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Prospection of Coal in the Area of the Simpur River Southeast of Bengkulu on the Island of Sumatra (Indonesia)

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A geological prospection has ben carried out in a part of the Bengkulu basin attributed to the Tertiary age, in which coal deposits have been identified. Intensive neotectonic movements and magmatic activity have been also ascertained.

In the region of the Simpur river two coal outcrops have been discovered. The chemical analyses of coal samples have shown that it is a question of brown coal of high quality, which might achieve a significant commercial value.

Izvršena je geološka prospekcija dijela bazena »Bengkulu«, u kojem se nalaze naslage ugljena. Ustanovljena su intenzivna neotektonska kretanja i magmatska aktivnost. U predjelu rijeke Simpur otkrivena su dva izdanka ugljena. Kemijske analize uzoraka ugljena pokazale su da se radi o smeđem ugljenu dobre kvalitete koji bi mogao imati značajnu ekonomsku vrijednost.

INTRODUCTION

In the area of the Simpur river on the island of Sumatra during the summer months of the year 1986 a prospection of coal was carried out. The aim of this exploration was to evaluate potentials of the explored terrain on the basis of field prospection, sampling and sample analyses for the purpose of further detailed explorations as well as possible expoitation of coal. During the prospection two outcrops of coal deposits were identified, from which samples for analyses were taken. A recently opened strip coal pit, located on the north-western edge of the prospected terrain was visited, too. On the uncovered terrain of the coal mine lithostratigraphic and structural relations could be noticed, which are otherwise hardly visible in this terrain covered with thick vegetation (jungle).

The geological relations in the prospected area, as well as the characteristics of the Bengkulu Tertiary basin with coal outcrops have been described.

Besides the authors, the field prospection was attended by Mr. Mahruf Madjakir, mining engineer with the Government Institution in Beng-

kulu, Mr. E. Rasjad, who was in charge of the work and life organization in the field. Man-power from the local population was provided for carrying the equipment and samples. We thank to all of them most cordially for a successful co-operation.

Chemical analyses of coal samples were done by Mrs. V. Supek, B. Sc. (Chem), to whom we are expressing our most sincere thanks as well.

GEOGRAPHICAL POSITION OF THE EXPLORED AREA

The prospected area is situated in the south-eastern part of the island of Sumatra (Fig. 1). It is about twenty kilometres far from the coast of the Indonesian Ocean.

The terrain gradually rises reaching the height of about 700 m above sea level in the cultivated area. The terrain is well-indented so the relief morphology indicated numerous valleys at 300 m above sea level as well as hills with a height exceeding 700 m. Numerous brooks and rivers flow along the valleys, the Simpur river and the Seluma river being the biggest among them. All water streams flow toward the south and empty into the Indonesian Ocean.

The explored area is located in a jungle and access to it is very difficult.

PREVIOUS EXPLORATION AND TECHNICAL DOCUMENTATION AVAILABLE

The area to be investigated has been very poorly explored until now, therefore the basic technical documentation is missing.

Concerning the topographic data sheets, we had at our disposal only topographic maps in the scale 1:250.000 of inadequate quality prepared during the Second World War (in 1943.). However, new topographic maps in the scale 1:50.000 are just being prepared. On the contrary, such maps are already finished for the region north from the investigated area, so the ones for the investigated area are expected to be completed in the very near future as well.

This will facilitate the orientation and work in the field as well as mapping of geological-structural elements and ore outcrops.

The geological documentation is also very unsatisfactory, the only available we had was a geological map in the scale 1 : 250.000 without explanation.

Another technical documentation dealing with this area was not available to us. Several old published geological reports availabe to us deal with a regional geological structure of the island of Sumatra or the whole part of Indonesia, however, this region is not mentioned at all.

GEOLOGY OF THE TERRAIN PROSPECTED

Basic geological data have been shown on the general geological maps (Peta geologi Lembar Bengkulu and Peta geologi Lembar Mauna, Sumatra) in the scale 1 : 250.000 by Rairman and Subandoro (1977) (Fig. 2).

