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Mongolia Report

(FOUO 2/81)

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CONTENTS

Fifty Years of MPR Foreign Trade Reviewed (Yendongiyn Ochir; EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV, No 1, 1981).....	1
Achievements of National Economy of MPR Outlined (VESTNIK STATISTIKI, Jul 81).....	7
Hangay Thermal Water Resources and Possible Use (V. P. Shipachev; VODNYE RESURSY, Mar 81).....	12

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FIFTY YEARS OF MPR FOREIGN TRADE REVIEWED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 1, 1981 (signed to press 16 Feb 81) pp 14-17

[Article by MPR Minister of Foreign Trade Yendongiyn Ochir: "Fifty Years of Foreign Trade Monopoly"]

[Text] The objective course of development of history created conditions which enabled the Mongolian people, guided by the ideas of the Great October Revolution, to prepare for and carry out the victorious People's Revolution of 1921. This opened up a highroad to this country's economic and cultural rebirth.

Immediately following the victorious revolution, the people's government commenced the productive effort of transforming and boosting the backward economy. It had been entirely in the hands of foreign commercial-usurer capital. Therefore expulsion of the latter constituted one of the main tasks facing the people's government following the victory of the revolution.

The first steps taken in this direction were revision of the official exchange rates on the foreign currencies in circulation in our country, repudiation of debts to foreign businessmen, and establishment of customs control over the import and export of goods.

As we know, V. I. Lenin saw as one of the important features of socialist foreign trade its governmental character, nationalization and centralization in the hands of the proletarian state. Proceeding from Leninist theses and taking into account this country's specific conditions, the Government of Mongolia decided that a co-operative structure was the most expedient form of nationalization under those conditions.

The first popular mutual assistance cooperatives were established on 16 December 1921, with the task of forcing foreign commercial firms and private businessmen out of the domestic market. The total number of shareholders of these cooperatives increased 60-fold in five years, total shareholder capital increased 24-fold, and volume of commerce -- 332-fold. In spite of this fact, initially foreign capital continued to dominate the domestic market. In 1924 its share amounted to almost 80 percent of the nation's imports and almost 78 percent of its exports.

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In connection with this, the First Great People's Hural, convened that same year, issued a directive calling for preparations for and gradual implementation of a foreign trade monopoly. This was a complex business and required considerable caution and preparatory work.

The mutual assistance cooperatives, constituting the country's sole national trade-economic organizations, became the principal support of the people's government in the designated measures. They also played a significant role in establishment and development of trade-economic relations between Mongolia and the USSR.

The first Mongolian-Soviet trade agreement, grounded on principles of proletarian internationalism, mutual benefit, equality of rights and respect of sovereignty, was signed in 1932. External economic relations with the Soviet Union were of great importance for eliminating foreign commercial-usurer capital in Mongolia and thus for the establishment of a national economy and trade.

Pursuant to the agreement, a number of Soviet trade organizations worked in close cooperation with Mongolian people's cooperatives. In addition, Mongolian-Soviet joint-stock companies were formed in Mongolia. They promoted strengthening of the people's cooperatives and staffing of socialist trade with national cadres. An especially important role here was played by experienced Soviet trade specialists, who lent us inestimable assistance in this area.

A major measure by party and government in the area of the country's economic transformation was establishment of a Mongolian Trade-Industrial Bank in June 1924 with the assistance of the Soviet Union. Its principal task was to promote development of trade and industry in this country and to strengthen money circulation and performance of state budget financial transactions. The bank was also of particular significance for deepening economic relations between the MPR and the USSR.

In connection with expansion of trade with the Soviet Union and development of national commerce, in 1927 the people's mutual assistance cooperatives were transformed into a Mongolian consumer cooperative.

These and other measures, in particular a currency reform and establishment of a stable national currency -- the tugrik -- constituted important stages in the struggle for economic independence and prepared the conditions for introduction of a foreign trade monopoly. The same aim was pursued by the government's decision calling for duty-free import of goods to boost agriculture, industry and transportation, and forbidding the import and export of certain other goods, and on so-called special monopolies, which were granted to cooperative organizations pertaining to procurements, export and marketing. All this promoted enhancement of the role of the public sector in procurements, foreign trade and domestic commerce, and led to a shrinking of the sphere of activity of foreign capital.

