensuring the realization of the application strategies (TKİ Strategic Plan 2010-2014, Page 1).

22 % of the total lignite reserves in Turkey as well as 52 percent of the lignite production capacity belong to the general Directorate of TKI. As such, General Directorate of TKI is in the position of being the most important player in the coal market of our country. TKI, which realizes its production process completely on the basis of the demand of thermal power plants and heating and industry, has been increasing its sales to the thermal power plants in the recent years by taking into consideration the electrical energy needs of Turkey.

TKI is presently feeding 10 thermal power plants belonging to Elektrik Üretim Anonim Şirketi and its subsidiaries. The total installed power of the subject matter power plants is 4,209 MW corresponding to approximately half of installed power (8,140 MW) of Turkey based on lignite and approximately 16 % of its total installed power.

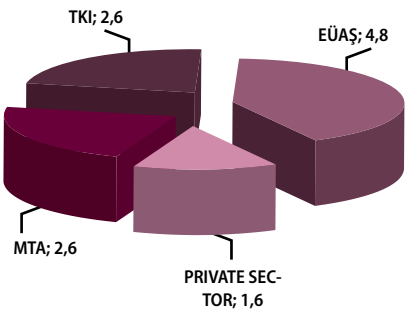
Turkish Coal Mining Administration is an institution that has undertaken very important responsibilities in production and utilization of coal in Turkey since its establishment and it aims to continue with and develop its work in this field in the future.

Although TKI was established in 1957, it is possible to go back to Etibank, established in 1935, and even as far back as coal operations active in Zonguldak in the 19th century to base the roots of the corporate culture. Therefore, it is possible to say that TKI Institution has a corporate culture dating back more than 150 years.

HISTORICAL DEVELOPMENT OF TKI

The mining sector of our country, which is said to be under appreciated, was not also deemed as an important field of activity during the empire era. However, the mining sector has been deemed to be fundamental to the economy especially by the staff of the Republic and during initial years of the Republic, policies in line with this view had been developed3.

The Republican Administration wanted to dispose of the mines within a framework of an industrial program to be implemented. The desire of the state to enter the mining sector as an investor and operator became a reality with the establishment of Mineral Research and Exploration Institute (MTA) in the year 1935 as per Law number 2804 and Etibank as per Law number 2805. While MTA has undertaken responsibilities such as mine exploration, conducting of geological and geophysics research studies, establishing laboratories and training of personnel, the responsibilities such as the operating of mining resources, carrying out operations related to mining, purchases – sales, obtaining licenses and carrying out similar activities as well as the banking transactions have been undertaken by Etibank.



Graph-4: Lignite reserves distribution

As the new arrangements have become applicable in the mining field, the authorization to operate mineral coal mines was purchased from French Societe Heraclee in the year 1936. All the coal mines in Zonguldak basin were nationalizedand transferred to Etibank on 15 October 1940.

As of this date, the coal production in the basin was carried out by "Ereğli Coal Enterprises", an establishment of Etibank. In the year 1937 Değirmisaz Lignite Orewas purchased from private sector and opened for operations.

The franchise to operate Seyitömer Lignite mine was acquired by Etibank in the year 1938 however the production had not immediately started. Contrary to Seyitömer, the production at Tavşanlı - Tunçbilek Lignite mine, for which the operating franchise had been obtained in the same year, had started.

The share of Etibank in mineral coal production had increased from 20 % in the year 1938 to 100 % in the year 1941 and similarly its share in lignite production increased from 69 % in the year 1939 to 81 % in the year 1945. when the Second World War came to an end, Etibank had already completed its establishment process and reached a certain level of institutionalization. In the year 1945 Etibank had undertaken a five - yearly industrial plan and from this date onwards, majority of the investments had been streamed to the coal basin and lignite mines of Zonguldak.

However, especially in 1950s, due to the fact that some of the municipalities could not pay their electricity bills to Etibank and also due to other political interventions, Etibank started experiencing financial troubles and conse-

quently new investments could not be made and the production of mineral coal and lignite became a burden for Etibank *(TKİ Strategic Plan 2010-2014, Page 3, 4, 5 and 6. Tamzok, Nejat, "Osmanlı İmparatorluğu'nun Son Döneminden Çok Partili Döneme Madencilik Politikaları, 1861 - 1948", Ankara University SBF Periodical, No: 63 - 4, 2009)*.

As a result of the subject matter developments, Turkish Coal Mining Enterprises was established upon publishing of the Law number 6974 on Organization of TKI in the Official Gazette dated 31 may 1957 Number 9621 and Ereğli Coal Enterprises (EKI), Armutçuk Coal Enterprises (AKI), Türkiye Kömür Satış ve Tevzi Müessesesi (Turkish Coal Selling and Distribution) and Garp Linyitleri Isletmesi Müessesesi (Lignite Operations) (GLI) have all been linked to the Turkish Coal Mining Enterprises. The operations of TKI that was initially established on the basis of the Law no 3460 on State Economic Enterprises (KIT – SEE), have later on been re-arranged as per the provisions of "TKI General Directorate By-Laws" that was published in the Official Gazette dated 27.11.1984 number 18588 as per decree dated 8 June 1984 number 233.

Later on in the year 1982, the establishments in Zonguldak Coal Basin were separated from TKI. At the time, the Cabinet, as per Decree dated 11.04.1983 number 60, decided to realize the re- organization of State Economic Enterprises on the basis of the authority granted by 2680 numbered 17.06.1982 dated Law, and subject to the new arrangement, Ereğli Kömür İşletmesi Müessesesi was replaced with Turkiye Taskomuru Kurumu (TTK) (Turkish Mineral Coal Enterprises) and Armutçuk, Kozlu, Üzülmez, Karadon and Amasra establishments became the subsidiaries of this entity.

The activities of TKI picked up pace particularly by the end of 1970s. As TKI conducted its operations at the sites for which the franchises had been granted for a period that extends up to 99 years, on the basis of the cabinet resolutions reached according to articles 63 and 64 of 6309 numbered and 08.08.1954 dated Mining Law, the Law on "Mines to be Operated by the State" number 2172 date 04.10.1978 was published. In the subject matter law it is stipulated that the granted operating rights, under 2172 numbered Law, of TKI General Directorate on the mining sites, that are also ensured for continuation as per 2840 numbered law, cannot be used by others. Within the scope of this Law, the operating of lignite mines that are required to be explored and operated by the state, has become the responsibility of TKI. To ensure that the requirements of the thermal power plants are met in a timely manner and the production is carried out according to a plan and no shortages are experienced in terms of energy, it is agreed that the operating of the coal sites that are close to the power plants and suitable for the purpose will be handled by the respective public sector entities. Following this arrangement, TKI's important investment projects such as Orhaneli, Keles, Tunçbilek, Ömerler, Seyitömer, Işıklar, Eynez, Darkale, Tınaz - Bağyaka, Sivas- Kangal, Beypazarı - Çayırhan, Afşin- Elbistan ve Bingöl - Karlıova were brought to life.

As a result of the foregoing developments, TKI had achieved 60 million tons of production capacity at the beginning of 1990s. However, the following projects realized by TKI were assigned to Elektrik Üretim Anonim Şirketi in the respective years indicated; 4.2 million ton / year capacity Sivas - Kangal in the year 1989, 20 million ton/ year capacity Afşin - Elbistan in the year 1995, and 4.3 million ton / year capacity Beypazarı - Çayırhan in the year 2000. On the other hand Kömür Satış ve Tevzi Müessesesi that was established to meet heating needs and industrial requirements across Turkey, with headquarters located in Ankara, was closed in the year 1991 along with its coal sales branches in 18 provinces and 4 districts.

As the new arrangements in the field of mining were put into application, the authorization to operate mineral coal mines was purchased from French Societe Heraclee in the year 1936. all the coal mines in Zonguldak basin were nationalized and transferred to Etibank on 15 October 1940.

TKI General Directorate was established on 22 May 1957 as per 6974 numbered Law and following this, the KITs were categorically re-organized on the basis of 08 June 1984 dated and 233 numbered decree law and TKI as a state economic enterprise (IDT) has been included in the annexed list of this decree law as a related institution of the Ministry of Energy and natural resources (ETBK). Again as per the subject matter decree law, the By-Laws of TKI was published in Official Gazette number 18588 dated 27 November 1984 (TKİ Strategic Plan 2010-2014, Pages 6 and 7).

FIELDS OF ACTIVITY

In line with the energy and fuel oil policy of the government, the General Directorate of Turkish Coal Mining Administration (TKI), has been established for the purposes of ensuring the utilization of

energy raw materials, such as lignite, asphaltite, bituminous schist and peat, meeting the requirements of the country, providing maximum contribution to the economy of the country, arranging, and following up the plans and programs, determining and ensuring the realization of the application strategies. The subjects of operation of TKI are listed below:

1. In relation to the activities to process or cause others to process the mines indicated above and to serve this purpose to be involved in exploration activities with regard to the same.

2. To operate asphaltite mines as per article 2 of 10.06.1983 dated and 2840 numbered law and to serve this purpose to be involved in exploration activities with regard to the same.
3. To establish and operate the necessary industrial facilities related to its field of activity.

4. To utilize the side products and scrap material obtained in operational work conducted.

5. To carry out or have others carry out necessary preliminary studies, research studies in relation to its business activities.

6. To be involved in or have others conduct any and all kinds of transportation, loading and unloading activities in relation to its subject.

7. To carry out any and all kinds of commercial activities including imports, exports and insurance agency, to acquire and sell intellectual rights and rights in kind.

8. To carry out expropriation activities to be able to perform its business activities.

9. To provide and increase the resources to be able to perform and develop the subject matter services.

10. When necessary, to establish or liquidate partnerships both in the country and abroad and to participate in the partnerships that are already or will be established or alternatively resign from such partnerships.

11. To ensure coordination between the enterprises and their subsidiaries.

12. To ensure the compliance of the budgets and price tariffs and investments of the enterprises and their subsidiaries with the general economic, mining, energy and fuel oil policies.

13. To serve its purpose and in relation to its subjects of operation to purchase, sell, lease, lease out real estate and to establish pledges, mortgages, rights of usufruct, easement, real estate ownership and similar rights on the same.

14. To purchase and sell the following within the framework of the technical specifications and regulation to be approved by the Ministry of Energy and Natural Resources; energy raw materials such as lignite, peat, and bituminous schist that are produced by legal and real entities and mineral coal other than sold by Turkiye Taskomuru Kurumu on FOB and FOW basis, coke, briquette coal produced by private administrations, municipalities, their subsidiaries, state economic enterprises and establishments, real and legal entities as well as any side products obtained during the coking process.

15. To determine the regions, in which the different types of coal produced will be used, to prepare the respective program and following the approval of the Ministry implement it.

16. To provide public educational information as well as help on the utilization, storage and burning of the coal produced.

17. To ensure that the skill enhancing programs arranged within the scope of expanding means of employment are implemented.

18. In administrative and technical subjects, to provide guidance to the small and medium sized private institutions that are already or will be established (TKİ Strategic Plan 2010-2014, Pages 4,5 and 6).

Turkish Coal Enterprises is the shining face of country, 16th bigger company of the Turkey. To produce electricity from lignite reserves, the Administration should be well known and over 50 years of talent must be shared by the sector. ●

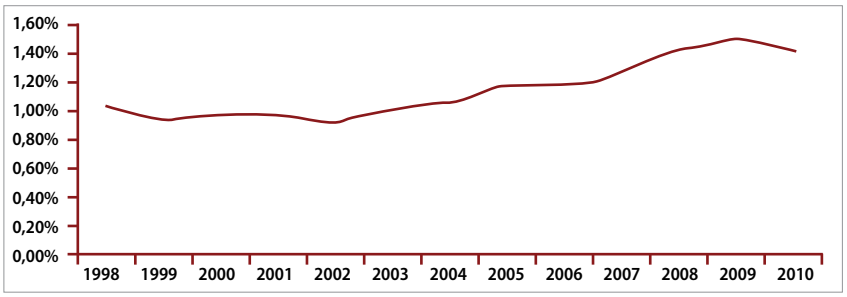
All the information in this article based on the "TKI 2010-2014 Strategic Plan" report, form TKI's web site.

CONTACTS

Turkish Coal Enterprises
Hipodrom Cad. No:12 Yenimahalle 06330 Ankara
Tel: +90 (312) 540 10 00 (50 Hat)
Fax: +90 (312) 384 16 35
E-mail: info@tki.gov.tr
Website: www.tki.gov.tr

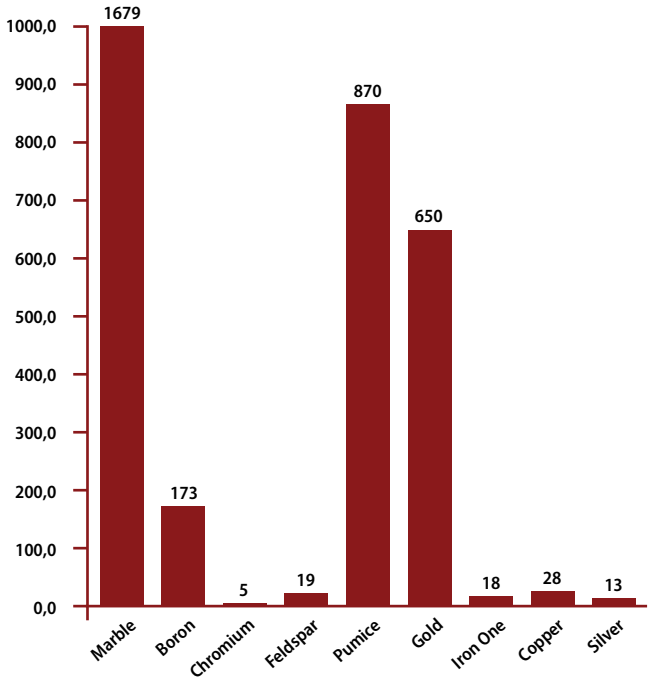
Turkish Mining Sector - Investments and Risks

Importance of the mining sector is increasing day by day with industrialization of nations and improving standard of living. Although, as a result of global financial crisis, interest in the sector has been low during last few years and significant decline in commodity price has been observed; as a result of recent improvements economy, recovery in the sector and increased demand, rise in commodity prices have been experienced. As a result of this demand increase, the competition between mining companies in order to reach limited resources is on again. Especially, countries which have rich reserves and relatively underdeveloped considering mining technology, like Turkey, attract attention of both local and global mining companies and investors.



Graph 2: Mining Sector Share in GDP [5]

Turkey can be considered as rich regarding mineral diversity, 77 out of 90 globally traded minerals exist in Turkey1. Moreover, Turkey holds 2.5 percent of the global industrial minerals reserves, 72 percent of global boron reserves, 33 percent of global marble reserves, 20 percent of global bentonite reserves and more than half of the global pearlite reserves[1]. Moreover, it is claimed Turkey has rich coal and gold reserves1. Graph 1, shows mine reserves to annual production ratio, especially marble, pumice, gold, and boron mining come to the forth as holding promising reserves for long years.