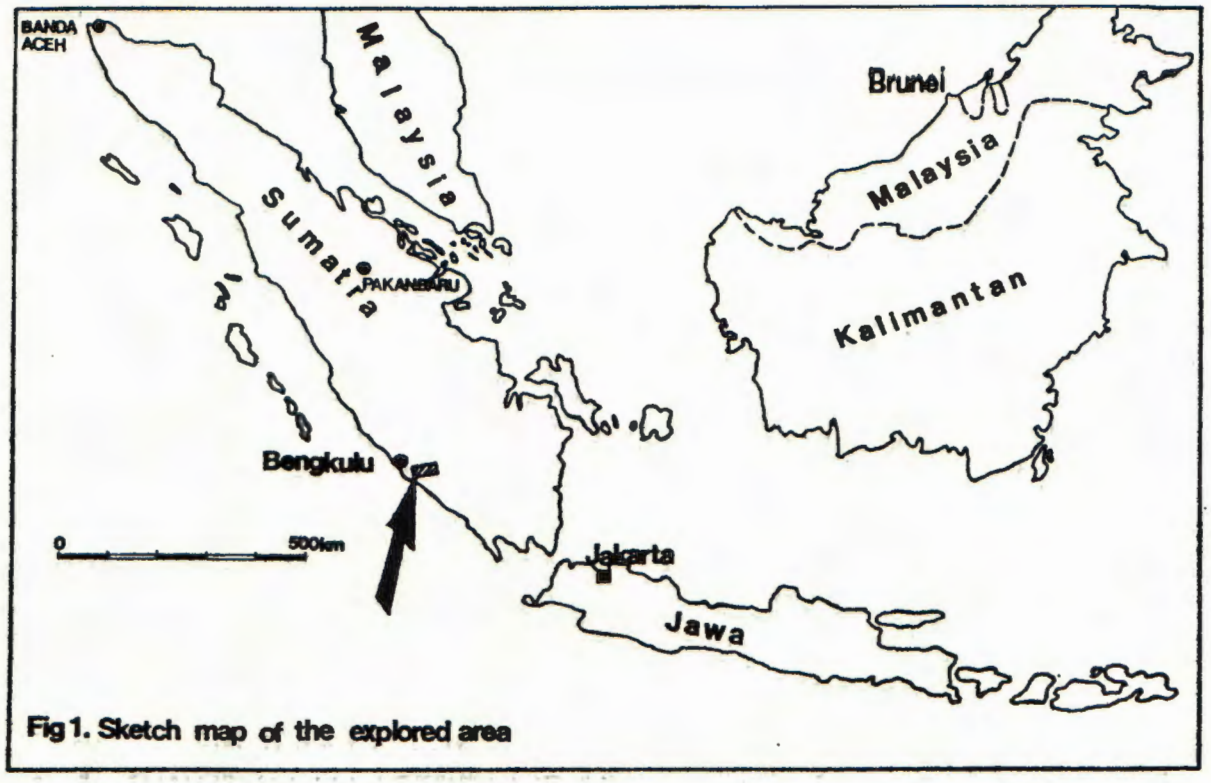
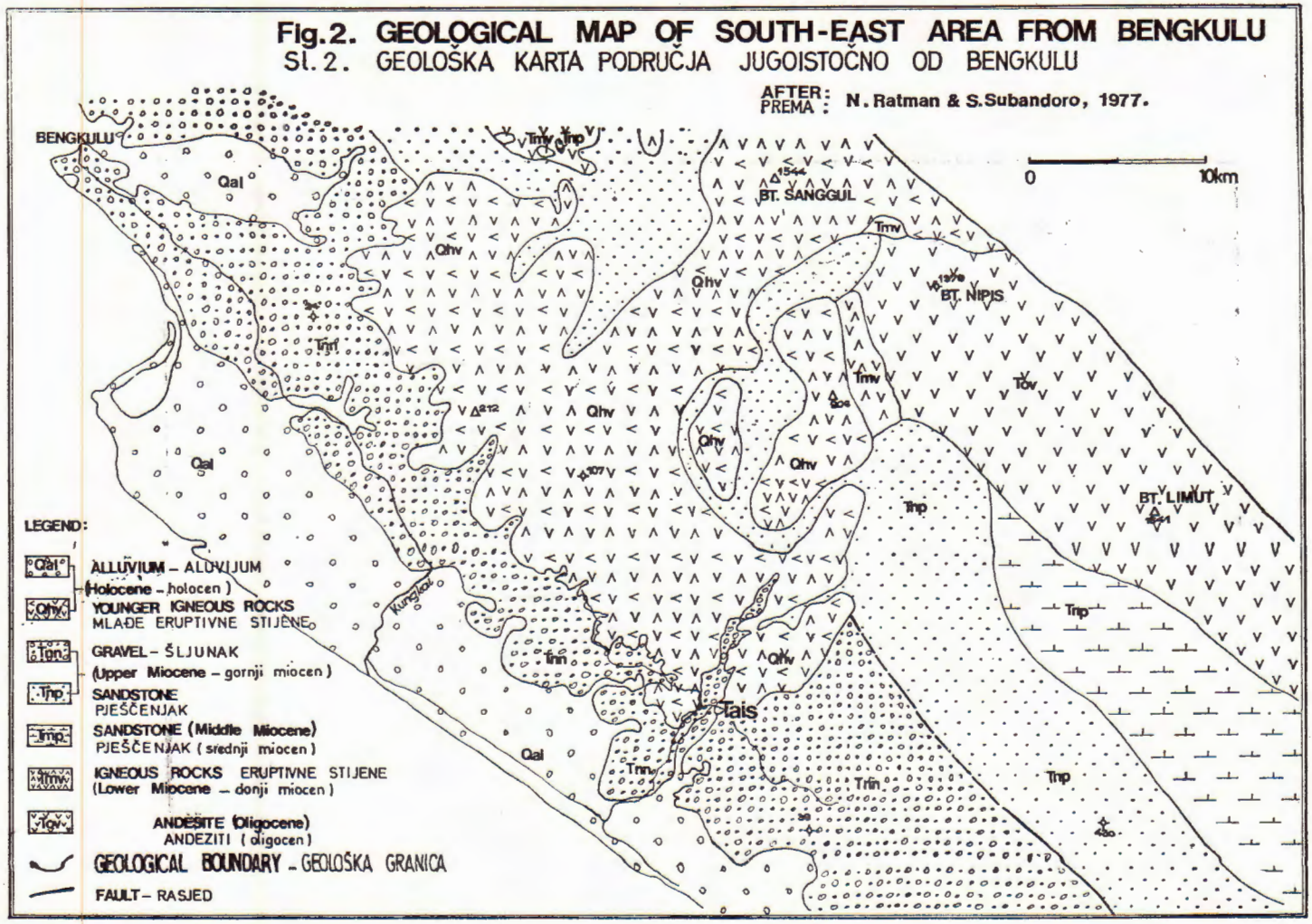


