Committee on Resources

Subcommittee on Energy & Mineral Resources

Statement

Metal-mining royalties around the World

---

submitted to

Subcommittee on Energy and Mineral Resources,

Committee on Resources, U.S. House of Representatives

for oversight hearing on:

Effect of Federal Mining Fees

and Proposed Federal Mining Policies and Royalties

on State and Local Revenues and the Mining Industry

23 October, 1999, Golden, Colorado

by

Fred Barnard, Ph.D., Principal

Mining Evaluation Profiles

1835 Alkire Street

Golden, Colorado 80401

INTRODUCTION. The material below is presented for the public record as part of the oversight hearing held on 23 October, 1999 in Golden, Colorado, by the Subcommittee on Energy and Mineral Resources of the Committee on Resources of the U.S. House of Representatives, on the subject of "Effect of Federal Mining Fees and Proposed Federal Mining Policies and Royalties on State and Local Revenues and the Mining Industry".

The data below has been compiled by Mining Evaluation Profiles, a consultancy in Golden, Colorado which since 1991 has provided objective data about the environments for mining investment in over 60 countries worldwide. The data is compiled from a wide variety of sources, including U.S. government agencies, foreign government agencies, mining companies, and consultancies in various countries. Several products are prepared by Mining Evaluation Profiles with this data, including 4-page country profiles, a 66-country tax and fiscal matrix, and individualized reports. These products are sold to mining companies, governments, and consultancies worldwide.

It should be noted that the discussion herein relates mainly to "metallic" or "hard-rock" minerals, a group which tend to share certain geological and/or economic characteristics, and which stand in contrast to other groups of minerals, such as mineral fuels (mainly petroleum, natural gas, and coal), organic materials (peat, amber, guano, etc.), industrial minerals (a wide variety of minerals which are mostly used in their physical mineral state), construction materials (sand, gravel, granite, limestone, shale, etc.), mineral waters or brines, and other special categories. The "metallic" minerals include gold, silver, copper, lead, zinc, tin, molybdenum, nickel, platinum, and some other metals, and often include associated minerals such as barite, and fluorite. In any particular context (i.e. national mining law or royalty schedule), the list of affected minerals is often stated. Surprisingly to the layman, ores of aluminum, iron and manganese are often excluded from the list of "metallic" minerals due to their particular occurrences, markets, and means of transformation.

WHAT IS A ROYALTY? With respect to mining, a *royalty* is a fixed share of mineral or mineral product paid (in value or in kind) without reference to the profitability of the extractive endeavor. Several variants of the definition may be found in Thrush (ed., 1968). A royalty may be expressed as a fixed fraction of the mineral value, or as a fixed amount of money per physical amount of mineral (e.g. cents or dollars per ton). Royalties are thus a highly regressive form of taxation, since a royalty penalizes even a low-income or loss-making operation, but is not increased for a highly-profitable operation. In this sense a royalty contrasts with an income tax or net-profits tax, either of which relates to profitability. Royalties may have other legal names, such as severance tax or production tax.

Royalties may be paid to governments for minerals extracted from public lands. In most countries, especially developing countries, the government or the crown owns all mineral resources outright. Exceptions to this are in many parts of the U.S. the U.K., Ireland, South Africa and to a much lesser degree a few other countries where small areas of minerals may be in private ownership. In the great majority of jurisdictions, royalty revenues go into general government coffers, and do not materially affect funding for programs which aid in the discovery or extraction of minerals. Royalties are thus normally justified by governments, not to finance mining research or to otherwise promote mining, but simply because governments have the power to tax.

Royalties may also be paid to private parties (surface owners, mineral-right holders, finders/agents) as negotiated compensation for access to, or information about, minerals which would not otherwise be available to the extractor. In these cases, the royalty serves as one of several possible alternate forms of compensation, but one which is payable only if the mining venture actually enters into production. Royalties to private parties are not considered in this discussion, as they are determined between a willing buyer and a willing seller and are not generally subject to government fiat.

TYPES OF ROYALTIES. Definitions of specific royalties vary from one jurisdiction to another, and from one legal document to another. The most common terms used are:

- The *gross royalty* or *ad valorem royalty* are based on the actual sale or invoice price of the mineral products produced.

- A *net smelter return (NSR) royalty* is based on the amount received from the smelter, refiner, or other buyer of concentrate or crude metal, after deductions for processing charges and penalties, losses during processing, insurance, freight, etc.