Graph 1: Mineral Reserves / Annual Production in Turkey[1, 3, 4]

Turkey has become the 17th largest economy of the World in 2010, and achieved to be the fastest growing country after China. Between 2004 and 2010, Turkish economy has reached to 1.11 trillion Turkish Liras from 559 million Turkish Liras with a CAGR of 4.01 %. In the same period, mining sector production at current prices grew with a CAGR of 26.88 % and reached to 15.79 million Turkish Liras. Graph 2 shows its share in GDP and reveals that mining sector production grew faster than Turkish economy.

Most of the global mining firms have to make capital project investments in water, transportation, and energy, and it may account for 82 percent of project spending. At this point, a distinguishing advantage of Turkey is its unique geographical position for transportation and shipping.

LOCAL AND GLOBAL DIRECT INVESTMENTS

Turkish government's intense studies for liberalization and privatization in several industries are expected to continue. With the regulatory changes, incentives offered, and reduced bureaucratic processes for obtaining mining licenses; both local and foreign investments have increased with each passing year, and are expected to continue to grow in the coming years. As it is explicitly defined at

the 61th Government Program, private sector investments will continue to be supported and encouraged by government. According to this policy, that in 2012, mining sector is expected to be the most prioritized sector after energy sector. Historically, in Turkey, metals like chromite, silver, copper, aluminum was produced by public companies, today most of these public sector companies privatized and Figure 1 shows history of EtiBank privatization.

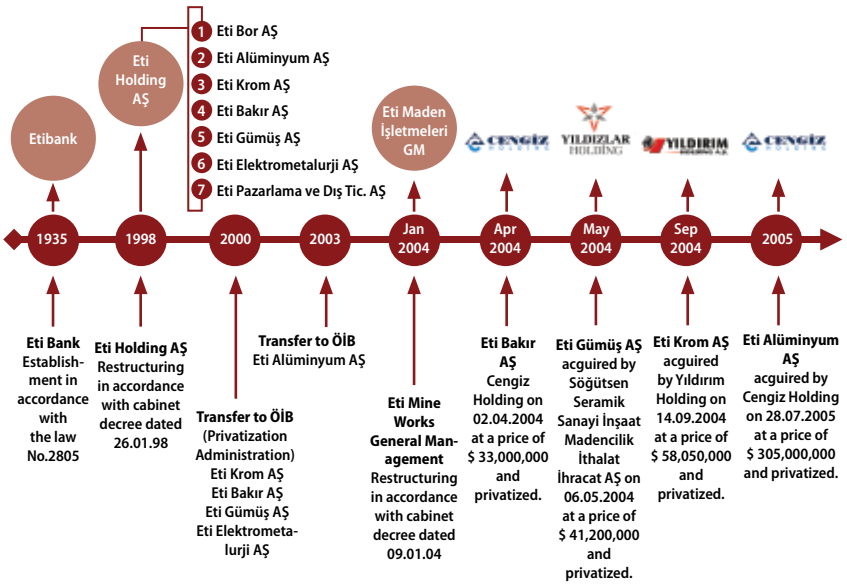


Figure 1: History of EtiBank and Mining Sector Privatizations

Besides privatization, local and global companies show their interest to Turkish mining sector by investing old and new mining sites. It is known that there is a significant increase in the number of mining license issuances, especially caused by the high interest of local mining companies.

Foreign direct investment allowance in rights of underground resources and operations has generated considerable debate for years. However, with Foreign Direct Investment Law No. 4875 date of June 5th, 2003, exploration and extraction rights of natural resources have been opened for foreign investments and consequently a number of international mining companies have invested in mining sites in Turkey.

VOLATILITY AND UNCERTAINTY

Due to global financial crisis, at the second half of year 2008, uptrend in commodity prices started to give way to sharp fall. At the mid-2009, loss in commodity prices reached 50%. The precious metals, like gold and silver, are seen as safe haven investments, therefore economic crisis does not have a negative effect on their prices, and on the other hand, industrial metals like nickel, aluminum experienced the biggest losses in price.

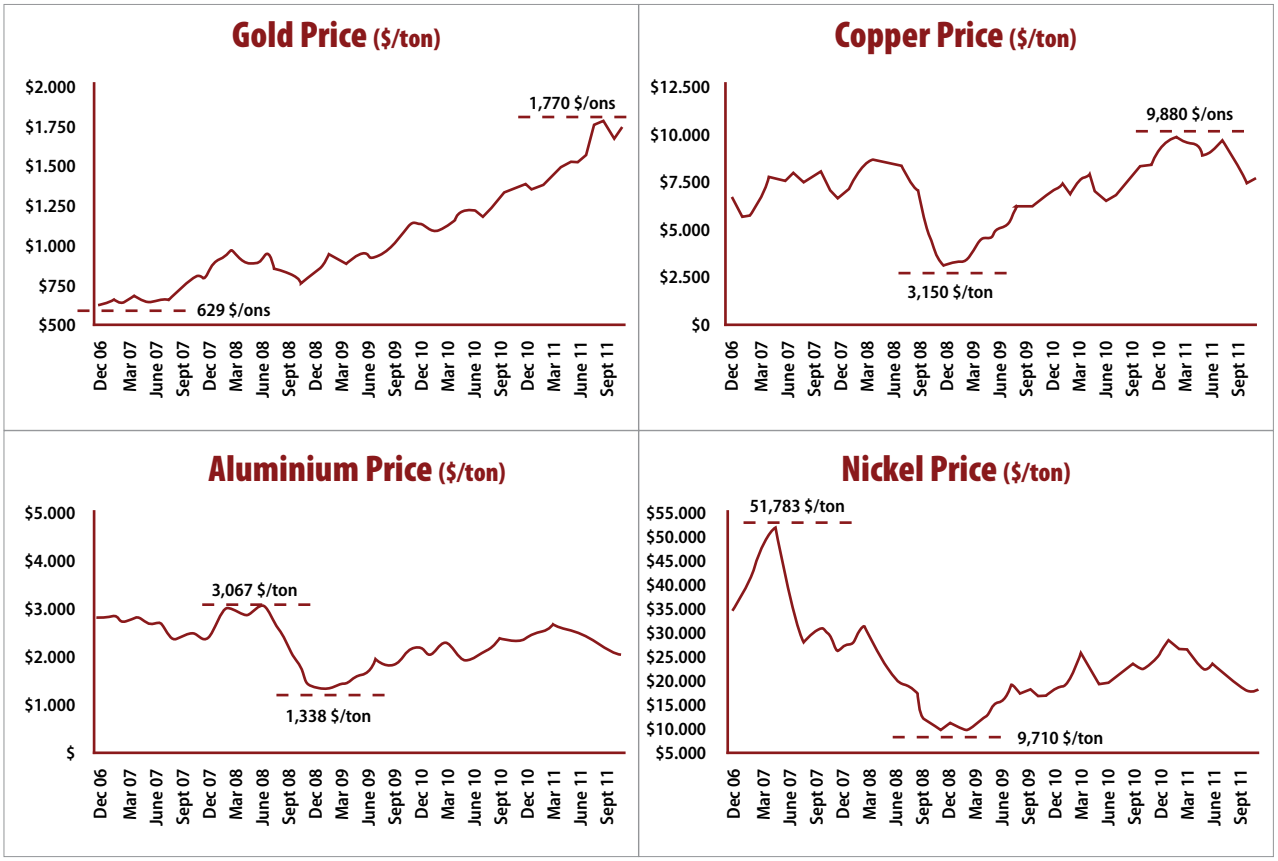
Despite the long-term effects of the global financial crisis, nowadays markets have gathered strength and started to rise again, as a result of demand in developing countries like China and India and the governments' incentives6. However, recently uncertainty have started to dominate the markets, due to so-called 1-in-100-year events like destructive weather, the disastrous earthquake and tsunami in Japan and flooding in Australia and Asia6. Graph 3 shows 5 years price development of gold, copper, aluminium, and nickel.

REQUIRED RISK APPROACH

High volatility in commodity prices is expected to continue for some more time; therefore mining firms have to review their management and operational plans and have to find new and better methods to cope with price volatility and risk[7].

Especially, mining executives must look beyond the traditional scenarios they have used in their planning and feasibility studies. In such volatile markets, companies must be prepared for previously unanticipated risks and begin to incorporate more complex scenarios into their strategic planning. Average business cases are also quite static, encapsulated in a few NPV numbers corresponding to a set of typical scenarios: high, low and base case.

As first step of risk management, before working on spreadsheets, every single risk and opportunity that this specific mining company can face has be determined and defined. The next step is



Graph 3: Gold, Copper, Aluminium, and Nickel Prices[2]

to create a tree map in order to understand the risks, opportunities, and NPV and their relationship. Another important task is to assess and analyze risk and determine probabilities and effect on outcomes. Finally, results should be summarized with techniques such as NPV vs. Probabilities graph and Tornado graph as shown in Figure 2. ●

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Deloitte.

Mine Yılmaz İlkdoğan
Senior Consultant
Deloitte Consultancy
E-mail: miyilmaz@deloitte.com

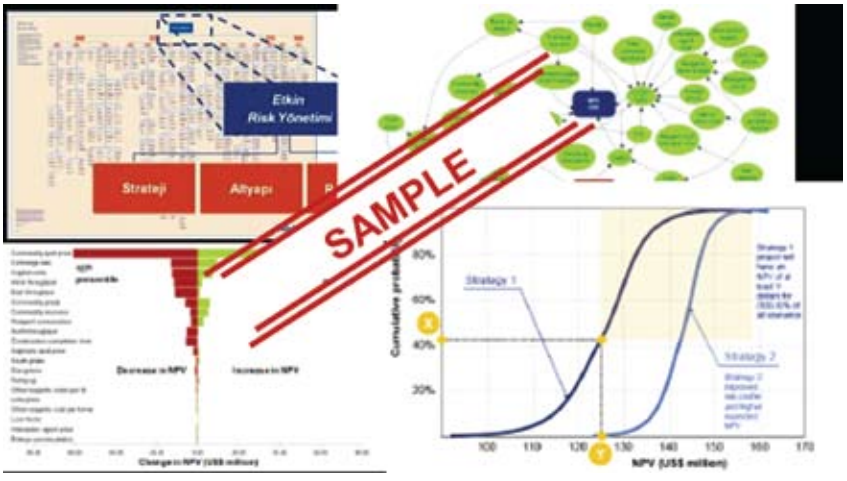

Figure 2: Mining Investment Risk Assessment and Outputs

Mine Operation License as Collateral

Nothing much has changed over the decades, if not the centuries, and today's mining ventures of any size entail significant financial backup too. Before pouring money down the line, creditors quite understandably look for securities that are legally sound, financially valuable and less costly. On the other end of the spectrum, mine operation license is what many miners see as family silver. But it has to, among others, be given away as a collateral to the creditors to ensure smooth flowing of funds into the mining venture.

This article endeavours, from a legal viewpoint, to answer the question of whether mine operation license can be given as a collateral when taking out loan facilities, therefore touches upon salient features to this end.

Under Turkish Mining Law No. 3213 ("Law"), as amended by Laws No. 5177 and 5995 respectively, in order to perform operational activities on a particular mine, the person or persons, who are willing to carry out such activities subsequent to the exploration phase, are, by virtue of law, required to obtain an operation license *(maden işletme ruhsatı)*. In this regard, the mine operation license is defined as "the authorization certificate given for the purpose of conducting operational activities" by the Article 3 of the Law.

Considering both the purpose and the wording of the Law along with its secondary legislation *(Madencilik Faaliyetleri Uygulama Yönetmeliği)* in place, it could be pointed out that the mine operation license not only grants an authorization as such, but also constitutes a "right" *(hak)* for the licence holder. In other words, mine operation license truly embodies what is precisely meant by the "mining rights" *(maden hakkı)*. In addition to this, "license law" *(ruhsat hukuku)* is defined as "a combined set of rights and obligations of license-holders stemming from the license itself (irrespective of it being exploration or operation)".

Accordingly, the Article 38 of the Law allows for assignment, transfer and garnishment of the mining rights. It also does so for both pledging and mortgaging. The liberal approach enshrined in the Article 38 comes with a condition that all these legal transactions must be registered at the "mine registry" *(maden sicili)*. General Directorate of Mining Affairs *(MİGEM)* is responsible for keeping of the mine registry.

While the Article 42 regulates in detail the way mortgage is established on a mine operation license, the Article 43 sheds a light on how such mortgage can actually be realized. Pursuant to the Article 42, mine operation license can be mortgaged in order only for the debts already accumulated or loans contemplated for taking out by the license holder in connection with the mine.

If and when there occurs a change in the geographical area of the mortgaged mine operation license, the existing mortgage shall continue to be effective under the same conditions also for the newly demarked area without further ado.

It should also be pointed out that the mortgage term should be in commensurate with that of the mine operation license. To put differently, under no circumstances can mortgage term exceed mine operation license term. Moreover, the creditor may, depending largely on particularities of credit facility agreement, have the mortgaged mine operation license auctioned off. Prospective bidders can only participate in the auction if they substantiate with a certificate issued by the Ministry that they are qualified to operate the mine in full compliance with the stipulations of the Article 3 of the Law.

Once established, mortgage also covers the following items that are regarded to be an indispensable part of the mine operation license:

1. lands (if privately owned),
2. facilities,
3. vehicles,
4. equipment and materials as further prescribed in the first paragraph of the Article 40 (which are described as wells, pits, and galleries and machinery, buildings, any transportation vehicle used above or under ground that are required in the operating of the mine, equipment and plants that are required for increasing the value of the minerals such as for extraction, dressing and smelting of minerals and the material required for the operation of the mine for one year).

It should be noted that in order for the mortgage to be fully enforceable, aforesaid items 1, 3, 4 might need further formalities to be fulfilled before relevant authorities, such as land registry, traffic registry, machinery registry.

Last, but not least, if and when creditor prefers not to cherry-pick one security over another, it can go ahead with commercial enterprise pledge with a view to having an umbrella-type security tool that also covers, in its usual content, mine operation license as envisaged in both Article 3 (para. c) of Commercial Enterprise Pledge Law and Article 6 (para. c) of Commercial Enterprise Pledge Regulation. ●

CONTACTS

Av. Cemâl Dursun
Partner at Dursun Özfırat Attorneys at Law.
E-mail: cdursun@dursunozfirat.com

Observations From Over 15 Mines:
How to Manage Information Systems in Mining?

Global events tell us, we must have a combination of the right data and appropriate analysis to make the right decision. Very often data is used as a way of reinforcing an already held view which may result in the wrong decision (i.e. using "Statistics as a drunken man uses lamp-posts - for support rather than for illumination." Andrew Lang). To quote another often heard adage: "We are drowning in data but starved for information." Developing systems and techniques that evolve 'data' to 'information', to 'knowledge', and eventually to the value-generating 'action' will help drive better decisions. Many of the technologies used in mine operations to record productivity, machine health, and as operator aids, produce and store data. In most cases, most of this data goes unused. There are specific reasons for this lack of use as observed from the many mines that we have worked with in the past. Turkey might have relatively new mining industry; however, it is important to adapt previous experiences of other mines and counties. This article is designed to ensure that data systems that are upgraded or purchased provide the value promised from previous experiences. It also aims to create the fundamental components for an analysis and solution culture driven by facts rather than a reporting culture with intuitive decision making based on faulty information.