Fig 1. Sketch map of the explored area

Fig. 2. GEOLOGICAL MAP OF SOUTH-EAST AREA FROM BENGKULU

Sl. 2. GEOLOŠKA KARTA PODRUČJA JUGOISTOČNO OD BENGKULU



According to these maps the investigated area is composed of Tertiary and Quaternary sediments and igneous rocks.

Miocene sediments are composed mainly of clastic rock: sandstones, conglomerates, mudstones, breccia, marl and some limestones.

Within this complex of rocks there are coal seams as well as intercalations of volcanic pyroclastic sediments and andesite seams. The contacts of Miocene deposits and older rocks are covered so it is difficult to define their relation.

In the basement of the Miocene sediments the magmatic rocks of Paleogene and Pre-Tertiary age are determined by drilling, however, sporadically there are also sediments of Cretaceous and Jurassic age.

In the central part of the Miocene deposits, in the region of the Bukit Sunur coal-mine there occurs a coal-bearing horizon which sometimes consists of seven coal layers separated by seams of clay and tuff. The basement of the coal horizon is often composed of sand and sand-marl deposits, the age of which is not precisely defined. On the general geological map they are assigned to Lower Miocene age, provided that they can partly belong to Oligocene as well. The sediments overlying the coal-bearing deposits are assigned to Upper Miocene age.

Coal-bearing horizons: These are formations of fluvial, lake and pond environments. There are actually semi-isolated and at places isolated depressions of various dimensions which are convenient for the accumulation of organic matter. In such depressions intermittent layers and isolated lenses of coal deposits are encountered. The thickness of the coal-bearing horizon and coal layers within the whole basin varies as the coal settled into the depressions at various rate of subsidence.