As a result, by the end of 1929 Mongolian cooperatives had essentially gained a monopoly right to procurement and marketing of goods abroad, as well as supplying the public with consumer durables and foodstuffs.

A decree calling for the adoption of a foreign trade monopoly throughout the entire territory of the MPR was issued by the government in December 1930. It signified

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concentration of all external economic activity in the hands of the state. Pursuant to this decree, licenses were henceforth required for the export and import of goods both by privately owned, state and cooperative organizations. They were also introduced for transit goods. Free access to Mongolia's domestic market was shut off entirely to foreign capital, and the decree enabled the people's state to transact foreign trade operations in the most favorable area for the country and to subordinate them to the interests of the national economy. The planning component was becoming considerably stronger in distribution of goods among the general public.

Introduction of a foreign trade monopoly made it possible substantially to increase sources of domestic accumulations essential for the creation and development of industry, transportation and agriculture, and for boosting the people's material and cultural living standards. Formerly these funds had been totally removed from Mongolia in the form of commercial profits.

In response to this entirely legitimate action taken by the sovereign Mongolian state, all countries except for the USSR ceased trade relations with the MPR. In connection with this, for a period of 20 years the Soviet Union was our sole foreign economic partner. During all these years it conscientiously carried out its international duty, supplying the MPR with the goods which were essential for the economy and the population.

V. I. Lenin considered a state monopoly to be the only acceptable form of conduct of foreign trade in a socialist nation, since it alone ensures maximum utilization of this sector in the interests of building socialism and helps protect a country's economic and political independence.

The first industrial enterprises, transportation, trade and other economic organizations in Mongolia, created with the assistance of the Soviet Union for the most part as joint Mongolian-Soviet enterprises, were subsequently transferred to full ownership by the MPR. They played an important role in development of our nation's economy.

By 1940 trade between our countries was double the 1935 figure. The Soviet Union was fully meeting the requirements of the population of the MPR in such products as sugar, tea, dalemba [a type of cotton cloth], Dunza tobacco, etc.

Development of certain branches of Mongolian industry enabled our country, in addition to increasing export of meat and livestock, hides, wool and furs, to export a number of new items to the USSR, food products in particular.

Trade between the MPR and USSR continued growing during the years of the Great Patriotic War. In 1945 trade between Mongolia and the Soviet Union was almost double the 1939 figure.

The end of World War II, establishment of a popular democratic system in a number of countries in Europe and Asia, and formation of a world socialist system created favorable conditions for further expansion and deepening of Mongolia's external economic relations. At the beginning of the 1950's it established trade relations with all socialist countries. Trade began to be conducted on a long-term basis with the overwhelming majority of these countries.

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When the MPR joined the UN in 1961 and CEMA in 1962, its prestige in the world arena rose to an even greater degree, and its trade-economic relations broadened and deepened.

Active participation in CEMA activities, and in particular in implementation of the Comprehensive Program, created favorable conditions for intensive mobilization and utilization of internal resources, for acceleration of the historic process of gradual drawing together and equalization of the level of economic development of the MPR with that of the other CEMA member nations.

Considerable prospects for an accelerated upsurge of the national economy of the MPR opened up in connection with elaboration and implementation of long-range specific programs of cooperation (DTsPS). An important role is also to be played by the country's draft Future Directions of Socioeconomic Development for the Period up to 1990. It prescribes creation, with the assistance of the Soviet Union and the other brother nations, of a national economic complex which is optimal for the MPR, including a structure of basic branches and sectors which would ensure their dynamic and inter-linked development and would lead to attaining a high level of societal labor productivity.

Table 1. Development of MPR Foreign Trade (1960=100)

	1965	1970	1975	1980*
Total trade turnover	106.0	121.2	229.4	306.3
Of that:				
export	111.8	116.4	241.6	332.0
import	101.7	124.8	220.3	287.0

* According to official figures for 1980

The groundwork for such a complex is being laid in our country in the course of socialist industrialization. Taking account of its specific features and the present level of international socialist division of labor, the MPRP [Mongolian People's Revolutionary Party] and the Government of the MPR consider it advisable to concentrate manpower and resources on development of those branches and sectors for which our country offers the most favorable natural and economic conditions. They include first and foremost the fuel-energy industry, the mining and mineral processing industry, as well as agriculture.