Few universities or mining companies has an education program to teach their technical personnel how to manage the data. Organizations should not expect their employees to use Information Technology (IT) effectively when there is insufficient or no training in maintaining and using such complex tools. Company policy should include basic education in databases for all technical personnel that contribute or manipulate data as part of their job functions. This basic education can likely be undertaken over a half-day to a full day short course. Investing a few hours of time in training for the personnel would have a payback period of only a few days considering reduced data entry, errors, and manipulation. A long-term plan can be in the form of a one-to-two page description of the business processes and potential improvements that the IT tools are to serve and change respectfully. Schedules for new technology acquisition and plan revisions should be clearly laid-out. Plan revisions are necessary as this area of technology is changing so rapidly, new technologies may open new opportunities. Efforts should also contribute to the continuing maintenance and utilization of the data systems. An Information Systems (IS) plan should include budgeting for continuing education of the products and services provided.

Database technology has made huge advances in the past decade, driven by supply chain and marketing industries. Most of the R&D focus is on developing analysis tools for improving business processes. However, the skill sets in most mining companies do not include the database skills necessary to take advantage of these new technologies. Vendors use the maximum capabilities of these technologies in their marketing but after implementation, this technological potential is usually left un-tapped. Technological capabilities are often highly underutilized due to the ineffectiveness of the training provided by the vendor or limited time a user has to be trained or simply lack the necessary skills. These skills are not difficult to master and would take only a full-day education session for those who have had the basic education, some practice, and aptitude.

Accessing the data is only important if the user intends to use the data tool beyond simple reporting. Most data-driven technologies are sold not only on the simple reporting functions, but on the potential analyses that can only be brought about through integration and advanced analysis. Developing a corporate culture is an important step for technology-driven companies. The strategy should include a long-term mission and goals, a maintenance and utilization policy, and standard technology selection and implementation criteria. Due to the multi-vendor nature of the mining IT sector, most mines have a mix of different data-generating products from various companies. A long-term strategy would ensure that these different pieces can incrementally add synergistic benefits. For example, integrating drilling, blasting, haulage, and costing information is possible if a common naming convention is applied for location. This would enable one to link geology, blast performance, digging performance, and product quality

for improved performance measurement and reconciliation. A long-term IS plan would be intimately linked with whatever Business Process changes the IS intended to enable.

Most vendors point to their reporting tools as a means of accessing the data. Systems are often packaged with reporting tools that can be web-based or accessed through special software included in the system purchase. Reporting tools are just reporting tools. Little analysis or integration with other systems is possible. Decision makers must understand the limitations and inefficiencies of a system if the only means of accessing the data is through packaged reports. However, vendors may point out that their databases are available to be directly accessed. Although, these same vendors are rarely encouraged to provide the requisite documentation or follow a standard setup. Mining companies should include investment in the skills of employees to the extent that the overall company strategy's goals adhere to. If the IS strategy of a particular company is to only use standard reporting tools and not to undertake analyses of more detailed data, then no advanced education is needed. To use data beyond reporting, one must have access to the data, the skills to create integrated queries or views, and an understanding of the database. An understanding of the database is a key challenge since vendors rarely provide the metadata during the purchase. They may state that the raw tables are available, but rarely provide a written description of each field in the table. All database tools give the ability to program metadata directly into the table so that users can easily access definitions but vendors rarely take advantage of this. Similarly, ER diagrams are infrequently provided, therefore the structure of the database, how each table links to other tables, is not known. These common vendor practices are akin to delivering data in another language without providing a dictionary or grammatical rules.

When a vendor installs their technology, they require input from the operation in the form of naming equipment, locations, etc… Naming conventions facilitate integration across an organization. Similarly, standard measure definitions are also important. For example, availability and utilization are often calculated using different formula at every mine. Having a corporate definition standard for key measures is a requirement if a company intends to compare performance between mines. As with any complex expensive piece of equipment, IS systems need maintenance. Not only in terms of patches and upgrades, but how they are used and managed as well. Also as with expensive equipment, someone is usually made responsible for its utilization and effectiveness. For example, an electric cable shovel is expected to have a utilization of at least 80% and a set minimum production rate. A direct supervisor is made responsible to ensure that the shovel meets the anticipated performance expectations. Similarly, IT projects also should have a sponsor or dedicated continuous improvement (CI) person in charge and the utilization of IT products should be also tracked very closely.

Most operations have one or more advanced database or spreadsheet user. These users are often relied upon to link complex spreadsheets together or access and maintain databases. These users also rarely have formal training in information management hence do not document or design the systems for easy-maintenance. However, their services and knowledge are highly valuable. If these individuals changed positions or left the company, the linked spreadsheets and databases would soon fall into disrepair and that knowledge would be lost. Therefore a key organizational strategy is to provide a few knowledgeable socially adept IT that can be dropped into the various sites as needed to provide IT services.

IS tools may be selected at various levels in an organization. This makes a corporate IT strategy difficult to enforce. Vendors may sell a product based on all the potential benefits that can be derived from the product's many features. In most cases, vendors do not explain all the organizational and process changes necessary to make full use of the IS product. When evaluating an IS product, decision makers should have:

- Comprehensive risk and benefit analysis through a checklist or a weighted scoring matrix
- A realistic plan, budget, and schedule to implement the organizational and process changes necessary to take advantage of the IS product features.
- Cost of the R&D should be included (along with its potential benefit) in the evaluation. ●

CONTACTS

THE UNIVERSITY OF ARIZONA.

Sean Dessureault[1], M. Mustafa Kahraman[2]
1) Assoc. Prof., The University of Arizona, Department of Mining and Geological Engineering
E-mail: sdessure@email.arizona.edu

2) The University of Arizona, Department of Mining and Geological Engineering
E-mail: kahraman@email.arizona.edu

E&MJ
ENGINEERING AND MINING JOURNAL

GLOBAL BUSINESS REPORTS

Mining in Turkey

A country thirsty for its own mineral reserves

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This report was researched and prepared by Global Business Reports (www.gbreports.com) for Engineering & Mining Journal.

Editorial researched and written by Caroline Stern and Jacopo Dettoni.

For further information, contact info@gbreports.com

Cover photo: Spektra Jeotek's rig (Courtesy of Spektra Jeotek)

A REPORT BY GBR FOR E&MJ

JANUARY 2012

Introduction

Turkey's move to unleash its mining potential

View of a nickel open-pit mine. Courtesy of Photo courtesy of Fe-Ni Mining.

At first glance, Istanbul seems to have changed very little since the time of Ara Güler's black and white photographs. Its streets are still crowded and chaotic, and its wooden houses as neglected as the camera of Güler, "the eye of Istanbul," captured them 50 years ago. Despite the appearance, however, things have changed dramatically. Istanbul has become a 17 million people megalopolis with a brand-new metro system, two bridges stretching between Europe and Asia, a vibrant service sector, real estate developments springing up on every available piece of land, shopping boulevards packed with the glittering windows of international boutiques and 35 billionaires living in its yalis (waterfront villas) along the Bosphorus.

Over the last 20 years, meanwhile, Turkish cities such as Balıkesir, Bursa, Denizli, Gaziantep, Kahramanmaraş, Kayseri and Konya have become important business and industrial centers. Ankara is no more the provincial town that was despised by international diplomats in the 1920s, but a dynamic political capital with a population of 4 million.

Since Turgut Özal opened up the country to private and international investment in the 1980s, Turkey has been growing at impressive rates. Neither the domestic financial crisis of 2001, nor the more recent global financial crisis managed to invert this trend, even if they did take some toll. The country ranks 17th in the world in terms of nominal GDP and Prime Minister Tayyip Erdoğan has vowed to make it one of the 10 biggest economies by 2023, the 100th anniversary of the Turkish republic.

Turkey's mining industry has gone through the same dramatic changes. Only 15 years ago, 85% of the mining operations were controlled by the state; today the ratio is reversed. Overloaded with cash flows predominantly proceeding from the construction sector, the so-called "Anatolian Tigers" have diversified into the mining sector by making the most out of the liberalization process. At the same time, Erdoğan's nine-year, investor-friendly tenure paved the way for international mining companies to increase their exploration efforts across the Anatolian peninsula, a varied, rich, but largely unexplored geological setting.

Turkey abounds with precious and base metals and it also sits on large industrial mineral deposits such as boron. Overall, the country ranks 10th in the world for the mineral variety of its underground resources: 50 different minerals are found in economically adequate quantities, while another 27 types have been discovered but lack the quantity or quality to be commercially exploited. Booming commodity prices have recently augmented this mineral potential. As return rates on mining operations have dramatically bounced back following the global financial crisis, exploration activities have intensified and lower-grade ores are increasingly mined through sophisticated technologies.

Engineering and Mining Journal and Global Business Reports first published a report on Turkish mining in March 2008. Back then, we reported on a growing sector with plenty of potential for new discoveries. The market had both the opportunities and challenges that are typical of an emerging sector within an emerging economy. On the one hand, a mineral-rich land offering huge space for discoveries after years of state

Ümit Akdur, chairman, Turkish Gold Miners Association.

control had left it poorly explored; on the other hand, the sector lacked a reliable supplier base and a skilled workforce, and was tied down by a developing but still complex legal framework. In the case of the latter, the instance of Kışladağ is emblematic. The gold mine, which the Canadian company Eldorado Gold had equipped to process 10 million mt/y of ore, saw its permits were abruptly revoked over doubts regarding its environmental impact assessment (EIA).

Four years later, things have improved. Kışladağ is back at work and Turkey has quickly become Europe's largest gold producer with an annual output set to breach 25 mt in 2011. After a severe financial crisis forced the adoption of emergency reform measures in 2001, the national economy grew at a healthy average of 4.8% per year between 2002 and 2010. The global financial crisis took its toll in 2008 and 2009, but the resulting recovery saw Turkey posting a 2010 economic growth of 8.9% — very close to that of China and India. Early projections by Turkey's Deputy Central Bank Governor Mehmet Yörükoğlu, put the growth rate for 2011 at 7%. While European countries are trapped into a spiraling sovereign debt crisis, Ankara is following through its plan to storm into the cherished club of the world's 10 largest economies by 2023.

The mining sector could not avoid the 2008/2009 slowdown, with several international investors putting development projects on hold due to the disappearance of funding. However, as soon as the global economy started to recover and commodity prices began their upward trend, mining projects were back on track, largely supported by international capital. After decreasing for two consecutive years, foreign direct investments in the Turkish mining sector (not including investments through share purchases) bounced back vigorously in 2010, reaching $195 million.

In gold mining alone, three new mines have opened in the last couple of years and several projects are due to be fully developed in the coming years. International investors showed their interest in the recent developments in Turkey's gold mining by subscribing 40% of the initial public offering (IPO) of Koza Gold, the sole local gold producer on the Istanbul Stock Exchange. Overall, investors laid down a total of $436 million to subscribe 30% of Koza's capital, giving the company, which at the time was producing around 230,000 oz/y of gold with further resources for 8.1 million oz, a market value of $1.45 billion.

Meanwhile, the Turkish government paved the way for new investments by amending the mining code in 2010. The new rules focus on making exploration campaigns more effective and lessening the bureaucratic red tape surrounding mining activities. The reform quickly made its mark on the industry by discouraging license holdings for trading purposes and unleashing new "serious" exploration campaigns.

According to the General Directorate of Mining Affairs (MIGEM), the number of total licenses (active and inactive) has dropped to 32,000 from 45,000 since the reform was approved. At the same time, the number of companies, both national and foreign, exploring for gold increased to 26, as of October 2010. Before the amendments in June 2010, there were only nine companies searching for gold. More are sure to come in 2012, when Ankara will tender more than a thousand new mining licenses.

Although this is all resulting in a steep increase of mining activity in Turkey, the overall value of mining and quarrying output is still low, equalling a mere $15.3 billion and representing just 1.4% of the national GDP. A modest contribution compared to developed countries such as Germany (4%) and the U.S. (4.2%), let alone mining powerhouses such as Australia (8.7%) and Canada (7.5%).

Turkey adds little value at the end of the mining value chain: the country has a very limited processing capacity. There are just a handful of metal, ferrochrome and ferromanganese smelters across the country — and it is a net importer of refined metals and alloys such as copper and stainless steel. The country also imports large amounts of hard coal to feed its energy demand. As a consequence, coal, metals and alloys imports are contributing to Turkey's growing current account deficit. If Turkey wants to reverse this trend and capitalize on its mineral potential, it needs far more capital.

"We need more international companies coming over, meaning more capital for exploration activities. According to our estimates, Turkey's gold mining receives no more than $150 million in foreign investments every year. That is not enough to completely unfold the sector's potential," said Ümit Akdur, chairman of the Turkish Gold Miners Association.

Beyond the gold sector, there are several companies that have recently completed feasibility studies for opening mines as well as processing plants for ferrous, non-ferrous and industrial minerals. They are all searching for the finance needed to follow these projects through.

At current commodity price levels, the potential return on investment could be very high. For Güven Önal, a professor of geology at Istanbul Technical University, fresh capital would unleash Turkey's mining potential and increase its share of the national GDP to 4%. "In 10 years, $30 billion of investments would lead to $400 billion worth of mineral production," he said.

This report will serve as an update on the state of development of mining in Turkey, on the recent discoveries and on the potential that still lies untapped underground, waiting for the capital able to activate the drilling rigs needed for its exploitation.

The Reformed Mining Code

The reform addressed some of the weaknesses that had weighed down the development of the sector in the previous years.

Following the Turkish Constitutional Court's decision to cancel Article 7 of the mining code regarding the regime regulating environmental permits, the government drew up a set of amendments that were accepted and passed by Parliament in June 2010.

The basic principle of the Turkish mining code was left untouched, and minerals remain under the ownership and sovereignty of the state, which issues mining licenses for a defined period of time. The main focus of the new rules falls on exploration activities. It was previously a point of contention in the industry that there was no rule that prevented so-called çantacı — literally 'someone that stores something in a bag' — from collecting mining licenses just to sit on the land with the hope of eventually reselling it at a profit. License-holders were not asked to invest any money on the land and could mask their intentions by producing unreliable reports. Malcolm Stallman, regional exploration manager of Centerra Gold said: "It was like buying a lottery ticket for a few hundred Turkish liras with the hope of selling it for millions later on."

The government put an end to this practice by imposing financial constraints for any potential explorer. "If a company wants to carry out exploration activities, it has to prove it has the financial ability to do so, otherwise it will not be permitted to explore," said Mehmet Üzer, general manager of the General Directorate of Mineral Research and Exploration (MTA).

The new rules also introduced a three-step exploration period: a pre-exploration period; a general exploration period; and a detailed exploration period. Throughout the entire period, authorities are expected to check on-going developments and whether mining companies are carrying out their exploration campaigns in an effective way. If they fail to live up to these criteria, their licenses will be revoked. This license regime does not hold for mining production belonging to the so-called "Group I" (sand, gravel and clay) and "Group II" minerals (aggregate, marble and natural stones) where no exploration phase is required to access an exploitation license.

The amendments also clarified the liability terms under which both the licensee and the sub-licensee/operator are now "jointly and severally liable for all damage caused by mining activities," said Andrew Ridings, an analyst from Holman Fenwick Willan, in a recent analysis of the reform.