During prospection works, recording and visual observation of rocks directly from basement and overburden of coal outcrops were made. Coal samples were taken for analyses from soil surface but there were taken also samples of rocks belonging to basement and overburden to be defined with respect to age more precisely. In the microscopic slides prepared from the samples taken directly from the basement and overburden of coal, fossils are missing entirely so it is not possible to define the age of deposits precisely. Through a visual observation it has been ascertained that in the basement of coal deposits there are fine-grained to medium-grained quartzite sandstones, light-olive coloured. In the overburden of coal deposits there occur clay and marl deposits of pale-olive to medium-grey colour as well as volcanic tuffs of light-grey colour.

In the prospected area there are several outcrops of coal predominently in the valleys of rivers and brooks.

Plio-Quarternary sediments are extended in the coastal part of the area where they cover Miocene deposits. They are composed of sandstones, gravel and clays, however, there are sometimes smaller occurrences of coralliferous limestones. These deposits are predominantly of lake origin.

Igneous rocks are presented mainly by andesites, rhyolites and tuffs. They usually occur in the basement of the Miocene deposit complex that is in the Oligocene, but they are encountered also inside of these

sediments. The young volcanic rocks are also developed in the Plio-Quarternary age. Magmatic activity of the Neogene — Quarternary age made a great influence upon a diagenesis ie. metamorphism of coal deposits.

Tectonics

Tectonic relations of the island of Sumatra are very complex. Through the geological history very complex repeated tectonic movements took place followed by an intensive magmatic activity. Such an activity has proceeded to these very days. It is necessary to observe the tectonics of Sumatra as well as of other Indonesian islands in the plate tectonic model, in which the plate of the Indonesian ocean is slipped under the continental part of Sumatra (Fig. 3).

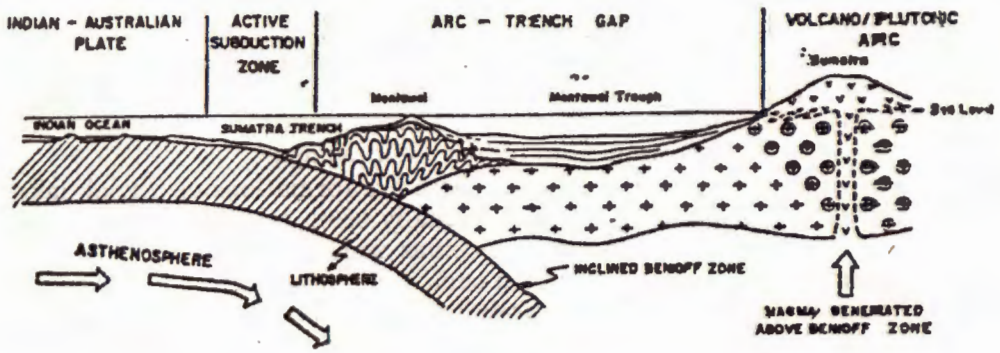


Fig. 3 Schematic cross-section of Sumatra (acc. to J. A. Katila, 1974)

Sl. 3 Shematski profil otoka Sumatre (po J. A. Katili, 1974)

1 — Cenozoic sediments (kenozojski sedimenti)
2 — Young volcanic rocks (mlade vulkanske stijene)
3 — Deformed Tertiary rocks (deformirane tercijarne stijene)
4 — Basement rocks (temeljne stijene)
5 — Continental crust (kontinentalna kora)
6 — Oceanic crust (oceanska kora)

According to J. A. Katila (1974) the most intensive subduction was in Tertiary age, while in Pliocene age it was followed by intensive volcanism. This regional tecto-magmatic activity from the Neo-tectonic age caused basic features of geological structure of the island of Sumatra. The consequences of such an activity are simple and very complex structural patterns.

Numerous longitudinal and transversal faults with significant vertical and horizontal movements could be noticed on the terrain. Reverse mo-

vements well manifested in the coal deposits (Plate I, Fig. 1) were also visible. Such movements conditioned the disturbance of coal deposits, however, at the same time they were favourable for the carbonization process and metamorphism of coal deposits i. e. the transition of turf into coal of higher quality.

CHARACTERISTICS OF THE BENGKULU TERTIARY COAL BASIN

The Tertiary coal basin called Bengkulu is located along the coastal part of the south-west Sumatra between a place called Buntuhan in the south-east and a place called Pasar-Bantal in the north west in the length of 350 km. The basin is situated between the Indonesian Ocean and the central mountain range with the highest peaks BT. Raja Mandara (2817 m), BT. Dingin (2020 m), BT. Daun (2483), GI. Pandan (2168) etc., of an appropriate width of 30—35 km covering an area of approx. 11000 sq. km.