- A *mine-mouth royalty* allows deductions for transportation, milling, and all subsequent charges, and represents the lowest basis of mined mineral value.

A number of alternate definitions actually in use around the world are shown below in Table 1. In any given case, the precise means for assessing a royalty payment may be determined by inspection of each mining operation, or by de-facto negotiation between the operator and the government agency. This is especially true in the case of definitions such as "mine-mouth" and "net smelter return".

Table 1.

VARIOUS METALLIC MINING ROYALTY DEFINITIONS

Royalty definition	applies to % of market price	countries (examples)
ad valorem	100	Nigeria
Caracas value	97	Venezuela
ex-mine	30-90	New South Wales
fixed amount by weight	var	Fr. Guiana, some Australian states
FOB value	70-95	Burkina Faso
gross production	100	Philippines
gross value	100	Tanzania
London fix (gold)	100	Guinea
market value	100	Indonesia
mill value	50-95	Nicaragua
mine-mouth	30-90	Argentina, Colombia
negotiable	var	Suriname

NSR (Net Smelter Return)	50-85	Papua New Guinea
sale price	100	Costa Rica
sale value	100	Guatemala
value added	30-95	Brazil

ROYALTIES TODAY. Due to the regressive nature of royalties, one percent of royalty often has the net economic impact of two to five percent of income tax, depending on the definition of the royalty in a particular case, and the nature of the mining operation concerned. For this reason, the royalty level in a given jurisdiction is a key fiscal parameter for consideration by mining investors.

Royalty data for over 60 countries are compiled by Mining Evaluation Profiles. These include all major metal-mining countries except China and the Russian Federation, countries where the economic and regulatory environments are inadequate to make meaningful royalty comparison with other countries. In these two countries, most mines are still operated - often with little regard to economic efficiency - by the government in one form or another, and the concept of royalty and tax payments from one government agency to another has little economic reality.

The countries and their data actually used in this analysis are shown on Table 2. Note that the tax and royalty data represent recent years, from 1996 to 1999. Users of these data is also referred to the article by Barnard (1998) which discusses other aspects of similar royalty and tax information.

The royalty may vary from one metal or mineral to another. Although not shown on Table 2, a wide range of royalty rates is applied in countries such as Colombia, ranging from 4% for lode gold to 8% for nickel (mine-mouth values).

Although historical data are not shown in Table 2, it should be noted that several important mining countries (Mexico, Argentina, Bolivia, Philippines) have reduced or eliminated royalties since 1990. Few (e.g. Papua New Guinea) have had an across-the board increases (from 1.25% to 2% in the case of Papua New Guinea). Canadian and Australian provinces/states have had varied movement, with a net decrease in the royalties charged, but an increase in net-profits taxes.

OTHER PARAMETERS. In addition to the tax and royalty data shown in Table 2, the undersigned also compiled data on production from each country of the major metals - gold, copper, zinc, and nickels. These four metals had the largest average annual market values of all metals, calculated by multiplying the average world mine production by the average metal price for each during the six-year period 1990-1994. The gross market sizes were: gold $26 billion; copper 23 billion; zinc 8.9 billion; and nickel 6.7 billion. The next largest metals markets were: platinum metals $3.0 billion, lead 2.6 billion; silver 2.1 billion; and tin 1.1 billion. Iron ore, considering the tonnages produced and the world market prices for iron ore (not iron metal) had a market size of $31 billion, but is not generally considered as a "metallic mineral". The metal production data were taken for the year 1996, from the chapters for gold, copper, zinc, and nickel in the 1997 Minerals Yearbook, published by the U.S. Geological Survey's Minerals Information section (formerly the U.S. Bureau of Mines).

An economic analysis was run of a typical gold-mine development, utilizing the *MiningPro Matrix*, a

proprietary product of Mining Evaluation Profiles. This calculated the IRR (Internal Rate of Return) for identical hypothetical mine-development projects in each country. The simple hypothetical model mine had these parameters:

- 1,000,000 ounces of gold, subject to 90% recovery
- construction period of 1.75 years
- ten-year mine life
- $125 per ounce direct operating cost (excluding capital amortization)
- capital expenditure of $38 million
- $300 per ounce gold price
- discount rate of 9%.