Reforms also addressed the historically poor conditions of the health and safety of miners in Turkey. According to a parliamentary report issued in May 2010, Turkey has the highest rate of fatalities in mining accidents in Europe. By tightening the HSE requirements, including requiring that professional mining engineers and technical staff are present at mining facilities, this is expected to be reduced. A final important change regards the role attributed by the law to the Ministry of Energy and Natural Resource which held regulatory powers under the previous regime, but is now only responsible for implementing and administrating the new laws.

With these changes, the Turkish mining code certainly comes closer to international standards. In the eyes of operators used to dealing with mining laws throughout the globe, there are some gaps that still need to be closed.

"The maximum size of Group IV tenements is still small — 2,000 hectares — and tenements can assume any shape. Because of this, putting together several licenses to form a large land package can be very difficult. Turkey also lacks a so-called 'open file' information system. Exploration companies that have been granted a license cannot access the results of the exploration work that someone may have been carried out on the same piece of ground in the past," said Centerra Gold's Stallman.

There is also room for improvement in the reporting system, although MIGEM is in talks with CRIRISCO, the Committee for Mineral Reserves International Reporting Standards, to push through new amend-

ments which will force the introduction of international reporting standards.

Companies interested in acquiring licenses in Turkey must pay attention to the potential underground resources, but also to the surface area. Forests and archaeological sites are scattered over the country and specific laws grant them particular protection. For instance, no mining operations can be established within a distance of 3 km from an olive grove. As the amendments approved in 2010 did not change this state of affairs, a bill has recently been drafted to loosen the rules. Legal sources questioned on the issue showed skepticism about it being pushed through due to the influence and opposition of the farmers' lobby. Tap water reservoirs around mining locations are also granted special protection. A mine operating company is strictly prohibited from detonating explosives inside a mine unless they are situated at least 2,000 m from any reservoir in the vicinity. Companies will also have to act in accordance with environmental impact reports in the method of extraction for mines located 2,000 or more meters from a reservoir.

The auctioning process

The new rules pertaining to exploration activities will be tested soon. As the old mining code became increasingly unreliable, exploration license auctions were suspended. They will soon resume as a follow-up to the recent reform.

The government has called a series of auctions to tender 1,252 "Group IV" licenses (which include precious and base metals) via consecutive closed and open bidding processes. These will be held between January 2012 and May 2012. Both local and international companies have shown substantial interest in the auctions and geologists are at work to identify the opportunities worth a bid.

Although the resuming of the tendering process met with the approval of mining companies, it is proving to be controversial concerning the role the MTA will play in it. The state's exploration body has been granted the right to review the licenses to be tendered beforehand. Some fear this will make the overall process less transparent and ultimately less attractive for serious mining companies.

Sabri Karahan, who before founding Dama Engineering spent over 35 years working for both state-owned and private mining companies in Turkey, said: "The MTA will get away with the juice and the private sector will be stuck with the rest."

"The MTA can apply for licenses close to known basins and the applications have to be bound to particular projects. During their exploration activities, if they find an exploitable orebody, they give the license back to us for tendering. As a consequence we can raise two to three times the amount of tendering revenue with the contribution of MTA," said Hamdi Yıldırım, general manager, MIGEM.

Apart from this particular issue, the overall reaction of the industry to the 2010 reform has been positive and there is a clear understanding that the government is putting efforts into attracting investment to the mining sector. "Rules have become clearer and we know better what is expected of us. There is little room left for interpretation now," said Iain Anderson, managing director of Inmet Mining's Turkish operations, Inmet Çayeli Bakır.

The industry is now awaiting specific regulations to follow the amendments that will put every details in its proper place.

As a collateral benefit, international mining companies operating in Turkey can enjoy one of the most competitive corporate tax systems among OECD countries. Apart from the specific royalties applying to mining operations (the royalty for gold, silver and platinum has been increased to 4%, and the royalty for dimensioned and natural stones, which are processed into a final product in the facilities of the license holder, has been reduced to 1%), the basic corporate income tax rate levied on business profits is 20%, while dividends are subject to 15% tax. In regards to VAT, gold and silver exploration activities are exempt from any duty. Stamp duty applies to a wide range of documents, including contracts, agreements, notes payable, capital contributions, letters of credit, letters of guarantee, financial statements, and payrolls. Stamp duty is levied as a percentage of the value of the document at rates ranging from 0.165% to 0.825%.

The government is also using incentives to spur companies to overcome the actual weaknesses of the industry which include the small amount of deep underground operations and an overall limited ore processing capacity. For those mining companies that 'create additional value by processing the minerals,' and those that mine underground, royalties are 50% cheaper.

Ankara is trying to foster developments along the entire value chain of the mining sector: the exploration activities regime has been made more effective, while costly underground operations and processing facilities are being supported through incentives.

A Diverse Marketplace

The spectrum of companies operating in the Turkish mining sector is highly varied and reflects the historical stages of development the industry went through.

It is no surprise that the origin of Turkey's modern mining sector dates back to Mustafa Kemal Atatürk, the founder of the Republic of Turkey. Atatürk's vision for the national economy embraced all sectors, and mining was no exception. In the eyes of the "great leader", Turkey's mineral reserves had to be centrally managed to better serve the needs of the country's heavy industry. To follow through his vision, he founded the MTA to carry out exploration programmes throughout the country and Eti Bank to follow up MTA's discoveries by establishing mining operations. This setting lasted basically untouched for decades, with Eti Bank remaining in charge of most the mining operations going on in the country up until the 1980s.

Things changed with the election of Turgut Özal as prime minister. After years of instability marked by conflicts between right and left-wing parties culminated in a military coup in 1980, Özal entered the fray by founding Anavatan Partisi – the Motherland Party – and winning the first democratic election after the military regime. As soon as he rose to power, Özal started opening up Turkey's economy and unleashing the potential of the private sector. As part of his set of reforms, a new mining code was approved in 1986. That first step kicked off the privatisation process that, to different degrees of intensity, has lasted until today.

Following the 1986 mining code, Eti Bank was broken up into smaller companies to be sold to private enterprises. Most of them would end up in the hands of established Turkish conglomerates, which have recently risen to prominence as the Anatolian Tigers. These included the Cengiz Group (Eti Aluminium and Eti Copper) and the Yıldırım Group (Eti Chrome), the Ciner Group (coal and soda ash concessions), Dedeman (chrome ore, lead and zinc) and the Koç Group (iron ore and coal). These conglomerates, whose success is primarily rooted in construction, finance and media empires, are now the largest mineral producers in the country. They have capital to invest, but but may lack the expertise to develop mining operations. For this reason, they are increasingly relying on local service and equipment suppliers, creating room for developments among the mining industry's supplier base. For the time being, only Eti Maden (boron), TKI (lignite) and TKK (hard coal) have survived as state-owned mining companies since Eti Bank's original break-up.

Alongside local conglomerates, Özal's mining code and its successive reforms (2004, 2010) also lured international investors into the Turkish mining sector. They mainly focused on developing precious metal greenfield projects - Canadian Inmet's takeover of operations at the Çayeli Bakır copper mine is a rare exception.

Despite significant geological potential for precious and base metal mineralization, at the time of Özal only insubstantial amounts of gold or silver had been produced in the recent history of Turkish mining. International mining companies such as Cominco spotted the opportunity and stepped into Turkey looking to uncover its most precious mineral wealth. They kicked off a successful process and today Turkey can boast Europe's largest gold mine – Canadian company Eldorado's Kışladağ mine (located in the province of Uşak, some 400km South-West of Ankara) with reserves of 10,231,000 oz at 0.74 g/t – and other world-class deposits such as Denver-based Alacer Gold's Çöpler mine (Erzican, 550km East of Ankara). International companies also developed Ovacık (Izmir, on Turkey's Aegean coast) , the first active gold mine in the country, although Frontier Pacific sold this asset to Koza Gold in 2005. Inspired by these success stories and by booming gold prices, dozens of mining ventures are now trying to uncover other world-class gold deposits. Foreign companies, predominantly from Canada, Australia and Britain, are now carrying out exploration programmes throughout the country.

Alongside local conglomerates and international investors, the Turkish mining industry is being increasingly populated by a plethora of small local players looking for the enticing profits offered by exporting chrome ore and iron ore outcrops to China and other countries. They suffered serious setbacks in 2008, when the global financial crisis deflated the commodity bubble on which they rode, but they are now back on the ground trying to get the most out of the recent recovery in ferrous mineral prices.

This variety of active players results in a vibrant mining sector that is quickly growing and determining the rise of a local supplier base. Doubtless, gold mining is showing the highest rate of growth in terms of investments as well as of production.

"Our final aim is to transform Turkey"

Taner Yıldız, the Minister of Energy and Natural Resources explains what the government is doing to uncover Anatolia's mineral resources.

Why is mining so important for Turkey?

Mining is important for Turkey for several reasons. The mining sector provides the economy — mainly the industrial sector — with necessary raw materials. Besides, it fosters the development of rural areas through new investments in infrastructure and job opportunities. It also helps introduce in those areas new technologies and marketing and financing methods.

What is the current state of development of the Turkish mining sector?

The Turkish mining sector's total value of production topped $10.5 billion in 2010. It was $2.6 billion in 2003. Mineral imports grew to $3.7 billion in 2010 from $684 million in 2002.

Most of Turkey's mineral reserves are buried underground. What is the country doing to uncover that wealth?

Exploration activities can be divided into governmental and private operations. The governmental exploration activities are carried out by the General Directorate of Mineral Research and Exploration (MTA). At the same time, a contractual system enables private companies to bring forward their exploration. Recent figures give the idea of the impact the incentives put in place to spur drilling operations: public and private ventures drilled 1 million m in 2010, a tenfold increase compared to 2002.

The government pushed through a reform of the mining code in 2010. What innovations were introduced?

The mining code was first reformed in 2004. As a result, the interest in the sector increased. Later on, following the Constitutional Court's decision to cancel provisions of the national mining law regarding environmental permits, uncertainties on how to get permits for mining operations emerged. Therefore, it became mandatory to eliminate the legislative gap. There was a disequilibrium between the licenses granted and the number of new mining operations put in place. Licenses were being used for controversial purposes. To address these problems, the government passed a set of amendments to the mining law in 2010. With the final arrangements, 25% of the revenues proceeding from mining operations are used to fund infrastructure developments in the regions where the licenses are collected. At the same time, 50% of the fees paid for mining operations are invested to bring services to rural villages.

Is the government also supporting the development of a supplier base to the mining sector?

Currently, most of the equipment that mining companies need is manufactured in Turkey. This brings several advantages for operators: it reduces investment and operative costs by increasing the level of maintenance and making it easier to find spare parts.

Mining in Turkey is quickly developing. Within this context, what is the role the Ministry of Energy and Natural Resources wants to play?

The mission of the Ministry of Energy and Natural Resources is to realize a restructuring of the mining sector in order to achieve environmental-friendly and sustainable development. We also have to put in place contemporary standards in terms of job security .

By uncovering the country's mineral reserves, our final aim is to transform Turkey from a country that produces and sells raw materials into a country that is industrially integrated and has a voice in the world market in terms of high-value products.

Gold: Turkey's Glittering Treasure

With production at Eldorado Gold's Efemçukuru and Koza Gold's Kaymaz having kicked off in the second half of 2011, the sector is set to further boost its annual outcome.

According to the Turkish Gold Miners Association, overall 2011 gold production is expected to reach 25 mt/y, compared to 17 mt/y in 2010. In the long-term, analysts expect it to stabilize around 60 mt/y. This is a remarkable achievement for a country that, in its recent history, had not produced a single ounce until 2001, when the first gold mine, Ovacık, entered production stage. In 10 years, Turkey has established itself as the largest European gold producer by a wide margin — Sweden follows with 6.5 mt/y.

The country is now posed to further strengthen its leading position. With gold setting new records in the financial market, fueled by growing concerns over European and U.S. sovereign debt risk — spot contracts averaged more than $1,550/oz in 2001 — development projects are already piling up. In the coming months, a number of plays are due to reach production stage, while the processing capacity at some active mines will be further enhanced. In the words of a gold miner: "If you have something underground you have to develop it. And if you have already developed it, you have to double the processing capacity."

Besides, more discoveries are yet to come. Junior and mid-tier mining companies are scattered over the country looking for the next Turkish world-class deposit. The resuming of the license auctioning process will further intensify exploration activities. As long as explorers are able to access the capital markets to fund their exploration activities, rigs will be busy.

Growing processing capacity

All of the largest gold producers in the country are drafting plans to expand their productions. Eldorado is planning to invest $354 million to double the processing capacity at its Kışladağ property. The open-pit gold mine, boasts combined proven and probable reserves of 10.2 million oz. Yearly production for 2011 is expected to swing between 270,000 oz and 285,000 oz. Despite a low gold grade (0.74 g/t) the company enjoys extremely low production costs, around $360/oz in 2011, thanks to a heap leach circuit able to process 12.5 million mt/y and due to be raised to 25 million mt/y by 2014. Since last June, part of Kışladağ's leach pad capacity has been absorbed by the ore coming from Efemçukuru. This smaller underground mine has reserves of more than 1.5 million oz of high-grade gold (9.10 g/t). Mehmet Yılmaz, director of Tüprag, the 100%-owned local subsidiary of Eldorado Gold, estimates that total production will have reached 30,000 oz in the first six months through the end of 2011.

Denver-based Alacer Gold also has plans to update production at its Çöpler mine. Çöpler has reserves of 4.6 million oz at 1.5 g/t and Calvin McKee, Alacer Gold's country manager for Turkey, is confident he will soon be able to revise this figure upwards. Brought into production stage in December 2010, the mine's leach pad has delivered almost 50,000 oz per quarter and will end its first year at around 180,000 oz. McKee is committed to pushing the production even further. "We are pursuing a production of 250,000 oz/y," he said.

The company has mined only the oxides, but it also completed a pre-feasibility study for a sulphide processing plant and has initiated a complete feasibility study. "It should be completed by the end of 2012 and the plant should be in place by the end of 2014," said McKee. Overall investment will amount to $400 million.

Turkey's Koza Gold is focusing on expanding mine-life at Ovacık. As the first Turkish gold mine to enter the production stage back in 2001, Ovacık has produced a total of 39.63 mt of gold. The mine's development was initially very controversial due to then-owner Newmont's attempt to introduce the first cyanide leaching in Turkey. As

a consequence of environmental protests and legal challenges, the mine has operated only sporadically for years. Koza took over Ovacık in 2005 and soon afterwards a court overturned a previous decision to suspend production at the mine. As soon as production resumed, the company looked for satellite deposits that could feed the processing plant and expand the mine-life beyond initial projections. Today, the plant still has an output of 180,000 oz/y, and 80% of the ore it processes comes from Koza's nearby Çukuralan mine. Mine-life has been expanded beyond 2020. Meanwhile, Koza also brought to production the Kaymaz play last September — production there is expected to stabilize between 80,000 oz/y and 100,000 oz/y.