On the surface of the basin there are sediments of Tertiary and Quarternary age extending as an elongated zone in the NW-SE direction. These sediments form a complex sedimentation cyclus and include sandstones, conglomerates, clays, breccias, marls, sand and coal deposits. During formation of the basin a magmatic-volcanic activity took place periodically in the basin itself or on its edge, so that tuffs, basalts and andensites occured (Fig. 4).

The formation of Tertiary sediments was conditioned by a persistant rhythmic basin subsidence compensated by uniform sedimentation deposits.

On the basis of the coal outcrops extension and the structural and geomorphological characteristics of the site it can be stated that the circumstances for the accumulation of organic matter (plants) have been favourable even at a wider area; in other words the paleorelief was well-indented and hydrographic and climatic-pedological conditions were suitable for the occurrence and development of coal deposits. A well-indented relief can be proved also by an uneven thickness and number of coal layers in individual parts of the basin.

Separated, individual occurrences of coal are arranged one next to the other proving existence of shallow semi-isolated or completely isolated depressions, in which the subsidence proceeded according to the accumulation rate of the peat matter. However, there existed also deeper and more stable depressions in which accumulation of significant quantities of peat occured through a Quarternary deposition of decayed plant substance from the shallower neighbouring areas.

According to the technical documentation available about thirty coal outcrops have been identified in the area of the basin.

The influence of the distance of magmatic activity on the coal metamorphism has been recognized, too. In the above coal-bearing basin the coal occurs in several layers. Dr. A. Horkel (the Bukit Sunur coal mine) informed us that in the area of the coal mine detailed geological exploration had been carried out ascertaining that coal occured in one, but also in seven layers of different thickness exceeding even 10 m implying, however, various qualities of coal layers.