An IRR was calculated for this same hypothetical mine, using actual fiscal data for each country, including import duties, sales taxes, royalties, income taxes, export duties, and relative operating costs in each country. The results are included in Table 2. It should be noted that other mine models, using a different metal, mine life, capital cost, and other parameters, might show different relative IRR rankings of these countries.

RELATIONSHIPS OF ROYALTIES TO OTHER PARAMETERS. Various numerical relationships among the effective royalty rate, the marginal top-bracket income-tax rate, the IRR for the gold project, and metals production are shown on the attached graphs. Each point on a plot represents a single country.

The first four plots show production of gold, copper, zinc and nickel, plotted against the effective royalty for that metal in each country. All four show a similar relationship; countries with the highest effective royalties for a given metal tend to be those countries with little or no production of that metal. The largest producers in every case have very low or no royalty for that metal.

The fifth plot shows the top-bracket marginal income rate plotted against the % IRR (percentage Internal Rate of Return) for the hypothetical gold-mine project in each country. The scatter indicates that the income-tax rate is a relatively subordinate factor in determining the IRR of the hypothetical project. The other factors encompass a wide variety of considerations, including import duties, sales taxes, relative operating costs (especially high in countries such as Greenland, for example), royalties, compulsory carried (free) government ownership interest, and others.

The sixth plot shows the effective gold royalty plotted against the %IRR for the same hypothetical project in each country. As in the case of the income-tax plot discussed in the preceding paragraph, numerous factors are at play. In contrast to the income-tax plot, however, there is a clear relationship between IRR and effective gold royalty. A higher effective gold royalty decreases the IRR significantly.

The relationship of royalties to taxes discussed in Barnard (1998; copy appended to this report) indicates that there is a very low correlation; governments on average do not trade off lower royalties for higher taxes, or vice-versa.

CONCLUSIONS.

1. Metal-mining royalties are one factor among many in determining profitability of a mining project.

2. Royalties, although in most cases numerically small, can have a high impact on profitability (IRR).

3. In general, countries which are world-class producers of metals have zero or low royalties.

4. Many countries with high effective royalties have modest or no production of the metal in question.

REFERENCES.

Barnard, F., 1998, Mining royalties - what are they and where are they going?: Newsletter of Society of Economic Geologists (Littleton, Colo.), no. 32 (January 1998), pages 16-18. (A copy is attached to this paper)

Thrush, P. W. (ed), 1968, Dictionary of mining, mineral, and related terms: U.S. Bureau of Mines, 1268 pages.

***

Table 2. SELECTED ROYALTY AND OTHER DATA

Mine production for 1996, in 1,000's of tonnes except gold in tonnes. Royalties are % of market price.

COUNTRY	PROD'N GOLD	Effective Royalty GOLD	PROD'N COPPER	Effective Royalty COPPER	PROD'N ZINC	Effective Royalty ZINC	PROD'N NICKEL	Effective Royalty NICKEL	INCOME TAX top rate	IRR %
Argentina	0.7	2	0	1.5	31.1	1.5	0	1.5	38	22.27
Bolivia	12.6	0	0	0	145.1	0	0	0	25	19.00
Brazil	60	3	40	2	117.3	2	25.5	2	45	18.01
Chile	53.2	0	3115	0	36	0	0	0	35	23.04
Colombia	22.1	3	2.2	3	0	3	27.7	5	32	21.36
Ecuador	17.7	0	0	0	0	0	0	0	36.25	24.24
Fr. Guiana	3.0	3	0	3	0	3	0	3	33.3	21.29
Guyana	12.4	5	0	3	0	3	0	3	35	20.50
Paraguay	0	2	0	1.5	0	1.5	0	1.5	30	22.88
Peru	64.8	0	486	0	760.5	0	0	0	35.6	26.57
Surinam	0.3	2	0	2	0	2	0	2	39.6	13.12
Uruguay	1.0	2	0	2	0	2	0	2	30	25.59
Venezuela	11.7	1	0	1	0	1	0	1	40.5	21.08
Belize	0	0	0	0	0	0	0	0	35	25.59
Canada ave	166.4	0	688	0	1235.3	0	192.6	0	30	24.25
Costa Rica	0.5	1	0	1	0	1	0	1	30	20.05
Cuba	0	6	2	4	0	4	51.3	4	40	7.51
Dom. Rep.	3.7	2	0	2	0	2	50.6	2	44	17.67
El Salvador	0	3	0	3	0	3	0	3	18	23.53
Greenland	0	0	0	0	0	0	0	0	35	19.99
Guatemala	0	1	0	1	0	1	0	1	20	26.63
Honduras	0	0	0	0	25.3	0	0	0	40.5	19.86
Mexico	24.5	0	340.7	0	377.6	0	0	0	34	22.29
Nicaragua	1.5	3	0	1.5	0	1.5	0	1.5	30	23.95