The cyanide debate

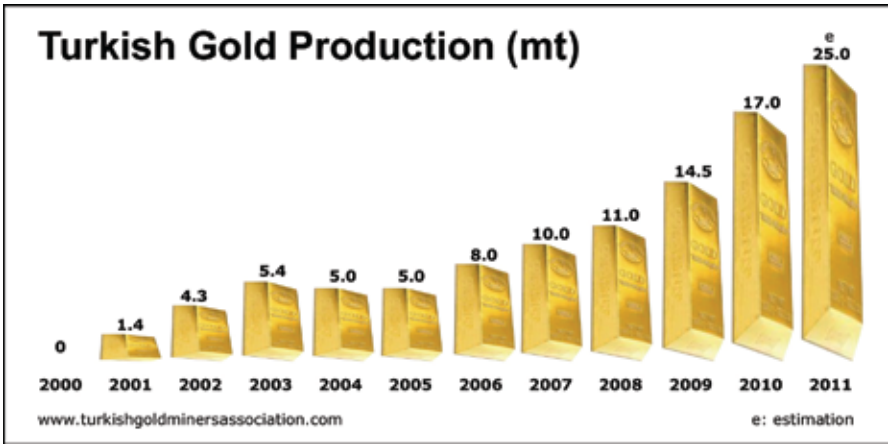
Despite the resuming of operations at Ovacık, the Turkish public is still very sensitive to cyanide usage in mining operations. Bora Arpacıoğlu, managing director for Turkey of SRK Consulting said "Cyanide has not been well understood by the Turkish public. It has become a myth. But cyanide is used frequently in other industries here in Turkey and is not as well managed as it is in the mining sector. In the past there were no legal rules that could handle the use of cyanide. Now, a lot of environmental transposition from EU regulations has happened. Air quality and water quality regulations are in place, and there is a draft in parliament regarding the regulation of mining waste. With better regulations, things became clearer, especially in the legal arena. In the past people could bring companies to court very easily, now it has become more difficult. All in all, the general environmental regulations have improved, but still there is a stigma attached to the use of cyanide."

This stigma is one that mining companies have to address very thoroughly. "Gold mining is certainly a different type of mining: particularly due to cyanide, gold mining projects will get country-wide reactions and ministerial expectations are much higher — they will ask for specific studies, seepage models, transport models and so forth. There are two issues here. The first is to ensure that your EIA covers all of the necessary technical details; the other aspect is public relations. It should be the mining company that communicates in a meaningful manner to the affected public that they are doing all that they should," said Meryem Tekol, managing director of Golder Associates, a Canada-based company that specializes in providing environmental consultancy services. It launched its Turkish operations in 2006.

The production stage

While gold producers are gearing up to enhance their production facilities, a number of exploration companies are set to bring their plays into production.

Canadian Aldridge Minerals is developing a 24 million mt polymetallic ore field (copper, gold, silver, lead and zinc) in Yenipazar, in the western part of Anatolia. Gold equivalent mineral reserves are currently just above 3 million oz, which could potentially makes it the third largest mine in the country after Kışladağ and Çöpler. The ongoing exploration may uncover even bigger potential. "In a recent comparison of six diamond Reverse Circulaton (RC) duplicate drill hole pairs, we found that the diamond holes reported on average 49% more gold, 42% more silver, and about 10% more base metal (copper, lead and zinc). We knew that RC-drilling loses metal and tends to understate the grades, but this discrepancy came as a surprise. The resources reported so far are almost entirely based on RC drill holes, and we are now considering additional duplicate diamond holes. The so duplicated RC-holes represent 70% to 75% of the current resource, which may well be upgraded similar to the increased metal recoveries found in the six diamond/RC duplicate pairs," said Serdar Akca, Aldridge's country manager for Turkey.



Aldridge Minerals is carrying out the definitive feasibility study (DFS) at Yenipazar and plans to complete it by late November 2012. The company is also obtaining good results on the metallurgical side. "We have made progress especially on gravitationally recoverable gold, which would improve the overall gold recovery significantly when compared to the recoveries used in the still current preliminary economic assessment," said Akca. Aldridge, which has a market capitalization of $30 million, will have to invest around $200 million to fully develop the site.

As another consequence of such high gold prices, smaller-scale projects have also become economically viable. AIM-listed Ariana Resources plans to bring its Red Rabbit project into production by the end of 2012. "Our current JORC compliant resource report at the Red Rabbit project stands at approximately 448,000 oz of gold equivalent, with two key sectors under development: the high-grade Kızıltepe Sector and the heap-leachable Tavsan Sector. We are still exploring the Red Rabbit project area, and there is still potential to increase the resource base to more than 500,000 oz," said Erhan Şener, general manager of Galata Madencilik, the Turkish subsidiary of Ariana Resources.

The company will need $26 million to process 150,000 mt/y ore and reach a target yearly production of 20,000 oz over a mine life of eight years. Ariana Resources joined efforts with Turkish construction company Proccea to set up Zenit Madencilik, the joint venture that will be in charge of Red Rabbit's production. Zenit is committed to funding 30% of the $26 million investment and is already talking to financial institutions to access credit lines for the remainder. "As long as gold prices remain at their currently high levels, we do not foresee that financing the project will pose a problem at all," Şener said.

Another AIM-listed company, Stratex International, is expected to bring its Inlice and Altıntepe developments into production by 2012 and 2013, respectively. The projects have a total of 868,000 oz of JORC-compliant resources.

Untapped potential

Beyond these developments, the room for further expansion is still substantial. Turkey sits in the middle of the Tethyan Metallogenic Belt, a geological feature rich in gold and other base metals that runs from Eastern Europe to Afghanistan. "Turkey has mines and prospects in a number of geological segments; there are gold deposits from East to West. For us, Turkey is attractive because it has potential for large copper/gold deposits. At Çöpler we have reserves of 6 million oz and this will increase substantially with our next resource update. That is a world-class deposit. And it is not the only one. There are already six mines producing more than 100,000 oz/y, a couple of them are in the range of 200,000 oz/y. Right now, China is the world's largest gold producer, but big companies shun China because there are not world-class deposits there, but thousands of small mines. That is not the case for Turkey," said McKee.

According to a study published in 1977 by a well-known Turkish geologist, Ayhan Erler, Turkey has ready-to-use gold reserves of 700 mt, while exploration activities could bring to surface a further 6,500 mt. These figures are still regarded as the point of reference throughout the industry.

The number of mining companies actively exploring for gold has risen sharply, from nine to 26 within a year. Nonetheless, operators still point to the lack of an adequate investment flow.

The resumption of the license auctioning, which will initially focus on Group IV licenses (mainly concerning gold and base metals), will certainly attract more invest-

ments. Mining companies interested in Turkey's gold are following the process closely. "This marks a key opportunity to substantially increase the company's mineral exploration footprint in Western Turkey, an area which we believe holds significant exploration upside and potential for multi-million ounce discoveries," said Soner Koldas, director of Galata Madencilik, Ariana Resources' fully owned subsidiary.

"Exploration companies should not be stopping now. They should keep going and generate new ideas and projects. We ourselves are planning to expand our presence in Turkey, including by taking part in the license auctions," said Cem Yüceer, exploration manager for Chesser Resources.

Local Turkish exploration companies can leverage their knowledge both of Turkey's geological setting and of MTA past exploration results. "I worked in the MTA for 30 years. According to my previous experience, PreGold is focusing on some properties sitting mostly on mesothermal and epithermal systems," said Mehmet Kılıç, exploration and research director at PreGold.

Since exploration campaigns are costly, those who can rely on steady cash flows can make the most out of the upcoming auctions. "While Eldorado wants to develop the existing opportunities as much as possible, our exploration teams are constantly working to find new deposits. We have some good-looking prospects and we believe our growth will come through exploration," said Tüprag's Yılmaz.

Alacer Gold is drilling at Karakartal and Cevizlidere. "We are very committed to growing the Turkish business. Now that we have a production and a cash flow coming from Çöpler, we can invest more in exploration activities," said McKee.

Koza's geologists are working on the forthcoming auctions too. It is no secret that this heightened level of interest by different mining companies in the first auctioning process for many years will inflate prices and companies are already expecting to pay much higher prices than those typical some years ago.

"Under-the-pillow" reserves

Despite its recent achievements, Turkish gold mining has not been able to keep the pace of the booming internal demand for gold. According to the recent figures by the World Gold Council, the Turks' 2011 annual demand for gold has topped 140 mt, posting a 27% growth compared to 2010 figures inspired almost entirely by a doubling of the demand for gold for investment purposes (coins and bullions). Turkey is now the world's fourth gold market after India, China and the U.S.

The growing appetite for refined gold is reflected by the increasing activity of Turkish gold refineries. Just recently, two of them — Atasay and the Istanbul Gold Refinery (IGR) — have gained accreditation on the London Bullion Market Association, the most respected standard setter in the global gold market. IGR recently launched new products to encourage people to trade their gold holdings.

"Turkish consumers have historically used gold as an investment, and tend to buy gold in large quantities. Formerly, there were no products which allowed customers/private gold investors to purchase gold directly from banks. We have introduced GoldGram™ in weights ranging from 1 g to 100 g, which makes it easy for our customers to invest. The packaging on our products includes security hallmarks that allow the bank to identify the karat and to identify the gold as a deposit. People have been buying gold and saving it until the gold price increased. Istanbul Gold Refinery's gold is standard 24 karat and our customers can exchange their old jewelry for our GoldGram™," said Özcan Halaç, chairman of IGR, whose processing capacity is 1.5 mt per day of gold and 7 mt per week of silver.

The Base Metal Deficit

Turkey's production of base metals is still unable to meet the needs of the booming national economy.

Despite expanding, Turkey's base metal miners are largely unable to cope with the growing demand coming from the manufacturing sector. At the same time, most of the companies involved in base metal mining produce concentrates, if not run-of-mine products, to be exported and, once processed, to be re-imported as final metal or alloys products.

Copper is emblemathic. According to the MTA, copper domestic production covers just 20% of the internal copper needs.

Anatolia lies in the middle of the Tethyan Metallogenic Belt, its base metal potential is large and appears mostly unexploited at the current production levels.

Turkey's inability to smelt metals from concentrates prevents the country from taking advantage of its own natural resources. And plans to build new smelters are constantly put aside because of high electricity prices that make them economically unfeasible.

This creates a trade disequilibrium that will increasingly contribute to widen the already burgeoning national account deficit.

According to the estimates of Red Crescent Resources, a company involved in base metals mining, the current dynamics will bring about a fourfold increase of the metal trade deficit by 2023.

If Turkey wants to reverse this trend — analysts point at the country's current account deficit as the main weakness of the national economy — it has to capitalize on the actual metal market prices by enhancing current production and developing recent discoveries. At the same time, it has to push through plans to build up an internal refining capacity able to absorb base metals' mining production.

Copper

Copper production covers just 20% of the internal copper needs. This deficit, caused by a low overall mining production, is accompanied by a very limited processing capacity. There is just one copper smelter in the country. Most of the companies involved in base metal mining produce concentrates to be exported and, once processed, to be re-imported as final metal products.

Copper mining is mostly in the hands of Anatolian Tigers such as the Cengiz Group and the Ciner Group. The Cengiz Group took over former Eti Bank copper interests via the privatization process. Under the brand of Eti Copper it now mines some 3.6 million mt/y of pit-run copper in its Kastamonu Kure and Artvin Murgul mines. The final output of the mining operations — some 165,000 mt/y of copper concentrate — is trucked to the Samsun smelter, the only copper smelter in Turkey, which the Cengiz Group acquired again via privatization in 2004. The plant has the capacity to produce

40,000 mt/y of blister copper through a flash smelting process.

Following a similar path, the Ciner Group purchased the operating license of the copper site in Siirt/Madenköy from Eti Holding in January 2004. Park Elektrik exported 80,000 dry metric tons (dt) of copper concentrate in 2011 and aims to achieve an export volume of $120 million. In addition, there are ongoing investments to increase its processing capacity by 50% to 1.5 million dt/y of copper ore.

Within this context, Canadian Inmet appears as a rare exception of an international company developing copper mines in Turkey. The company has been operating Çayeli Bakır, Turkey's largest underground base metal mine, for almost 20 years. Production started in 1994 and the mine is projected to continue running until 2018. So far, the company has invested $327 million to extract more than 14 million mt of ore. The actual production capacity at Çayeli Bakır is 1.2 million mt/y of ore, and 2011 copper concentrate production is expected to be 28,400 mt, plus 48,000 mt of zinc concentrate at a cost of $81/mt per ore milled. Most of the production is exported, whereas spot trades with the only local smelter are carried out on occasion.

The potential for further developments is still significant. According to the MTA, Turkey's total copper reserves amount to 1.46 million mt of metal concentrate. Should low-grade resources be considered, the total reserves would increase to 3.50 million mt, with the majority located in the Black Sea region close to the Georgian border.

Inmet's Çayeli Bakır mine also produces some 48,000 mt/y of zinc. Zinc mining is among the mining interests of Dememan as well, which is targeting 2014 production of 60,000 mt/y from 16 mines in the provinces of Kayseri, Niğde and Ordu.

Interesting developments in zinc and other base metals mining are going on in south-eastern Turkey, a part of the country which has been historically shunned by locals and international companies alike because of the on-going violence in the predominantly Kurdish region. A number of courageous companies are now uncovering some of the potential of that almost-virgin land. TSX-listed Red Crescent Resources is among them. After taking over the 'Tufanbeyli asset that used to be owned by Canadian Silvermet, they brought the area into production in just 13 months. "I believe that over the next 10 years, it is going to prove to be several hundred million mt of high-grade zinc oxide and sulphite mineralized material," said Alan Clegg, founder and CEO of Red Crescent Resources.

"Today we have clearly defined potential for more than 50 million mt. It is a 30% open-pit and 70% underground mine and we are currently doing both; we also have an old underground mine that has been rehabilitated. The target for 2012 is to sell 30,000 mt of zinc contained in ore and concentrate. Our first shipment was 26.75% zinc, 4.5% lead and 4 oz/mt silver. The lower grade ore is to be processed via gravity concentration to reach about >25% zinc. The gravity machines cost an approximate $1.3 million each when deployed and generate about 10 mt per hour of concentrate. The processing cost varies but is around $35-$45 total cost embedded per mt. We also have silver and potential for other by-product materials such as barium sulphate and, potentially, tungsten," Clegg said.

Clegg, who served as a special adviser for the former Minister of Natural Resources, Hilmi Güler, has also drafted a plan to address Turkey's lack of metal production facilities. "The one solution is to fast-track the development of Turkey's abundant mineral resources to full-blown mining operations, and push them into large-scale metal production facilities. We have put forward plans for such a hub, for which the current minister and government have indicated support. There is a state strategy to create a free economic zone within which the hub would be built, alongside synthetic fuel production and other infrastructure which Turkey needs. The first metal could be produced by around 2016," Clegg said.

To those who say that electricity costs would make the plan infeasible, Clegg said "it makes sense for the government to invest in providing the facility with subsidized electricity because the overall benefits to the economy will be self-sustaining".

The overall investment would be in the order of $6 billion but, according to Clegg's estimates, if the government does not act, the metal trade deficit will grow to more than $20 billion from the $5 billion it sits at today. "The current account deficit is certainly the Achilles heel of Turkey's economy."