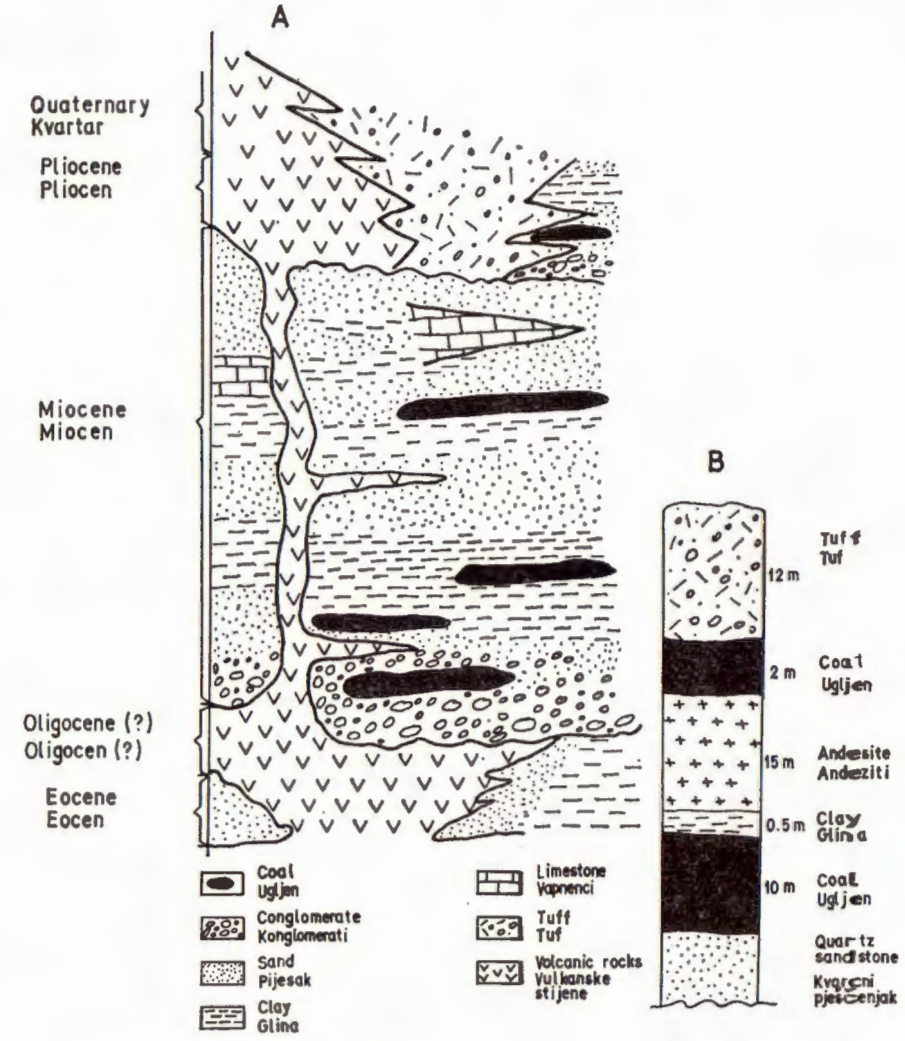


Fig. 4 Lithological schematic columnar section of »Bengkulu« Tertiary basin (A) and detailed lithological column of drilling well (B).

Sl. 4 Litološki shematski stup tercijarnog »Bengkulu« Bazena (A) i detaljni litološki stup iz bušotine (B).

Similar circumstances might be expected in the other parts of the basin.

Coal substance from the coal layers of the above basin belongs to a group of highly calorific »brown coals« (subbituminous C coal), with some seams of layers passing into »pit coals«. Main characteristics of coal in this basin are as follows: a high heating value, generally exceeding kJ/kg 25000—29300, a low sulphur content amounting less than 1% and a relatively high C-fix content.

The technical analyses indicate that the coal from different basin parts has got different characteristics so it could be used for various purposes. From the mining-commercial viewpoint it is necessary to emphasize that the coal outcrops occur most frequently at an altitude of more than 250 m and less than 40 km far from the sea coast.

It can be estimated that the coal layers are mostly moderately inclined, mostly at an inclination of 10—15°, except in those basin parts where they are tectonically disturbed. Therefore it could be assumed that the majority of the discovered coal deposits would be partly feasible for the strip pit exploitation.

In the whole, the Bengkulu Tertiary coal-bearing basin can be considered promising for further exploration and exploitation of coal. However, the feasibility of each individual parts of the basin can differ significantly. Therefore the detail geological explorations which would define more precisely the ore-bearing regions are inevitable.

Taking into consideration the intensive magmatic activity the occurrence of other useful minerals might be expected in the area of the above basin.

COAL OUTCROPS

In the area of the Simpur river we carried out a field prospection of coal outcrops in two localities designated on the map as locality No. 1 and No 2 (Fig. 5). Both localities are in the right tributaries of the Simpur river.

Locality No. 1

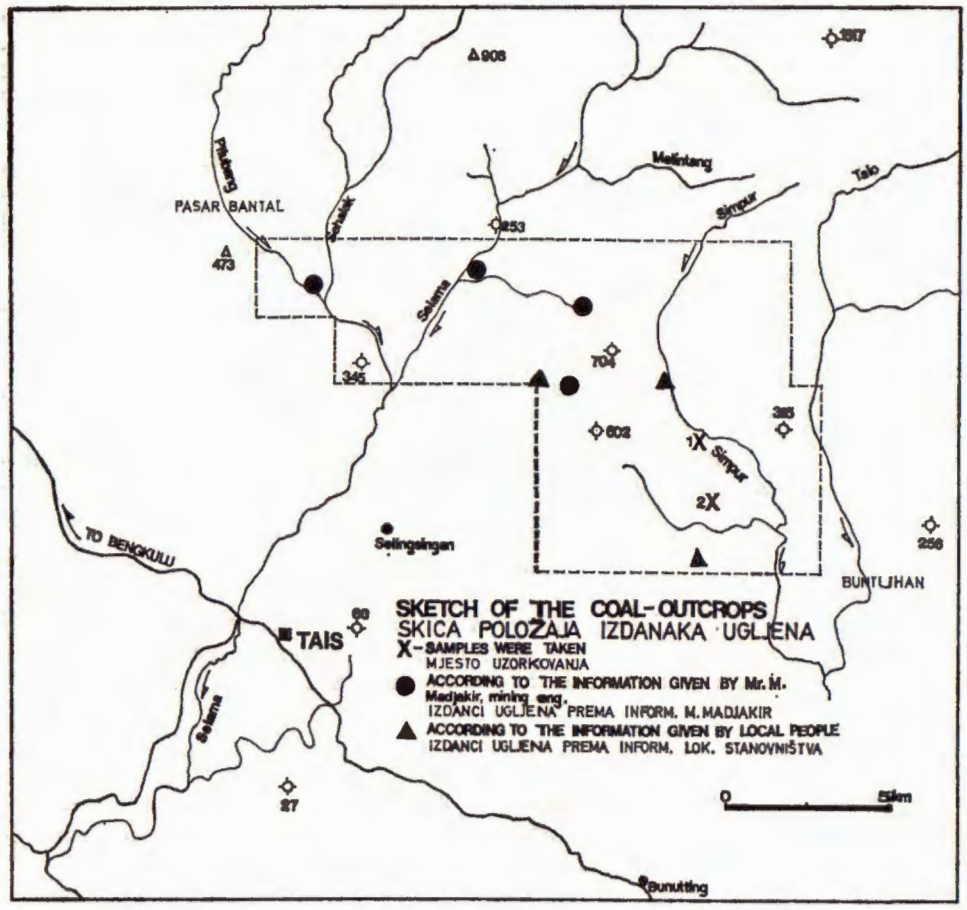
The coal outcrop is located in a deeply cutted valley with a small brook. The valley is covered with thick and high vegetation so it is possible to observe the coal outcrop on a rather small area. The outcrop is located on the left bank of the brook and it can be observed at the length of 6 m only (Fig. 6,a).