Constituting the principal form of economic relations between the MPR and other countries, foreign trade provides a substantial percentage of state budget revenues. It is steadily growing (Table 1), which attests to this country's increased export capabilities and import requirements.

Thanks to successful implementation of tasks assigned by the MPRP pertaining to transforming this country from an agrarian-industrial into an industrial-agrarian country, and active participation in international socialist division of labor, positive changes have taken place in recent years in the commodity structure of our exports and imports (Table 2). This has been fostered by an increase in our country's

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industrial output and movement on-stream of new enterprises built with the financial and technical assistance of the Soviet Union and the other CEMA member nations, which has enabled the MPR to expand year by year the volume and variety of finished manufactured products and semimanufactures which are exported to these countries. Today Mongolia exports to brother countries such new categories of goods as carpets, sheepskin and fur items, canned meats, biological preparations, animal tankage, tin concentrate, etc.

Table 2. Structure of MPR Export and Import (percentages)

	Export				Import			
	1965	1970	1975	1980*	1965	1970	1975	1980*
Machinery and equipment	-	0.2	0.3	0.3	23.7	25.9	35.8	31.6
Fuel, raw materials and supplies	0.6	5.4	6.5	23.1	10.1	12.8	10.3	26.1
Chemical products, fertilizer, rubber	0.1	0	0.1		4.8	5.1	5.2	5.4
Construction materials	-	0.9	0.3	0.3	2.6	1.7	2.6	2.0
Non-foodstuff raw materials	56.9	58.5	34.9	28.5	1.7	2.0	1.5	2.1
Foodstuff raw materials	34.3	19.5	27.2	14.7	2.4	0.3	3.0	2.3
Foodstuffs	5.5	9.6	21.6	22.0	16.6	12.7	7.3	10.2
Manufactured consumer goods	2.6	5.9	9.1	11.1	36.2	36.3	33.4	20.3

* According to official figures for 1980

Of great importance for deepening economic cooperation between the MPR and the USSR and implementation of the Comprehensive Program is the Agreement on Economic and Technical Cooperation in construction of the Erdenet Joint Copper-Molybdenum Mining and Concentration Combine, which was signed in February 1973. When this industrial giant, one of the 10 largest enterprises of its type in the world, reaches full capacity, this country's gross industrial output and export resources will increase substantially. Our import capabilities will also increase correspondingly.

An important event in the further development of highly productive relations between the MPR and the USSR was the signing in October 1980 of a new long-term trade agreement between our countries, covering the period 1981-1985. According to this agreement, the volume of mutual trade between our countries will increase by approximately 50 percent over the figure for the last five-year plan. We attach particular importance to this agreement which, just as preceding agreements, will play an exceptionally important role in successful attainment of our national economic targets and in boosting the people's living standards.

MPR foreign trade has accomplished a great and complex journey in the last 50 years. Lenin's teaching on a state foreign trade monopoly is just as valid today. It

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plays an important role in our successful fulfillment of five-year plans of development of the national economy and culture as well as achievement of the program target of the MPRP pertaining to building the material and technological foundation of socialism in this country.

The MPR presently trades with close to 30 different countries. The CEMA member nations account for more than 96 percent of this country's total foreign trade, with the USSR accounting for approximately 80 percent. A number of goods manufactured by Mongolian industry have been awarded gold medals and certificates at international fairs and exhibits.

Constituting an organic component of the national economy of the MPR, foreign trade is developing in close interaction with other branches and sectors. Foreign economic relations are being increasingly more extensively utilized for speeding up the development of productive resources. Modern, advanced equipment is being purchased abroad on an increasing scale for Mongolian industry, agriculture, and transportation. Foreign trade channels are being more extensively utilized for accomplishing the main economic task -- improvement in the material and cultural living standards of our urban and rural working people.