Free from these challenges, the Turkish steel industry has been able to catch up with the development of the local economy by doubling its crude steel capacity to 29.1 million mt over the last 10 years. This rapid development has also created room for processing metals from electric arc furnace dust (EAFD), solid waste generated during the steelmaking process in an electric arc furnace. Canadian Silvermet, for example, is

Workers at Inmet Çayeli Bakır's mine in Rize, Turkey.

recovering some 7,300 mt of zinc concentrate through EAFD. The company entered the Turkish market attempting to develop a zinc mine, but had to abandon this plan due to the effects of the global financial crisis. The set-back may well have been a blessing, as Silvermet then decided to sell the property to Red Crescent Resources to focus on EAFD recovery instead. "The raw material aspect is more dependable than mining because there is a continuous supply. Turkey is the 10th largest steel manufacturer in the world, the resource keeps growing as the Turkish steel industry continues to expand and there is no limit to the life of the resource. Existing EAFD processing capacity in Turkey is much less than the amount of EAFD being produced by steel manufacturers, so we think there is a growth opportunity for us," said Ian D. Atacan, CFO of Silvermet.

Silvermet processes EAFD to obtain zinc oxide, an intermediate zinc concentrate (70% zinc content), to be exported to smelters that then refine the product up to 99.995% zinc. Its current output of EAFD is 62,000 mt/y results in production of 16,000 mt/y zinc oxide. Since there are no zinc smelters in Turkey, Silvermet export its entire production, mostly to Belgium and Korea.

Nickel

Although it does not share the nickel reserves of countries such as Russia and Canada, Turkey is at the forefront in regards to the extraction of nickel from oxide type ores — laterites.

Up until recent years, the global supply of nickel has relied predominantly on sulphide type bodies processed through pyrometallurgical routes. The steep drop in sulphide type ore reserves is pushing the industry to develop efficient ways to process laterites, which today constitute 80% of the world's nickel reserves. Turkey's main laterite deposits — clustered in the region of Manisa and Sivrihisar — have transformed into a testing ground for nickel extraction based on high pressure acid leaching (HPAL) processes.

Ankara-based Meta Nikel was the first company to mine nickel in Turkey. Their Manisa-Gördes property has produced a total of 230,000 mt of lateric-type nickel ore from two open-pits since 2003. The company is now committed to investing up to $500 million to build up the first hydrometallurgy process plant facility in the country. The first phase consists in a $250 million investment to process 1.5 million mt/y of lateric ore and obtain nickel and cobalt


Ali Safder İplikçioğlu, general manager, Meta Nikel Kobalt.

concentrate. The concentrate (MHP) will be equivalent to 10,000 mtpa nickel metal and 750 mt/y cobalt metal. This phase is to be completed by the end of 2013, when the plant is expected to start commercial production. Then, Meta will invest another $250 million to expand the production capacity to 3 million mt/y of lateric ore. At that point, the MHP will be equivalent to 20,000 mt/y nickel metal and 1,500 mt/y cobalt metal, resulting in a yearly turnover of approximately $400 million, at current nickel prices. "Meta will use HPAL technology at Gördes," said Ali Safder İplikçioğlu, general manager of Meta Nikel Kobalt. "Before deciding on the technology, Meta carried out an extensive laboratory testing program and economical analyses on the available technologies, namely, heap leaching, tank leaching and HPAL. As a result, HPAL technology was selected mainly due to its low environmental effects (it is a controlled process within a closed circuit), high metal recovery level and its low operational cost (due in part to its low sulphuric acid consumption). The selected method was tested in pilot scale in Australia and Canada to guarantee that this is the safest technology to use for Gördes ore, especially from an environmental point of view."

The technology is currently used by a number of countries including Australia, Canada, U.S. and China, although Gördes will be the first project to use HPAL technology in Europe.

A few kilometers away from Gördes, AIM-listed ENK unsuccessfully tried to develop another promising laterite deposits at Caldag. The company had originally planned to invest almost $300 million to produce 20,000 mt/y of nickel. Should the plan have been carried out, it would have been the first commercial nickel laterite heap leach operation in the world. However, the company's plans were delayed by the financial crisis in 2008. When it managed to find the necessary capital from Chinese partners by accepting higher financial costs that raised the overall cost of the development to $428 million, its forestry permits were challenged by the authorities. The company tried in vain to have the permits reinstituted, and the management finally decided to sell the property for $40 million to Turkish OreMine to focus on another development in the Philippines. "After years of uncertainties, ENK realized it did not want to deal with the Caldag project any more," said Cevat Er, general manager of Sardes, the former ENK's local subsidiary that has now been sold to OreMine. "This is because ENK is a small company. If a company like ENK starts operating, it can not run the risk of having operations suspended for any regulatory issue because this would bankrupt the company. They felt that operating in Turkey would not have been easy and they did not wanto to take the risk."


A panoramic view of Meta Nikel Kobalt's mine site.


Birol Kaya, director general, Fe-Ni Mining.

Aside from multiple projects to construct process plant facilities, there are already several local companies producing nickel ore to be exported. Some are focusing on the quality of their processes to improve the success-rate of their ventures.

"We have constituted a research and development department as well as a foreign affairs department in order to apply modern exploration and production techniques and marketing processes," said Birol Kaya, director general of Fe-Ni Mining. "Within this framework, project-based studies have been implemented by the geological and mining engineering departments of Hacettepe University-Ankara, Ankara University and Dokuz Eylül University-İzmir."

Fe-Ni Mining has properties in the Karaçam-Eskisehir area and the company is carrying out exploration activities to find new untapped reserves. "Up to now, on the basis of geological and analytical data collected from both licensed areas, total reserves are estimated at 6 million wet metric tons (wmt)," said Kaya.

Chrome

Chrome ore mining in Turkey dates back to 1850. Since then, the country has established itself as one of the world's most established high-quality chrome ore producers (Cr_2O_3 44/48% content). Despite a consistent residual potential, according to the MTA, chrome ore reserves with more than 20% Cr_2O_3 are about 26.5 million mt, after years of exploitation head grades are inevitably decreasing; in some cases to the extent that past waste materials are now being treated as precious ore. "We started mining in 1947 and we have accumulated a lot of tailings since then. Over the years head grades in the mines have decreased, but when we checked our tailings we realized many have higher grades then our current head grades. Meanwhile, prices have gone up and technology has improved. If

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Tel: +90 312 583 78 78 • Fax: +90 312 583 78 79
www.metanikel.com.tr

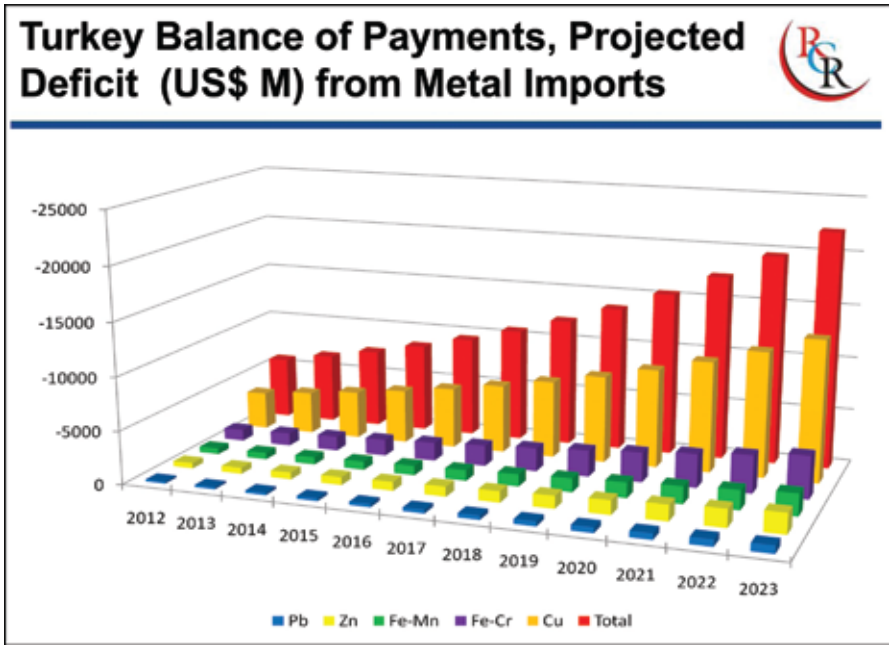
in the past it was not feasible to produce chrome with a grade of less than 45%, now we can earn a good profit with 6.5% run-of-mine ore," said Murat Eroğlu, deputy chairman of Dedeman Mining, one of the oldest private mining company in Turkey.

Overall, Turkey produces more than 6.5 million mt/y of chrome ore, a level second only to mining powerhouses such as South Africa, Kazakhstan and India. Part of that production is absorbed by local ferrochrome plants. Turkey has two ferrochrome and one chrome chemical plants and their annual ore need is about 530,000 mt/y, just a fourth of the country's production, the rest is sold abroad. Chinese ferrochrome smelters are by far the largest recipients of Turkish chrome ore, followed by Russia and India. In 2010 alone, export values for chrome topped $471 million.

Reserves are mainly clustered in six different regions: the Guleman region (Elazığ, in eastern Turkey), which still holds the most important deposits in the country, the Kopdağ region (Erzincan-Erzurum, also in eastern Turkey), the Fethiye-Köyceğiz-Denizli region in South-West Turkey) the Bursa-Kütahya-Eskişehir region in North-West Turkey, the Mersin-Aladağ-Pınarbaşı region in the South and the İskenderun-K. Maraş region (Southern Turkey). In addition, there are several low grade chromite deposits, the most important of which is located in the Aladağ region (near Adana, in the South) where there are 200 million mt of 5.42% chromite.

Alongside iron ore, chrome ore is used to produce ferrochrome that will ultimately end up in stainless steel furnaces. Accordingly, its price reflects the development of the steel industry. Despite the steady recovery posted in 2010, the outlook for the steel market still hangs in the balance. With the outcome of the European and American sovereign debt crisis still uncertain, Chinese ferrochrome producers, the world's largest buyers of chrome ore, are hesitant. Their uncertainty inevitably affects the whole sector's value chain, with chrome ore prices currently suffering from a downward trend. Prices for Turkish chrome concentrate (Cr_2O_3 44/48%) and lumpy chrome ore (Cr_2O_3 40/42%) are around $300/mt and $280/mt respectively. These prices are a far cry from recent peaks, but remain at very high levels compared to historical averages and are still able to offer interesting profit margins.

Eti Bakır Murgul copper mine is owned by Cengiz Insaat using ROC L8 drill rigs at their open-pit copper mine. They are drilling with Atlas Copco Down the hole hammer 165 mm.



As a consequence of historically high prices, Turkish chrome ore miners are expressing interest in low-grade deposits and are investing to expand their mining and processing capacity. Dedeman Mining, one of the top three Turkish chromite producers, is about to carry out a two-step investment in the Adana province, where the company has measured and indicated resources of more than 20 million mt.

The project consists of two gravity separation facilities able to produce 150,000 mt/y of chromite concentrate. "Taking our other chrome ore mines into account, we expect to increase our chrome concentrate and lumpy production to more than 400,000 mt/y chrome by mid-2014. We are planning to invest $60 million in each plant," said Dedeman's Eroğlu.

As the scale of mining operations expands and head grades shrink, technology and processes must be updated. "Chromite is picking up considerably because mining grades as low as Cr_2O_3 5% have become economically feasible. Recovery rates are still increasing, while operation costs go down. We are now processing Cr_2O_3 5% chromium, but there is some room left for further developments: we can go down to carbon values as low as 3% or 4%," said Dama Engineering's Karahan.

Dama has been among the first to put in place gravity separators able to recover fine chromium from extremely low-grade ores.

The opportunities offered by the chrome ore market have also attracted a plethora of smaller local producers and traders that mine chrome ore outcrops to sell them to Chinese ferrochrome producers. They started proliferating from 2005 onwards and those who survived the global financial crisis are recovering quickly from the slump in demand. Companies such as AKM Madencilik are growing quickly on the back of Chinese furnaces.

"We have two mines where we produce approximately 18,000 mt of lumpy chrome ore per month. At the beginning of 2011, AKM started producing iron ore from two other mines and the output there is around 53,000 mt per month, plus another 30,000 mt that will be added by December 2011. Overall, our actual turnover is $12.5 million and we are planning to be publicly listed on the Istanbul Stock Exchange in a foreseeable future," said Kadir Gültekin, CEO of AKM Madencilik, a start-up producer launched in 2010.

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Coal for Energy Independence

Turkey's government is increasingly engaging with the private sector to get the most out of national coal reserves, with the aim of addressing its dependency on imported energy.

Over two thirds (72%) of Turkey's 2010 total primary energy supply came from overseas. Hard coal imports serving the needs of thermal power plants, steel production, and industrial and domestic heating purposes amounted to 26.9 million mt/y, while only 38% of Turkey's coal reserves were used for energy generation. This resulted in a $50 billion annual energy bill, a sum that alone makes up for two thirds of the current account deficit. What's more, the government expects the country's energy needs to double over the next decade.

Within this scenario, Turkey's Energy Market Regulatory Agency (EPDK) drew up a 20-year investment plan to increase Turkey's energy independence. "Within fossil fuel-based power generation, 25,000 MW in additional capacity is needed for the next 20 years. If we choose to build new fossil fuel plants, Turkey will spend nearly $225 billion on them over the next 20 years," said EPDK president Hasan Köktaş in an interview with *Today's Zaman* last October.

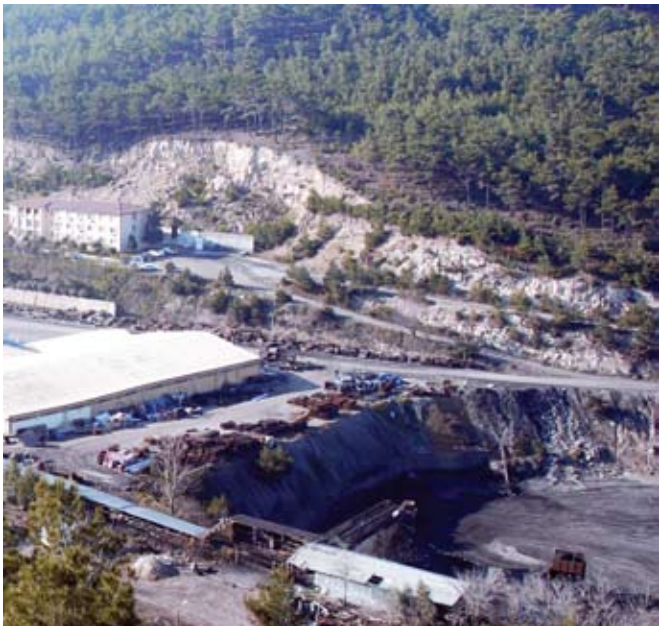
As Turkey's indigenous energy resources consist almost exclusively of lignite and a small amount of hard coal, coal mining will be a natural recipient of these investments. According to Eurocoal, the European Association for Coal and Lignite, the country has around 1.3 billion mt of hard coal and 11.5 billion mt of lignite resources, of which 500 million mt and 9.8 billion mt respectively are proven reserves. The MTA started new exploration campaigns in 2005 to identify untapped coal deposits. So far, it has drilled 65,000 m, succeeding in adding 4 billion mt to the country's total lignite reserves. The project is still ongoing.