The strike and dip of coal beds cannot be precisely defined, as the coal at the surface is wet, soaked, crumbly and covered with humus and thick vegetation.

The coal layer could be visually identified at a part of the outcrop in thickness of 1 m and at the other part in thickness of 2 m. The coal colour is completely black. As the coal is very crumbly, it breaks easily into small pieces. Strata can be hardly identified, the strike of beds amounts to 140/15°.

The coal deposit lie on rather crumbly fine-grained sandstones having a grey to brown colour. These sandstones are together with the coal deposit dislocated through a fault, which spreads along the brook bed, The fault is identified as an almost vertical and completely flat surface (like a mirror) in the sand-coal deposits. The fault surface dips steeply toward the valley and is orientated 180/75°.

The coal is covered with rather crumbly sandstones passing into sands mixed with clay and humus.



On the left slope of the valley, about 15 m above the brook, a smaller outcrop of a very crumbly coal was discovered. (Fig. 6,b) As the outcrop is covered with humus and vegetation, the elements of strata could not be identified.

It can be assumed that the coal represents a part of the same »package« of the coal deposits as recorded in the brook itself. It supports the assumption that we deal here with several coal beds separated by sand-clay sediments.

Samples were taken from the mentioned outcrops and chemical analyses made. The samples were taken from the lower seam directly from the brook (Fig. 6,a; samples $1a_1$ and $1a_2$), then from the upper seam (a visible one) and from the soil surface, about 15 m above the brook (Fig. 6,b; samples 1b).

The coal characteristics obtained by chemical analyses are listed in the Table 1.

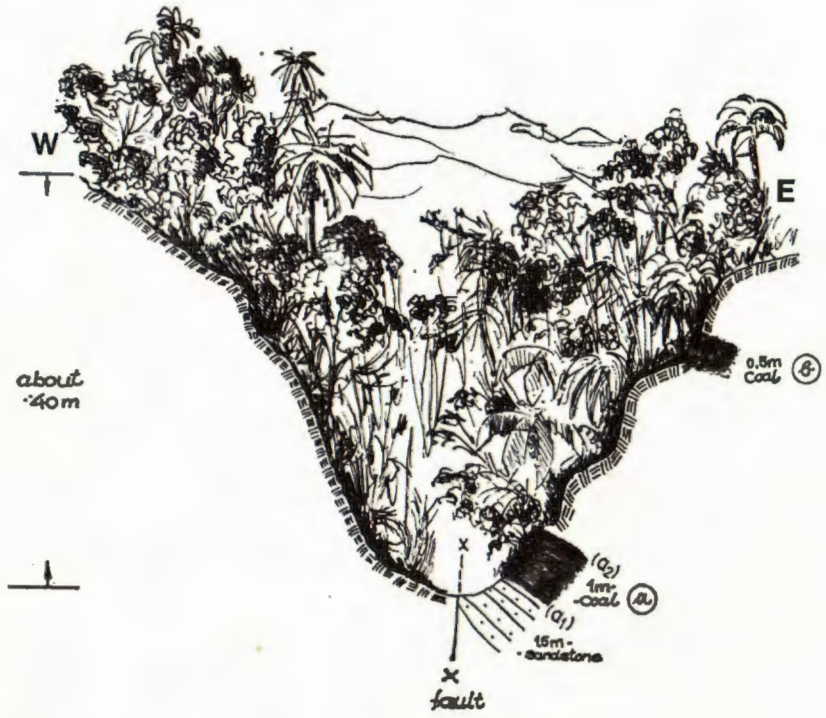


Fig. 6 The cross-section of the valley with two outcrops of coal (a and b)
Sl. 6 Profil doline s dva izdanka ugljena (a i b)