Panama	0.8	2	0	2	0	2	0	2	30	22.60
USA (11 W.)	326	0	1920	0	628	0	1.3	0	39	25.31
Finland	3.1	0	9.3	0	25.7	0	3.9	0	28	23.37
Norway	0	0	7.4	0	17.2	0	3.1	0	28	18.38
Portugal	0	2	110	2	0	2	0	2	39.6	22.30
Spain	3.1	0	37.5	0	140.1	0	0	0	35	22.98
Sweden	6.5	0	71.7	0	160.3	0	0	0	32	22.66
Turkey	1.2	10	50	10	12	10	0	10	43.5	16.51
Australia	289.5	2	524.8	3	1071	3	113.1	3	36	22.92
Indonesia	83	2.5	507.5	5	0	3	87.9	3	30	19.78
Papua NG	51.1	2	168.0	1.5	0	1.5	0	1.5	35	13.68
Philippines	31.8	2	54.5	2	0	2	14.5	2	35	19.97
Kazakstan	12	9	250	9	225	9	9.8	9	30	18.49
Kyrgyz Rep.	1.5	2	0	2	0	2	0	2	36	10.31
Mongolia	5.3	12.5	101.9	2.5	0	2.5	0	2.5	40	13.58
Tajikistan	1.1	0	0	0	0	0	0	0	30	7.85
Uzbekistan	72	10	65	10	12	10	0	10	38	2.44
Angola	0	3	0	2	0	2	0	2	40	17.59
Botswana	0	4	23.3	2	0	2	22.1	2	25	25.35
Burkina Faso	4.0	3	0	3	0	3	0	3	35	17.80
Congo (Zaire)	8.2	0	50	0	0	0	0	0	50	6.20
Cote d'Ivoire	1.0	3	0	2	0	2	0	2	35	23.04
Eritrea	0.0	5	0	2	0	2	0	2	38	18.94
Ethiopia	2.5	2	0	3	0	3	0	3	35	19.00
Ghana	49.2	3	0	3	0	3	0	3	35	16.61
Guinea	6.8	5	0	2.5	0	2.5	0	2.5	37	12.62
Kenya	0.0	2.5	0	2.5	0	2.5	0	2.5	32.5	19.14
Malawi	0.0	5	0	5	0	5	0	5	15	24.29
Mali	8.4	3	0	3	0	3	0	3	35	19.64
Mauritania	1.2	3	0	2	0	2	0	2	25	11.98
Morocco	0.6	0	14.6	0	79.7	0	0	0	17.5	25.87
Mozambique	6	5	0	3	0	3	0	3	25	23.44
Namibia	2.1	0	14.9	0	35.9	0	0	0	30	22.30
Niger	0	5.5	0	4	0	4	0	4	40.5	13.40
Nigeria	0	5	0	5	0	5	0	5	32	19.69
Senegal	0.6	2	0	2	0	2	0	2	35	21.40
Sierra Leone	0	3	0	2	0	2	0	2	37.5	20.03
South Africa	497.6	1	152.6	1	76.9	1	33.9	1	42	23.31
Tanzania	0	3	0	2	0	2	0	2	30	20.69
Uganda	3	3	0	2	0	2	0	2	30	20.53
Zambia	0	3	333.8	2	0	2	0	2	35	20.45
Zimbabwe	24.8	0	12.2	0	0	0	11.6	0	35	21.40

***

FOLLOW-UP ADDRESS

Fred Barnard, Ph.D., Principal,
Mining Evaluation Profiles
1835 Alkire Street
Golden, Colorado 80401 USA
tel + fax 303-232-1553
e-mail: miningepro@aol.com

website: www.miningprofiles.com

This presentation is intended to provide objective information about hard-rock mining royalties in an international context. Numerical data are presented, along with some numerical relationships among royalties, income taxes, profitability, and mineral production. No recommendations are presented.

# # #