Lignite deposits are widespread throughout Turkey, with the Afsin-Elbistan lignite basin of south-eastern Anatolia, near the city of Maraš, and the Soma basin in western Anatolia being the most important geological formations. The quality of Turkish lignite is generally poor and only around 6% of the reserves have a heat content of more than 3,000 kcal/kg. Turkey's main hard coal deposits are located in the Zonguldak basin, between Eregli and Amasra on the Black Sea coast in north-western Turkey.

Coal production has increased by approximately 10 million mt in the last 10 years and reached 71.8 million mt/y in 2010. Almost all of the coal produced is lignite while hard coal's share makes up only 3.9% of the total. Despite long-standing efforts to open up the sector to private capital, three state-owned enterprises were directly responsible for more than 90% of total 2010 coal production: Turkish Coal Enterprises (TKI), Electricity Generation Company (EÜAŞ) and Turkish Hard Coal Enterprises (TTK).

However, as 35% of the three state companies' output comes through private subcontractors, a number of private companies also have a long-standing experience in coal mining. These ventures are now trying to leverage their know-how by grabbing the new opportunities Ankara is giving to the private sector to boost both hard coal and lignite production.

The Koç group's Demir Export has won the tender to develop a large coal basin in the Soma region. It concerns a potential production of 2.5 million mt/y of coal over a projected 18-year lifetime. The company has gained over 20 years of experience at the Sivas Kangal coal mine whose 6 million mt/y production served to meet the needs of the state-run, 457 MW Kangal thermal power plant. Concessions for a $1 billion project have also recently been granted to



Soma Group's Eynez coal mine.

Polat Kömür's CEO Muzzafer at the signing ceremony with Zhejiang Minerals, their Chinese partner.

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Alp Gürkan, chairman of the executive board, Soma Group

Polat Kömür. It involves the development of 2,000 hectares area in the Soma basin and the construction of a 650 MW power plant. The company, which has been active in coal mining for more than 27 years, has uncovered reserves for 100 million mt in the licensed area and, as drilling progresses, hopes to raise that figure to 200 million mt.

To carry out the project, Polat plans to join efforts with Zhejiang Energy, a Chinese state-owned power enterprise originally based in Zhejiang Province's Hangzhou City. "We thought it would have been an ideal solution to cooperate with a mining and energy company coming from China, a country that relies on the best underground mining technologies in the world. As our partner, Zhejiang Energy will provide the project with the financing, the technology and the general management regime. We plan to finalize the partnership in the next six months, to mine coal in three years and to start producing energy within five years," said Muzaffer Polat, chairman of Polat Kömür. Polat is targeting 3 million mt/y production. According to Polat, the quality of the lignite after enrichment will be of 5,000 kcal/kg.

Concessions have been granted to private enterprises also in the field of hard coal mining. Although rare, hard coal is not absent from Turkey. Most of it is located in the north-western province of Zonguldak, where coal mining dates back to 1850 and where the country's first mining school was opened in 1936. The calorific value of hard coal reserves varies between 6,200 and 7,200 kcal/kg. TTK operates five deep mines there and so far has accounted for Turkey's entire current hard coal production (2.8 million t/y).

Private companies will soon add their contribution. "The Zonguldak area contains more than 1 billion mt of thermal and coking coal resources, but it's been historically difficult to extract. The area has been mined since 1850, but the difficult conditions have prevented extraction on a massive scale. TTK realised it could not work economically in its current scale and passed on some of its concessions to the private sector through tenders," said Alp Gürkan, chairman of the executive board of the Soma Group, a company that has been running an underground mine in the Soma area since the 1980s.

The Soma Group has just been awarded the right to develop an underground mine which holds 90 million mt of coking coal in Zonguldak. The total investment will be on the order of $200 million and the pit is expected to be operational in six years. Once fully developed, the mine will produce 2 million mt/y. The development will happen at a depth ranging from 400 m to 1,000 m. Soma is now looking at continental Europe to import the expertise needed to handle the entire process. "Coal mining has gone deeper everywhere. Equipment and expertise have already been developed in countries such as Germany, Poland and the U.K., and Turkey will be the next market for its use," said Yücel Piçakci, Turkey's project manager for DMT, a German engineering and consulting company.

Private capital has the potential to dramatically upgrade Turkish coal production. The Ciner Group has pioneered the presence of private companies in coal mining and related energy production. Following a privatization process in 1999, Park Termik, a subsidiary of the Ciner Group, took over a fully integrated coal-to-electricity project in Çayırhan, where it operates a 310 MW thermal power plant supplied with coal coming from a contiguous underground mine. The company has succeeded in steeply increasing the output of the mine as well as the efficiency of the plant. According to the company, the Çayırhan thermal power plant has increased its capacity use ratio from 48% to 81% and the daily production capacity of the coal mine has jumped from 500 mt to 7,000 mt.

Recently, Tamer Yıldız, the Minister for Energy and Natural Resources, reiterated the government's commitment to increase the role of domestic coal in the national energy mix by giving away concessions to the private sector. Last November, Yıldız announced a new round of privatizations concerning 2.8 billion mt of lignite reserves in three regions in 2012, which will support 7,000 MW of new installed capacity. Private capital is set to have a larger role in the quest to limit Turkey's dependency on energy imports.

Industrial Minerals: The Boron Country

Turkey has a large variety of industrial minerals that can either feed local manufacturers or be exported.

Boron, a substance used mostly in the glass and detergent industry, is Turkey's most significant industrial mineral. About 72% of the world's Boron reserves are located in Turkey. Such a wealth guarantees an increasing flow of exports that, to some extent, help counterbalance Turkey's trade deficit. This adds strategic value to boron reserves and helps explain why Ankara has not allowed boron production to undergo a privatization process alongside those of other minerals. Feldspar, quartz and other minerals are also widespread throughout the country, but are widely exploited by public as well as private sector companies.

For the time being, Eti Maden, the still-state controlled Eti Bank company, controls the entire boron value chain, including production, processing and marketing. The state-owned company went through a deep restructuring after the liberalization of the 1990s and has focused solely on boron since 2004. The new arrangement has paid off — fostering an increase in boron's exports to $900 million in 2011, compared to just $200 million in 2000. "We have increased our production capacity five-fold: we are actually refining two million mt/y of borates, whereas in 2002 we didn't go beyond 400,000 mt/y," said Orhan Yılmaz, chairman and general manager of Eti Maden.

Boron production is carried out at four mines and four associated processing plants which produce three different borate minerals: colemanite, ulexite and tincal. Despite its recent growth, Eti Maden's ambitions are far from being fulfilled. The company is working on a $600 million investment plan that should raise its production of refined products to 5.5 million mt/y by 2023. Alongside the efforts of Eti Maden to increase its production capacity, the government also established the National Boron Research Institute to widen the range of application for boron's chemical derivatives. "We want to increase boron's consumption in different areas," said Sufyan Emiroğlu, chairman of the board at the National Boron Research Institute. The range of boron's potential applications is wide and ranges from batteries for electric vehicles to superconductors. One of the new applications researchers are working on concerns the involvement of boron in next-generation green cars. Recently, the National Boron Research Institute tested the first car to runs on a sodium borohydride fuel cell. The fuel cell consumes nearly 1 kilogram of borohydride per 35 km and the vehicle can cover 100 km at a maximum speed of 80 km/h.

Within the wide spectrum of industrial minerals, Turkey's production of soda ash also stands out. Eti Maden has joined efforts with the Ciner Group to mine trona — natural soda ash — at Beypazarı, 100 km North-West of Ankara. Beypazarı's trona bed contains the largest reserve in the world, along with the reserves in Kazan (Ankara) and following the reserves located in Wyoming. Following a $375 million investment, Eti Soda (a joint venture with 75% from the Ciner Group and 25% from Eti Maden) started operations at Beypazarı in 2009. The company produces 1 million mt/y of soda ash and 200,0000 mt/y of sodium bicarbonate through solution mining and is undertaking research to increase the overall capacity of the site by 50%. In addition, the Ciner Group has also taken over another trona deposit in the Ankara vicinity which Rio Tinto had been unsuccessfully trying to develop for several years. "The annual capacity in that project will be 2.5 million mt/y. It will be another solution mine. We are undergoing the feasibility study and the design of the processing plant. We are also considering attaching a 400 MW gas-fired power plant to the mine," said Sami Demirbilek, president of the Energy division of the Ciner Group.

Eti Soda has to compete with another Turkish producer, Soda Sanayi, which produces 1.8 million mt of soda products through a typical ammonia-soda process — the Solvay process — and whose sole inputs are limestone and salt brine.

An Increasingly Solid Supplier Base

Growing mining exploration activities and operations have created the need for an equally vibrant service and equipment supplier base.

As little as 10 years ago it was difficult to find drilling contractors and equipment suppliers in Turkey. Today, the situation has changed dramatically as both local suppliers and traders have been gradually closing the gap. The supply of rigs and drilling services has quickly increased, and engineering companies, consultants and software houses are supporting a general upgrade of mining operations throughout the country.

Drilling is going deeper

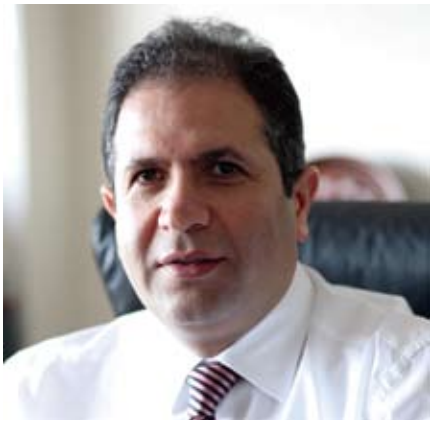
To uncover Turkey's mineral potential, exploration activities have to drill deeper underground. "In Turkey, most of the mine exploration facilities have been sustained in shallow environments (near 200-300 m).

For this reason, Turkey is an undiscovered country and there is potential for the discovery of a wide range of economic mineral deposits.

Apart from some underground coal mines, there are just two main large-scale underground operations in Turkey; Inmet's Çayeli Bakır and Eldorado's Kışladağ. As surface deposits are gradually being depleted, mining companies are well aware of the need for deeper and more comprehensive drilling campaigns.

As drilling goes deeper, new challenges emerge. "From a drilling perspective, Turkey's geology is very complex because of the main fault areas in the eastern and northern parts of the country. Drillers often have to case the holes to protect them," said Ahmet Zeki Topdemir, general manager of Ortadoğu Sondaj, one of the largest drilling contractors in Turkey with 30 rigs.

This all leads to an increasing need for deploying better technologies on the ground. "We delivered more than 50 Boart Longyear core drill rigs to our customers in the last decade. Eleven of these have been delivered in 2011. In Turkey, there are around 300 actively working drill rigs in total and around 180-200 of these are old, locally manufactured and of a low capacity. Boart Longyear drilling equipment has been used with almost all other rigs for many years," said Bülent Şahhüseyinoğlu, general manager of Mapek, Boart Longyear exclusive distributor for Turkey.



Bülent Şahhüseyinoğlu, general manager, Mapek.

Mapek has also sold two Boart Longyear LS-230s, the most powerful drilling rig currently available on the Turkish market, with a capacity of going as deep as 2,300 m.

To better serve a more sophisticated and booming demand for drilling services, the largest local contractors have put to work the expertise gathered over the last decade to establish in-house manufacturing of drilling rigs. According to Levent Okay, president and CEO of Spektra Jeotek, an established contractor active in Turkish mining, civil engineering and water well sector since 1985, in-house production "is an immense advantage and a major cost controller and quality booster. It allows unlimited and immediate access to the required hardware."

Spektra's Delta Makina manufactures three models of core-drilling rigs and two reverse circulation drilling rigs at a maximum pace of 14 rigs per month. In 2011, it produced 35 rigs for the market and 27 for the needs of Spektra itself. Ortadoğu Sondaj has also established its own production facility in 2010, Geo Makine, whose production capacity is currently at three rigs a month.

Other contractors are focusing on adapting imported technologies to the Turkish setting. “We are thinking of rigs that can do the job almost by themselves – lowering and pulling the string by themselves for instance. We are trying to modify the rigs in our workshop to make them more automated. If the potential limits of the rigs itself are not enough, then we are developing better supporting tools and vehicles. After almost 20 years at this job, we are still learning new things each day to improve ourselves. We have brilliant innovations to bring drilling life,” said Murat As, general director of IDC, a drilling contractor with a total of eight rigs that can perform both diamond and reverse circulation drilling.

Deeper drilling operations also require accurate data management in order to best assess the results of the on-going operations. From this perspective, the Turkish mining industry is still going through a learning process. “Turkish companies lack the skills required to accurately evaluate their data and general data management. The same areas are drilled several times because the data is lost or misinterpreted, leading to significant losses in money and time. Some companies have lost their samples or make mistakes while analyzing data, which is something that needs to be improved. Installing newer software for data evaluation and management can support company’s efforts to drill deeper,” said Esin Şişman, Turkey’s country manager for Maxwell Geoservices, an Australian producer of software for the mining industry.

When it comes to deeper operations, more investment in health and safety is needed and distributors such as PenaMaden are catching up with this growing demand for HSE solutions. Alongside ventilation and measurement systems, PenaMaden has just closed a deal to distribute the first refugee chambers available in Turkey. “Mining is going deeper and HSE safety standards are increasing day-by-day. HSE solutions will experience a growing market in Turkey,” said Togan Yürür, general manager of PenaMaden.

While drilling campaigns continue to evolve, the post-global financial crisis commodity price bonanza, now partially reversed, has increased the pace and the scale of surface mining operations. Operations that, a few years ago, would have proved to be economically infeasible are now largely profitable. “Back in 2001, gold was selling at $300/oz and mining operations at Ovacık focused only on high grade ores of at least 10 g/mt. Now, the

ounce of gold is selling for $1,700 and we are using ores with grades of only 3 g/mt," said Ismet Sivrioğlu, general manager of Koza Gold.

Mining lower-grade ores means increasing the scale of mining operations as well, with more tonnage to be mined, transported, and processed. This all requires a resizing of processes and equipments. However, it is not just a matter of size: the quality of mining operations must be improved as well, as the opportunity cost of putting them on hold for technical faults is particularly high these days.

Local suppliers and importers of equipment are increasingly aware of these dynamics. "We are working against time. Companies need to mine as much ore as they can now that prices are that high because, in the event of a cooling of the commodity cycle, their operations may suddenly become infeasible," said Vedat Kirişçi, managing director of Metrans, a distributor of industrial pumps and valves to the mining industry and other industrial sectors.

Accordingly, companies are putting more effort into tackling the current needs of mining companies operating in Turkey. "Lower-grade ore companies need bigger and more sophisticated equipment," said Erdem Tüzünalp, general manger for Atlas Copco's mining business in Turkey.

"They are looking to put in place less problematic operations because right now the pricing on the market is good. In the past, mining companies were operating with used, small and cheap equipment, while now they are definitely focusing on bigger and better products," said Can Özdemir, general manager of Dizel Turbo, a local distributor of Astec Industries' processing equipments.

