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INTERNATIONAL URANIUM RESOURCES EVALUATION PROJECT

I U R E P

NATIONAL FAVOURABILITY STUDIES

GUATEMALA

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CONTENTS

1. INTRODUCTION

(a) Geography

Guatemala is a heavily forested, predominantly highland area of 108,889 square kilometers located between latitudes N. 13°42'-17°49' and longitudes W. 88°10'-92°30'. Its capital is Guatemala City. Of the country's several mountain ranges the major ones are the Sierra de los Cuchumatanes and the Sierra Madre in the west-central region. A narrow plain is found on the Pacific Coast, and three river valleys extend inland from the Caribbean Coast. The northern third of the country is quasi-rain forest. Frequent earthquakes occur in the south-central sector. Altitudes range from sea level to 3,960 meters.

(b) Climate

Temperatures are hot in the lowlands and cold in the highlands. While rainfall is fairly heavy, much of the country has a pronounced dry season from November to April.

(c) Access

The road network totals 13,449 km. (2,552 km. paved); the three main highways are the Pacific Coast, Inter-American (504 km.) and Inter-Ocean. There are 820 km. of railroad trackage. Reasonably good rail, bus and truck transportation is found in the highland and Pacific Coast areas, but there is limited or no transportation elsewhere. International flights operate from Guatemala City; many of the country's 46 lesser airfields are unusable in the rainy season. Inland water transportation is important only in the Caribbean coastal region because the country's numerous rivers generally are too shallow for commercial use.

2. GEOLOGY IN RELATION TO POTENTIALLY FAVORABLE URANIUM-BEARING AREAS

Guatemala can be divided into 4 major physiographic provinces (see map). The southern-most province, the Pacific Coastal Plain, is up to 50 km wide and consists of sediments eroded from the Volcanic Province immediately to the north. The Tertiary to Recent volcanics of the Volcanic Province include active cones that lie in a belt paralleling the Pacific Coast. The Cordilleran Province immediately to the north of the Volcanic Province is made up of folded Paleozoic and Mesozoic sediments and intrusive rocks. A thick sequence of Mesozoic and Tertiary sediments is found in the northern half of the country known as the Peten Lowland Province.

Early and middle Paleozoic rocks of Guatemala are exposed in E-W fault-bounded grabens that narrow westward toward Mexico. The Polochic fault on the north continues into Mexico but the Motagua fault in the South is covered in the West by Quaternary volcanic deposits. The fault zone extends eastward into the Caribbean Sea and Cayman Trench System. Between these faults lie the intensely metamorphosed garnet-biotite schists and gneisses of the Chuacús Group. The Pucal marble, a

member of the gneissic unit, is part of a discontinuous marble belt extending from the Mexico-Guatemala border to central Guatemala. South of the Motagua fault are less intensely metamorphosed phyllites and greenschist facies rocks of the Palacagüina metamorphics. A broad area of Mesozoic serpentinite and serpentinized peridotite is exposed in zones along these faults.

To the north of the fault zone about 1000 m of clastic wedge, flysch-type sediments were deposited during the late Pennsylvanian-early Permian. These are overlain by a thick Lower Permian limestone sequence. The clastic wedge is referred to as the Santa Rosa Formation and includes 2000 m of shales, sandstones and conglomerates. The limestones are the Chocal Formation and amount to about 1000 m of section. The limestones undergo a facies change northward to shales. Due to extensive faulting and metamorphism, the contact between the Chuacus Group and overlying Santa Rosa Formation is obscured. In some areas a unit of clastic strata, the Tactic Formation, and a unit of clastic and carbonate strata, the Esperanza Formation, are found. These sediments are exposed north of the metamorphic belt (see map). The Paleozoic rocks of this area were folded and uplifted during Permian to Jurassic time.

The Todos Santos Formation, a thick sequence of continental red beds and marginal marine clastics dated at late Jurassic-early Cretaceous was deposited in E-W aligned longitudinal troughs. Thick miogeosynclinal sequences of marine carbonates and evaporites unconformably overlie the early Cretaceous red beds. To the South, granite intruded these sediments in mid-Cretaceous time. A late Cretaceous clastic wedge, the Verapaz Group, contains abundant serpentine clasts and unconformably overlies the limestone sequences.

In the late Cretaceous through Oligocene, the area was intensely folded, thrust faulted and uplifted in the North with less activity in the South and Yucatan platform. Some late Oligocene sediments were deposited in the Chapayal embayment that cut across Mexico and into northwestern Guatemala. In southeastern Guatemala, the early Tertiary is represented by the Subinal Formation consisting predominantly of shale, poorly sorted sandstone, and conglomerate with thicknesses varying from 100 to 1000 m. Some of the beds are red and the components include all older and contemporary rock types. In the upper part of the formation, the nonvolcanic beds are interbedded with volcanic tuffs and the whole formation grades up to the Tertiary volcanic sequence.

Cenozoic volcanic rocks cover much of the southern part of Guatemala. Volcanism started in the Miocene and continues today. Early volcanic activity produced thick rhyodacite tuffs, ignimbrites and associated lahars. Currently large andesite composite cones and basaltic cinder cones and flows mark the volcanic belt.