Our country's working people, who are presently standing shock-work labor watch in honor of the 18th Congress of the MPRP and the 60th anniversary of the People's Revolution, are achieving new labor successes for the sake of the prosperity of our homeland.

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ACHIEVEMENTS OF NATIONAL ECONOMY OF MPR OUTLINED

Moscow VESTNIK STATISTIKI in Russian No 7, Jul 81 pp 65-68

[Article: "Achievements of the National Economy of the Mongolian People's Republic in the Last 60 Years"]

[Text] The 60th anniversary of the victory of the People's Revolution in Mongolia is being celebrated on 11 July 1981.

During the years of the people's rule, the Mongolian People's Republic has been transformed from a country of backward nomadic livestock raising to an agrarian-industrial nation, having accomplished for the first time in history the transition from feudalism to socialism while completely bypassing the capitalist stage of development.

The Mongolian people, under the guidance of the Mongolian People's Revolutionary Party, have achieved impressive success in building the material and technological foundation of socialism, in increasing this country's economic potential, and in improving societal relations.

The living standards of the working people are steadily rising on the basis of dynamic growth of the economy.

The figures presented below characterize the successes of building socialism in the MPR.

1. Territory and Population of the Mongolian People's Republic	
Territory	1,565,000 km ²
Population as of the end of 1980	1,685,000
Capital of the MPR -- Ulaanbaatar	419,000
Population density per square kilometer	1.1 persons

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2. Average Annual Population Size and Natural Population Change

	1940	1960	1970	1975	1980
Average annual population size, thousand persons	741	953	1,248	1,446	1,663
Births per thousand population	26.1	43.2	40.2	39.4	37.2*
Deaths per thousand population	21.8	10.5	12.3	10.0	9.5*
Natural growth per thousand population	4.3	32.7	27.9	29.4	27.7*

* 1979

3. Population Distribution by Social Groups (percentages of total)

	Total Population	Of That			Other Population Groups
		Blue-Collar and White-Collar Workers	Farmers in Agricultural Production of All Types, Cooperative Handicraft Workers and Artisans	Self-Employed Farmers, Artisan and Handicraft Workers Not In Cooperatives	
1925	100.0	0.0	-	86.6	13.4
According to census as of 5 January 1963	100.0	46.5	53.3	0.2	
According to census as of 10 January 1969	100.0	56.4	43.5	0.1	
According to census as of 5 January 1979	100.0	63.1	36.6	0.3	

4. Principal Economic Development Indicators (1950=1)

	1950	1960	1970	1975	1980
Produced national income	1	2.8	3.6	5.0	6.5
Gross industrial output	1	2.8	7.1	11	16
Gross agricultural output	1	1.2	1.4	1.7	1.5
Capital investment	1	14	26	46	76
Average annual number of blue-collar and white-collar workers	1	2.3	3.2	3.9	5.0
Retail goods turnover (including public food services)	1	2.2	3.7	4.9	6.5

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5. Production of Major Industrial Product Categories

	1940	1950	1960	1970	1975	1980
Electricity, million kilowatt hours	11.5	21.0	106	548	848	1,569
Merchantable coal, total, thousand tons	174	270	619	1,999	2,726	4,387
Cement, thousand tons	-	-	-	96,2	159	178
Lumber (not including railroad ties), thousand m ³	...	13	152	421	479	585
Washed wool, thousand tons	1.7	4.5	5.6	9.8	11.6	11.9
Woolen textiles, million m ²	0.05	0.1	0.3	0.9	1.3	1.4
Leather footwear, million pairs	0.2	0.2	0.9	1.6	1.8	2.1
Meat (commercial production), thousand tons	4.8	4.0	12.8	34.9	53.7	56.7
Animal oil (commercial production), thousand tons	-	4.2	4.8	3.0	3.2	3.8

6. Gross Harvest and Yield, Principal Agricultural Crops

	1950	1960	1970	1975	1980
Gross Harvest, thousand tons					
Grains and pulses, total	12.7	227.4	284.8	482.5	258.5
of that					
wheat	6.4	195.4	250.2	365.7	206.9
barley	1.3	3.3	9.0	64.1	31.8
oats	4.8	25.9	23.9	49.4	17.6
Yield, quintals per hectare					
Grains and pulses, total	6.9	9.2	6.8	11.0	4.6
of that					
wheat	6.5	9.6	7.2	11.6	5.1
barley	6.1	3.3	5.9	11.9	3.4
oats	7.8	9.0	4.6	8.4	3.6