Workers operating the drilling rig. Photo courtesy of Spektra.

Closing the Investment Gap

Despite its potential, the stream of funds channelled towards the Turkish mining industry remains weak.

The unavailability of capital is due to several factors. The Turkish private mining sector has been developing only recently — the first mining code was approved in 1986, with following reforms in 2004 and 2010 — and the industry is still in its youth with a very low level of financialization. Mining companies struggle to access credit lines because they are unable to transfer the value of their reserves to their balance sheets. Unused to the mining industry, Turkish Banks cannot get a clear picture of the risk involved in any operation and end up avoiding them altogether. "The concept of international reporting systems such as the 43-101 is only starting to be understood by local Turkish companies. Companies are now looking for investment from banks and financial institutions. As a result they are increasingly confronted with specific terminology on reports and bankable feasibility studies and there is an accompanying greater need to service the development of projects for them to obtain the necessary financing. Also, the concept of qualified (QP) and certified (CP) personnel is not yet available in Turkey and, since there are only four or five CP or QPs in the whole country who have the authority to sign international or bankable geological reports, it is necessary to go overseas to get these services," said SRK's Arpacıoğlu.

Among the top Turkish banks, the most active in the mining sector is YapıKredi, with an overall exposure to the mining sector of TRL 2.26 billion (7.47% of the total cash loans, 4.12% of the total non-cash loans). For most of the other big players, such as Iş Bank, Garanti Bank and AK Bank, the mining sector attracts less than 1% of their loans and important recent projects such as the Çöpler gold mine developed by Alacer Gold obtained their financing from foreign banks (in Alacer's case, Unicredit via Bayerische Hypo– und Vereinsbank).

The most common way for smaller mining ventures to get financed is to go through a public listing on the stock market. Companies such as Chesser, Ariana and Red Crescent Resources have raised capital on foreign stock exchanges — Sydney, London and Toronto, respectively — to come and carry out exploration activities in Turkey. In this perspective, the Istanbul Stock Exchange (ISX) still has a long way to go. To get an IPO approved on the ISX companies have to show steady cash flows, something that prevents any exploration company from approaching the market. To some extent, this is preventing the sector from increasing its standards. "A weakness of the Turkish mining sector is that there are very few companies listed in the national stock exchange. Most of the mining companies in Canada and Australia are listed and this forces them to be as transparent as possible. This has not yet happened in Turkey," said Savaş Şahin, assistant general manager at Demir Export.

A reform to make it easier for small caps to enter the ISX is on its way and life for local explorers looking for capital may become easier in the coming years if this proves to be the case.

With the traditional sources of investment for mining running dry in Turkey, equipment suppliers are adapting their commercial offer to the needs of cash-strapped players. "The biggest problem for my customers is to build up the financial capability to carry our investments in our equipments. Historically, the lack of financial capital has always characterized the Turkish economy. Mining companies struggle to put long-term investments in the pipeline because they have limited access to credit lines and other sources of credit. This is why our biggest job is to find financing solutions for them and within this context we started to introduce equipment rental solutions in Turkey. But this is still not enough to cover the demand and we are studying further solutions. If only the sector had the financial resources it needs, the equipment fleet would double straight away," said Cihan Ünlü, marketing and sales manager of Temsa Global, one of the world's largest independent distributors for Komatsu equipment.

Others, like Atlas Copco, are directly providing their clients with the credit they need to build or upgrade their equipment. "We can supply our clients with the credit for their operations through our internal bank. Most of our smaller clients do not have the opportunity to access banking credit. Therefore they are being financed by us instead," said Atlas Copco's Tüzünalp.

Another alternative source of capital comes from the Anatolian Tigers active in the sector. Most of them have been actively involved in the construction sector for decades and have piled up large amounts of cash on the back of booming domestic and international developments. "They have cash, but lack the know-how needed to carry out mining operations. A lot of them are ready to invest alongside foreign companies that can provide them with the know-how which they lack," said Baran Umut Baycan, founding partner at the Baycan Law Firm, specializing in mining legislation.

These major international players can also turn to the local market to get the expertise they need, fostering in this way the development of local engineering companies such as Dama Engineering and the Engineering and Mining Consultancy (EMC).

The presence of some vast and sophisticated conglomerates will likely help take the sector to the next level. "Large Turkish groups are making big investments in the Turkish mining industry. This is creating the environment where there will be a proper finance solution for the sector and financial corporations are looking at it closely," said Hakan Kayganacı, managing director of Risk Management Practice at Marsh Turkey. The insurance industry is no exception to this. Marsh itself has just established a dedicated team in Turkey to serve the mining industry with risk management solutions. For the time being, apart from quarrying, insurance solutions for the mining industry in Turkey are still not available on the market, due to the international perception of high Turkish risk. However, as the mining sector and its legal framework develops, companies such as Marsh are confident that risk management practices will become more sophisticated and commonplace. "Should more structured project financing processes be in place, we would have a better case for a demand of insurance solutions," said Kayganacı.

In regards to the market risk, financial institutions such as DenizBank and IşBank can carry out hedging strategies on the London Metals Exchange (LME) on behalf of their clients. For small, dynamics mining companies whose fortunes are not rooted in a construction or financial empire but who can rely on internal trading expertise, they must constantly depend on a hedging strategy. "Back in 2008, we saw the global financial crisis coming and we completely shut down operations for more than a year. Now we have reopened the mine but continue hedging our position day-by-day," said Benjamen Pinto, general manager at Turmenka, a mining company that produces around 7,000 mt/y of concentrates (zinc, lead and copper) in the Black Sea region.

Going abroad

Turkish miners are not only interested in reserves at home. Following the steps of Turkish construction companies, and the making the most of Turkey's increasing political and commercial influence, Turkish companies are expanding operations overseas, in places such as the Balkans, the Middle East, the so-called Turkish republics (Azerbaijan, Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan) and Africa. But, again, those who managed to secure licenses abroad are on the look-out for capital to follow through with their plans. "The project needs a lot of capital and we are only at the very beginning and looking for partners to develop it," said Eyup Akdağ, co-chairman of the Akdağlar Group, an Istanbul-based conglomerate that has just won a tender to develop the largest nickel deposit in Albania through its subsidiary, North Star Mining.

In their push to grow abroad, some company's can leverage off the experience they gathered in the recent development of the Turkish mining industry. "Given Spektra's experience in the Turkish market and given the complexity of geology and terrain within our national frontiers, we have been able to branch out and penetrate into the international marketplace with a good level of confidence and comfort. Our vision is to be one of the reputable international players in this line of industry within the foreseeable future and we have the energy, determination, know-how and resources to do so. We are planning to operate in more than five continents within the next five years", said Spektra Jeotek's Okay.

Spektra has grown its fleet to 90 rigs, a threefold growth compared to 2008, and it is now active in eight African countries, in the Middle East, and has just established a subsidiary in Canada "where we are planning to start operations in a few months and where we are looking for opportunities to acquire existing companies to increase our presence faster."

Turkish construction companies are also creating opportunities abroad for companies active in the mining sector. "We carried out

the major part of the design and engineering scope of an approximately 230 km long slurry pipeline, in Morocco. Our client in this project is a leading Turkish construction company who was awarded the EPC contract by the Moroccan state-owned organization which accounts for 30% of the world's phosphate production," said Zafer Toper, CEO of Afrasia, a local consulting company.

Many others are focusing on the Balkans. Following the collapse of Yugoslavia, its mines have been underexploited, if not abandoned, for years — sometimes leading to severe environmental impacts. The ongoing stabilization of the region is now paving the way for a rebirth of the local mining industry.

With deposits for some 6 million mt of chrome and copper ore, Albania is proving to be a favourite among Turkish explorers. Ekin Maden has strengthened its presence in the country by signing an agreement with Canadian Tirex to commence commercial production of copper and gold from six areas of the Mirdita District. The resulting 50:50 joint venture is gearing up to reach a processing capacity of 2,000 mt of ore per day. Tete Mining, which has been mining in Albanian Muenella copper project since the early 2000s, is developing the Spac copper project alongside plans to open a new chromite mine. Meanwhile, the Akdağlar Group has just won a tender to develop the largest nickel deposit in the country through its subsidiary, North Star Mining. "The project needs a lot of capital and we are only at the very beginning and looking for partners to develop it. The mine has a production history but they were closed during the political conversion of Albania and now we have won the tender for the property," said Eyup Akdağ , co-chairman of the Akdağlar Group.

Kosovo is the hottest play in the region. Novo Brdo's mines have been renowned for centuries. In the words of Konstantin the Philosopher, a famous Byzantine historian, this town was "in truth, a city of silver and gold." Kosovo can still boast 50% of the former Yugoslavia's nickel reserves, 48% of its zinc and lead, 47% of all magnesium, and 36% of the country's lignite. Kosovo is also rich in asbestos, bauxite, chrome, limestone, marble, and quartz. According to International Council on Mining and Metals, the "small territory (is) home to one of Europe's most concentrated and potentially most lucrative mining sectors. With upwards of 14.7 million mt of exploitable reserves, Kosovo is host to the fifth largest accumulation of lignite coal on the planet."

Turkish companies are working to get their share of the cake. Two of the country's largest conglomerates, the Ciner Group and the Koç Group, are bidding for a couple of coal-fired power plant projects. The winner will be assigned the mining rights to 330 million mt of lignite from the Sibovc South area. Both groups have a mining subsidiary operating in coal mining at home: Ciner's Park Mining and Koç's Demir Export.

Tete Mining is also looking for new opportunities in the area. "We want to strengthen our projects, especially in Kosovo," the company said in a press release. Turkey is already Kosovo's fourth largest trading partner with $284 million in trade volume. Its strategic importance is being underlined by Turkish efforts to have the country's independence recognized on an international stage, when 85 states have yet to do so. Beyond Albanian and Kosovarian borders, the Balkans' mineral wealth is scattered over the entire region. The region is home to some of the largest mineral deposits left in Europe, including the Bor district in Serbia, with resources of 12 million mt of copper and 13 million oz of gold, the Panagyurishte district of Bulgaria with 5 million mt of copper and 7 million oz of gold, and a tertiary belt through Serbia, Macedonia and Greece which contains several major deposits including Trepcha and Sasa.

Turkish mining companies are also turning their eyes to the East. For historical and cultural reasons, the so-called Turkic republics are a natural recipient of Turkish investment. Construction companies pioneered the presence of Turkish companies in the region, and now mining companies are following suit. Many are also looking at Iran and its natural resources, but for the time being the country risk is too high for any sort of foreign investment in any industry. Opportunities are interesting only for service suppliers based in Turkey. "Most of the countries East and South-East of Turkey prefer to buy equipment via Turkey rather than in far-away markets. Here they can find a reliable banking system and good after sales support," said Dizel Turbo's Özdemir. The MTA signed cooperation agreements in resource-rich countries such as Uzbekistan, Turkmenistan, Tajikistan, Georgia, South Korea, Argentina and Indonesia. Turkish geologists are on the lookout for new opportunities. Whenever they find them, Turkish companies will follow.

For additional and up-to-date information on the Turkish Mining Industry, visit Turkey's monthly magazine at www.madencilik-turkiye.com

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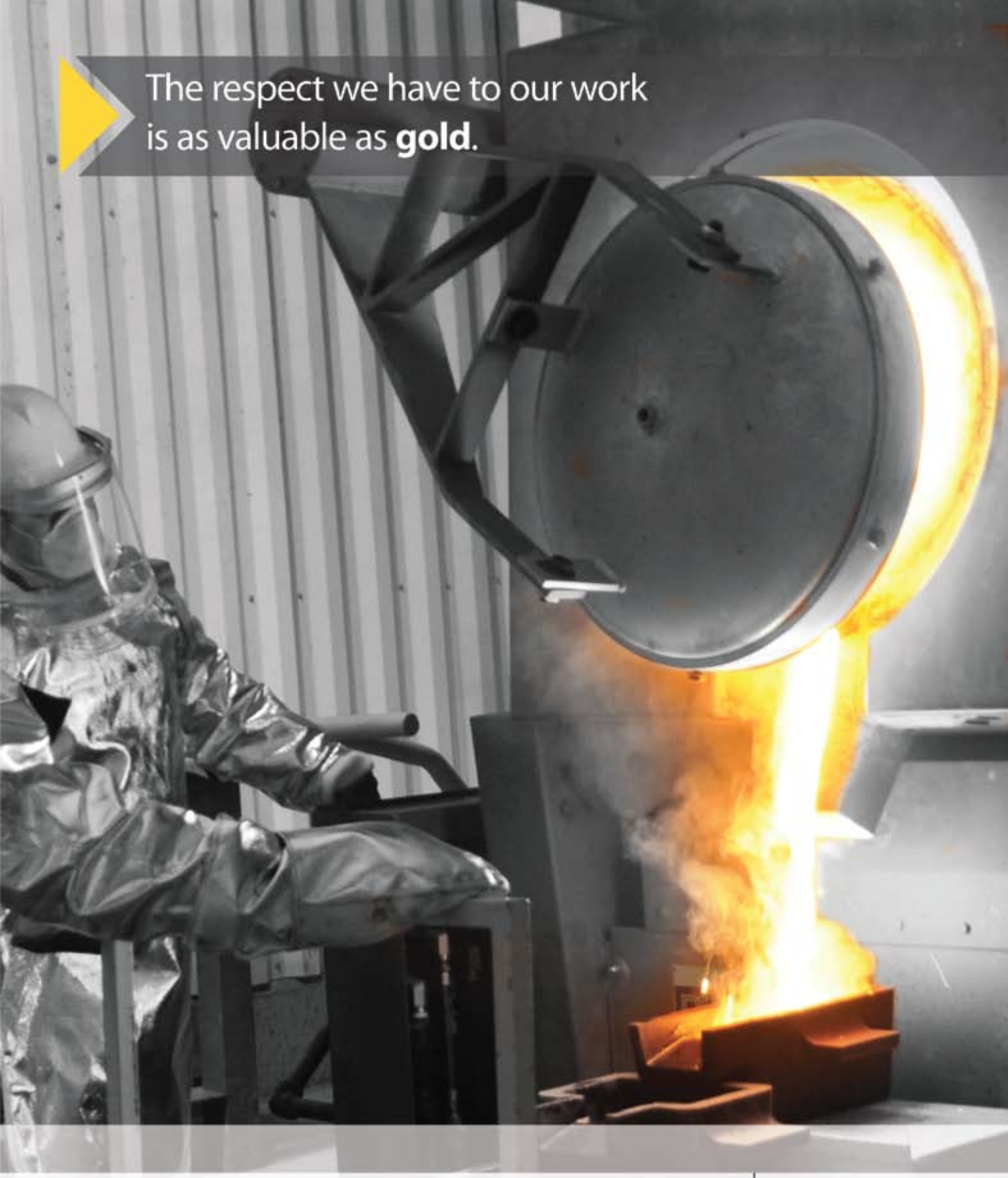

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Anagold Madencilik San. ve Tic. A.Ş.
Aşağı Öveçler 8. Cd. 1332. Sk.
No: 8/8 06460, Dikmen
Çankaya / Ankara / TÜRKİYE

T:+90.312 **472 80 51** (pbx)
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