3. PAST EXPLORATION

Before 1959 a private individual (Mr. René Abularach) is reported to have made an airborne radiometric survey of the Sierra de las Minas and Sierra Madre Ranges. Although many anomalies were detected by this survey, none were verified in the ground survey followup, despite apparently adequate flight control.

In 1968 a United Nations Special Fund Mineral Survey Project completed over 1,000 km of carborne radiometric survey with geiger counter readings at 500 m intervals. No anomalies were detected, but background radioactivity for several formations and geologic environments was established.

In 1969 the Guatemalan government solicited the IAEA for technical assistance in conducting a preliminary uranium favorability study designed to formulate recommendations for a national radioactive ore prospecting program. A carborne radiometric survey was made of environments theoretically favorable for uranium deposition, with spot geological and radiometric examinations being conducted in the more favorable areas.

All important mining regions of Guatemala except the laterites and the ultrabasics were visited. Mine stockpiles, waste dumps, and tailings dams were monitored where possible. Approaches to mining districts were checked radiometrically on the presumption that uranium occurrences may exist peripheral to base-metal mining districts. Several kilometers of contact zones were examined. Carborne radiometric surveys were conducted, and sources of all apparently anomalous signals were investigated by foot. Airborne surveys were considered but decided against because of hazardous terrain and lack of suitable equipment.

No evidence of a uranium province was observed in these field investigations and the recommendation was made that the government not embark on a more detailed national prospecting program at that time.

4. URANIUM OCCURRENCES AND RESOURCES

At the time of completion of the IAEA-Guatemalan government (GOG) reconnaissance program in 1971, no uranium reserves or resources were known. The occurrence that originally precipitated this joint investigation was a sample of betafite-bearing rock from a pegmatite in the Department of El Quiché. This pegmatite also produced the only radiometric anomaly of this survey; however, since most pegmatites are generally considered economically unfavorable for uranium production, the area was dismissed from further evaluation.

More recent information on uranium occurrences and resources in Guatemala does not appear to be available.

5. PRESENT STATUS OF EXPLORATION

Information on more recent uranium reconnaissance than that undertaken during 1971 IAEA-GOG study is lacking. However, in more recent years the country's mineral potential has been generally evaluated with the aid of the UN and ICAITI (Central American Research Institute for Industry).

Except for quarry materials, the state owns all minerals. Radioactive minerals and petroleum are regulated by special laws rather than by the basic mining code. Certain areas have been designated as national reserves which are closed to mining unless the government grants concessions for exploration or mining. While foreign citizens and companies may be granted prospecting rights, they are somewhat restricted with regard to obtaining exploitation concessions. The state has priority on purchase of any mineral production needed for the

country's welfare, subject to compensation at world prices.

6. AREAS FAVORABLE FOR URANIUM MINERALIZATION AND POTENTIAL FOR NEW DISCOVERY

Environments which were considered favorable for uranium mineralization during the joint IAEA-GOG investigation included:

(1) Pb-Zn and Fe mineralization in fracture-controlled Permian and Cretaceous limestone,

(2) bedded Sb-W deposits in Permian limestone and shale,

(3) fault-controlled Cu, Pb, Zn and Ag deposits in volcanic rocks, limestone and interbedded shales,

(4) major and minor fault zones,

(5) intrusive contacts with gneissic metasediments, micaceous and graphitic slate and schist, and Cretaceous limestone and clastics.

Many of these supposedly favorable environments were investigated during the 1971 reconnaissance. No radiometric anomalies were observed, however, and there appears to be little potential for discovery of uranium in Guatemala in these environments.

The following additional possibilities for uranium are suggested on the basis of the geologic characteristics of the country:

(a) Sandstone-type deposits

The Todos Santos Formation, composed of Jurassic-Cretaceous continental and marginal marine clastics, is possibly favorable for sandstone-type deposits; it is, however, lacking in associated volcanics. The Tertiary Subinal Group in the southeast also is promising as it contains continental red beds with interbedded volcanics.

(b) Disseminated magmatic, pegmatitic, and contact deposits in igneous and metamorphic rocks

Uranium deposits with pegmatitic affinity might be found in the Guatemalan metamorphic belt and/or associated with intrusive rocks. Granitic intrusives offer the possibility of contact-type deposits at granite-metasediment and sediment contacts.

(c) Vein deposits

Conditions suitable for vein deposits may be present in the Cordilleran Province, but possibilities are restricted to rocks of post-Precambrian age.

(d) Other types

The extensive carbonate sequence in the Peten, known to be a possible petroleum producing area, might be suitable for deposits of uranium with this host-rock association.

Quartz-pebble conglomerate and Proterozoic unconformity related deposits are unlikely to be found in Guatemala owing to the lack of suitable host rocks.

Although there has to date been no indication of associated uranium deposits, clastic continental and marginal marine sediments offer some prospects for uranium discovery, particularly since possible source rocks (volcanics) are present. The potential for pegmatite and vein type deposits cannot be evaluated from the information available on the geology of the country.

It is estimated that potential uranium resources may be on the order of 1,000 to 10,000 tonnes of uranium.

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I would rate this country as Group (1) with this (small) potential from the Subinal Group (in particular the upper parts).

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PHYSIOGRAPHIC AND GEOLOGIC MAP OF GUATEMALA