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7. Livestock (year's end; thousand head)

	1950*	1960*	1970	1975	1980
Cattle	1,988	1,906	2,108	2,427	2,397
of that, cows and wild yaks	776	796	871	981	1,010
Sheep	12,575	12,102	13,312	14,458	14,231
Goats	4,979	5,631	4,204	4,595	4,567
Horses	2,317	2,503	2,318	2,255	1,985
Camels	844	859	634	617	591

* Figures for 1950 and 1960 as of 1 September

8. Production of Principal Livestock Products (thousand tons)

	1950	1960	1970	1975	1980
Meat and lard (carcass weight)	157	185	180	235	237
Milk	241	228	221	230	247
Sheep's wool (unwashed)	15.0	15.2	19.0	21.1	20.5

9. Number of Persons Enrolled in General-Curriculum Schools, Secondary Specialized Schools, and Higher Educational Institutions

	1940/41	1950/51	1960/61	1970/71	1975/76	1979/80
Enrollment at general-curriculum schools of all types, thousand persons	24.3	68.7	115	240	310	376
per 10,000 population	330	880	1,188	1,897	2,113	2,292
Enrollement at secondary specialized educational institutions, thousand persons	1.3	3.2	8.8	11.1	13.5	18.0
per 10,000 population	18	42	92	89	93	111
Enrollment at higher educational institutions, thousand persons	0.2	1.5	6.9	8.4	13.6	21.1

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Table 9, cont'd

	1940/41	1950/51	1960/61	1970/71	1975/76	1979/80
per 10,000 population	2	19	72	68	94	131
Graduation of specialists from higher educational institutions, thousand persons	...	0.2	1.1	1.8	1.7	3.2

10. Culture

	1950	1960	1970	1975	1979
Number of public libraries of all types	22	33	349	354	371
Book collection, million copies	0.3	0.8	3.9	5.2	6.1
Number of theaters	4	9	11	12	15
Number of theater attendances, million	0.2	0.7	1.1	1.9	2.4
Number of motion picture projection units	88	371	490	484	511
Number of motion picture attendances, million	0.8	4.7	9.4	11.6	14.6
Number of magazines and journals, titles	12	16	28	31	30
Annual magazine and journal figures, million copies	1.0	2.0	3.9	3.9	4.5
Number of newspapers, titles	24	29	36	38	39
Annual newspaper figures, million copies	26	54	80	84	101

11. Health

	1940	1950	1960	1970	1975	1980
Number of physicians of all specializations, thousand persons	0.1	0.1	0.9	2.3	2.9	3.7
doctors per 10,000 population	1.5	1.8	9.7	17.9	19.9	22
Number of hospital beds, total, thousand beds	1.0	3.5	7.7	11.9	14.3	18.1
per 10,000 population	14	48	81	94	98	107

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HANGAY THERMAL WATER RESOURCES AND POSSIBLE USE

Moscow VODNYE RESURSY in Russian No 3, Mar 81 (manuscript received 28 Nov 79)
pp 182-186

[Article by V. P. Shipachev: "On the Thermal Water Resources of the Hangay Zone of the MPR and Possibilities of Their Utilization"]

[Text] Consumption of energy of various types is doubling approximately every 20 years (3). This is causing an extremely intensive consumption of fossil fuels -- coal, natural gas, and petroleum products, reserves of which are declining sharply as a consequence of this. Therefore one can well understand the endeavor to find new reliable and economical sources of energy, utilization of which will make it possible to reduce the consumption of fossil fuels, especially oil. In recent years the attention of investigators has been drawn toward such promising and accessible types of energy as solar, wind, and especially geothermal energy.

The fairly widespread distribution of thermal waters, stability of their conditions, relative simplicity of exploitation and large quantity of heat which can be extracted from a comparatively limited operations area (group of wells, springs) enables us to view this type of thermal energy as a highly promising thermal energy raw material. Characteristic of geothermal energy sources is continuous natural renewal, as well as uniformity of flow during operation. In addition, in most instances thermal waters possess certain medicinal properties, which offers the possibility of utilizing them for curative purposes. Frequently valuable chemical products can be obtained from thermal waters alongside heat: boron, bromine, iodine, sulfur, ammonia, silicon, etc (5-7, 9).

Experience in utilizing heat from deep within the earth has shown the economic advantage of exploiting this source of energy (3). As a rule thermal water reserves are sufficient to recoup all production costs in a comparatively short period of time and subsequently to generate substantial profit.

Fossil fuel reserves are fairly limited in the Mongolian People's Republic, but at the same time there are areas with numerous spots where thermal waters emerge at the surface, with temperatures ranging from 40-50 to 80-92°C. No sources of geothermal steam connected with zones of contemporary volcanism have yet been discovered. However, if deep wells are drilled in those areas where thermal waters occur, one can expect to bring water to the surface at a temperature of above 100°C.

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The cost of producing geothermal water in the USSR (with average well depths of 400 m, a flow rate of 15 l/sec and water temperature of 60°C) is 1.2 kop/m³, while the cost of producing a gigacalory of heat is 80 kopeckz (1971 figures). In the MPR, with geothermal waters occurring for the most part in fissures and seams, well depth will average 400-1000 m, while water temperature may prove to be 100°C and higher, as already noted. The cost of producing a gigacalory of heat will average 1-1.2 rubles, and water -- not more than 5-6 kop/m³. If we compare these figures with current rates on heat produced by boiler houses fired by coal, natural gas, and petroleum products, one readily notes that the cost of heat from subterranean waters in promising areas nowhere exceeds current rates. In other words, production of geothermal water is entirely warranted from an economic standpoint (7, 8).

According to available survey materials and the literature, there are a number of folded systems in the western and central parts of the MPR, particularly in the Hangay zone, in which latent volcanic activity is apparently occurring. Fairly numerous signs of geothermal sources have been discovered here on the southern and northern slopes of the Hangay Range. Some of these sites are used by the local populace for therapeutic purposes.

The type of all geothermal waters is for the most part sodium hydrocarbonate-sulfate, with mineralization of 0.16-0.42 g/l, pH 8.45. Gas composition is 80-92 percent nitrogen, whereby the nitrogen is of atmospheric origin, although in some instances it may originate at considerable depths (2, 4). Oxygen content varies from 2 to 14 percent. Hydrogen sulfide, in the form of hydrosulfide, is encountered in almost all hot springs, but its content does not exceed 3-5 mg/l, rarely reaching as high as 13-17 mg/l. The origin of the hydrogen sulfide involves for the most part oxidation of sulfides dispersed in intrusive rocks and zones of tectonic disturbances. Radon content in the waters ranges from 0.4 to 52 Mache units (from 2 to 188 eman), while carbon dioxide is as a rule not present. There are a number of trace elements in the composition of the majority of described hot springs.

The age of all thermal waters, according to (1), ranges from 0.5 to 6.9 million years. The fairly wide age range attests to the fact that the hydrogeologic conditions of formation of these waters differ, in spite of the seeming similarity of geologic-structural peculiarities -- almost all thermal water sources are associated with granite intrusions broken by large tectonic disturbances. This in turn attests to the fact that the temperature conditions of each area are formed primarily under the influence of postvolcanic foci. Under favorable conditions infiltration waters, filtering through fault zones, approach these foci, become heated and then, in more weakened locations, rise to the surface in the form of springs. Areas of intersection of differing-trend fault systems offer the most favorable conditions for such waters to reach the surface. The fact that these waters have a low level of radioactivity excludes the possibility that the water was heated by radioactive decay deep under the surface.

Certain manifestations of neotectonic movements evidently play a significant role in the formation of hot springs. Evidences of this include comparatively recent (1905, 1957) powerful earthquakes and, as a consequence of this, a rise in the flow rate and temperature of some springs (2, 4).

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As of 1977, more than 330 mineral springs have been discovered on the territory of the MPR, but only 55 of these, or 17 percent, are hot springs. Only 18 of these have a temperature of between 40 and 92°C (see figure), while no more than eight are being exploited in an organized manner (spas, hydropathic establishments). There is no doubt, however, that the degree of exploitation of hot springs in the MPR will increase substantially in the near future, in connection with the considerable increase in world market prices on energy raw materials. Probably hot geothermal waters will be utilized primarily in Bayan Hongor, Arbayheer, Tsetserleg, and certain somons in the vicinity of which hot springs have been discovered. In particular, the Shargaljuut, Bagashargaljuut geothermal waters and deep hot geothermal waters within the town proper can be utilized for Bayan Hongor. Rough preliminary calculations indicate that Shargaljuut can supply Bayan Hongor, without detriment to the development of this spa, at least 3700 m³ daily of water at a temperature of 70°C, which corresponds to annual thermal resources of 6 x 10⁴ Gcal of heat. Finally, with successful prospecting for geothermal water right in Bayan Hongor, it is possible to produce 4300 m³/day of water at temperature of 90°, which corresponds to annual thermal reserves of 11.1 x 10⁴ Gcal. Thus it is possible to produce approximately 12,300 m³/day of geothermal water with an annual thermal resource volume of 25.8 x 10⁴ Gcal.

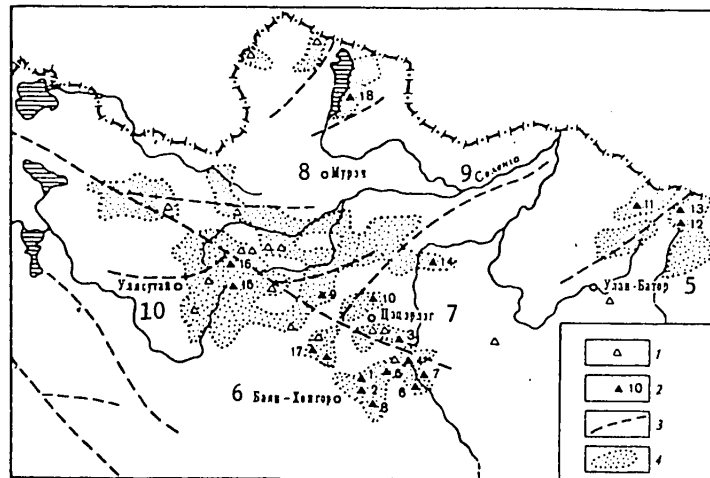


Diagram of Distribution of Principal Hot Springs in the Hangay Zone of the MPR

Key:

- | | |
|--|-----------------|
| 1. Spring with water temperature of 20-40°C; | 5. Ulaanbaatar |
| 2. Spring (and its number) with water temperature above 40°C | 6. Bayan Hongor |
| 3. Principal mountain ranges | 7. Tsetserleg |
| 4. Promising areas for geothermal water prospecting | 8. Moron |
| | 9. Selenge |
| | 10. Uliastay |

The hot water supply requirements of a town with a population of 16,000 amount to 800 m³/day with a daily consumption of 50 liters per capita. Heat requirements for

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Principal Data on Hot Springs in the Hangay Zone of the MPR

No	Name of Spring	Water Temperature, °C	Flow, l/sec	Composition of Waters, %-Equivalent in mg/l	Mineralization, g/l	Water-Containing Rocks and Their Age	Existing Geo-thermal Resources, Gcal	Potential Geo-thermal Resources, Gcal
1	Shargaljuut	70	51.0	H48S42Cl10/ S84 S188F12H2S5,1	0.33	Granodiorites, P1	80,700	161,400-1,614,000
2	Begashargaljuut	50	17.5	S84 S188F12H2S5,1	0.35	Same	16,500	49,500-330,000
3	Hujirt	38	0.8	H72S19/S95C3 S1136H2S9.4	0.34	Granites, P1	443	18,180-61,200
4	Mogoy-Haluun-Uus	50	2.0	H71S23/S92 S1123	0.32	Granites, P	1910	9550-38,200
5	Ara-Citron	50	5.0	H87Ch7/S67C28 S178	0.16	Sandstone, P2	4740	14,220-94,800
6	Hurmetuun-Haluun-Uus	55	1.6	H71S23/S96 S194H2	0.30	Granodiorites, P2	1760	8800-35,200
7	Emt-Haluun-Uus	45	0.5	H80S10/S90K6 S191H2S9.8	0.36	Granites, sandstone, P2	400	4000-8000
8	Khalun-Uusu	56	5.5	H50S31/S78C15 S16	0.25	Granites, P(C)	6220	18,660-24,400
9	Chuluut-Arshaan	45	1.5	H58S31/S89C7 S110H2S50	0.33	Granites, sandstone, P2	1210	6500-24,200
10	Shibert-Arshaan	63	0.5	H47S42/S89C7 S1113H2S3.6	0.40	Sandstone and shales, P2	677	6770-13,540
11	Yoroogiyn Haluun	50	8.0	H63S22/S96C4 S180B1H2S1	0.28	Granites, P(?)	2190	10,950-43,800
12	Haluunyy Us	50	8.0	H67S20/S86X10 S194,5H2S4	0.31	Granites, Pz3	7600	22,800-152,000
13	Baga-Haluunyy	73	0.3	H79S11/S81C2 H2S4	0.15	Same	500	5000-10,000
14	Hulidji-Arshaan	42	0.3	S80Ch11/S73C23 S178H2S4.9Rn3 1	0.84	Effusive rocks, P	210	2100-4200
15	Bogd Uul (Otgon teg)	42	0.3	H55S40/S95C4 S130H2S4.5	0.28	Granites, P(?)	209	2090-4180
16	Tegshiyin-Haluun	90	0.5	—	—	—	1100	5550-22,200
17	Uhugiyn (Baydrag)	63	0.5	— S193	0.41	Sandstone	680	6800-13,600
18	Arshaaniy Haryee	55	9.0	S76H18/H96C3 CO210.5Fe3	1.23	Granite gneisses	9100	18,200-182,000

Note: Following are indicated in the chemical composition of waters: H -- hydrocarbonates; S -- sulfates; Ch -- chlorides; S -- sodium and potassium; C -- calcium; M -- magnesium

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the heating season amount to 5.6×10^4 Gcal, at 3.5 Gcal per capita (3, 8, 9). Or according to another variant: approximately 15 liters per day of geothermal water at a temperature of 60-70° are needed to heat 1 m² of living space, and 1,740 m³ per day to heat the entire town. Including hot water supply, the town's total requirements will be 2600 m³/day of water at a temperature of not below 60°C. Geothermal water resources are considerably greater than this figure and, consequently, considerable reserves remain for successful development of large-scale industrial and agricultural production in the Bayan-Khongor area.

Employing the most reliable sources, we calculated the annual quantity of heat in gigacalories and determined the volume of lignite equivalent to this heat (see table). The existing volume of heat totaled 148,000 Gcal, which is equivalent to 64,400 tons of lignite. At the same time, according to data from geologic-hydrogeologic investigations, taking into account the results of drilling exploratory wells, we determined the potential future increase in the thermal resources of each site. For example, artesian-flow water at a temperature of 52° (as compared with 38° in the spring proper) was obtained from a depth of only 37 meters in well No 7 at the Khudzhir site; with pumping, the flow amounted to 3.3 l/sec, while flow in the spring does not exceed 0.8 l/sec (4, 9). By drilling 3-4 wells to a depth of 200-300 meters, one can tap the basic "stream" of geothermal waters, and thus the geothermal resources of this site can be increased severalfold. Anticipated geothermal resources thus amount to 18,180 Gcal/year. Similar calculations of geothermal resources were performed for all other sites (437,080 Gcal, or 189,000 tons of coal). At the same time, as is indicated by practical experience and the study of hot springs, thermal reserves determined according to the results of spring flow alone prove to be 20-30 times greater following exploratory drilling (3). If we approach the matter from this standpoint and increase the thermal resources of each of the 18 sites only 20-fold, the total amount of heat will run 2,775,440 Gcal, which is equivalent to 1,206,700 tons of lignite.

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