Locality No. 2

A bigger coal outcrop appears downstream along the Simpur river also in a valley of its right tributary (Loc. No. 2).

In this locality the coal was found in the brook bed itself i.e. at the waterfall 5 m high. The elements determining the characteristics of coal deposits were not available for observation, as the outcrop is visible to the extent the brook reveals it. The thickness of the revealed coal outcrop amounts to 5 m. The coal is soaked, black in colour and it crumbles easily. The coal deposit basement could not be observed as it lies under water surface, while the overburden is covered with a thick layer of humus and vegetation. It is predominantly of crumbly sandstones mixed with clay.

In addition to this outcrop we found another outcrop of coal situated above the waterfall in the same brook on its right bank. The data on its strike of layers and their thickness could not be identified either. For that purpose pitting and test drilling should be done.

Samples were taken for chemical analysis both from the lower seam (samples 2a) and the upper seam (samples 2b) of the outcrop. The characteristics of coal obtained by chemical analyses are listed (Table 2).

Table 1. Data obtained by chemical analyses.
Tablica 1. Podaci dobiveni kemijskim analizama.

	Samples 1 a1			Samples 1 a2			Samples 1 b		
	as delivered	dry basis	combustible	as delivered	dry basis	combustible	as delivered	dry basis	combustible
TEHNICAL ANALYSIS									
moisture	29,84	—		32,10	—		44,72	—	
hygro moisture	10,90	15,53		9,35	13,77		7,38	13,35	
total moisture	40,74	—		41,45	—		52,10	—	
ash	3,29	4,69		14,33	21,11		19,66	35,56	
combustible	55,97	79,78		44,22	65,12		28,24	51,56	
total sulphur	0,34	0,48		1,91	2,82		0,74	1,33	
high heat value HHV kJ/kg	15.077	21.487	26.932	11.627	17.124	26.296	6.036	10.919	21.372
low heat value LHV kJ/kg	13.557	20.390	26.046	10.218	16.232	25.459	4.497	10.170	20.561
PROXIMATE ANALYSIS									
coke (char)	31,26	44,56		36,08	53,13		29,93	54,15	
volatile matter	68,74	55,44		63,92	46,87		70,07	45,85	
moisture	40,74	15,53		41,45	13,77		51,20	13,35	
ash	3,29	4,69		14,33	21,11		19,66	35,56	
fixed carbon	27,97	39,87	49,98	21,74	32,02	49,17	10,28	18,59	36,39
dry volatile	28,00	39,91	50,02	22,48	33,10	50,83	17,96	32,50	63,61
ELEMENT PERCENTAGES									
% C	35,36			28,07			15,16		
% H	3,13			2,41			1,84		
% S	0,26			1,52			0,50		
% 0	16,52			11,86			9,89		
% N	0,71			0,36			0,84		

Table 2. Data obtained by chemical analyses.
Tablica 2. Podaci dobiveni kemijskim analizama.

	Samples 2 a			Samples 2 b		
	as delivered	dry basis	combustible	as delivered	dry basis	combustible
TECHNICAL ANALYSIS						
moisture	23,62	—		24,64	—	
hygro moisture	9,67	12,66		9,06	12,02	
total moisture	33,29	—		33,70	—	
ash	29,77	38,98		35,83	47,54	
combustible	36,94	48,36		30,48	40,44	
total sulphur	0,79	1,04		0,98	1,30	
high heat value HHV kJ/kg	8.941	11.706	24.206	6.739	8.943	22.114
low heat value LHV kJ/kg	7.737	10.907	23.212	5.594	8.244	21.130
PROXIMATE ANALYSIS						
coke (char)	45,24	59,23		47,73	63,34	
volatile matter	54,76	40,77		52,27	36,66	
moisture	33,29	12,66		33,70	12,02	
ash	29,77	38,98		35,83	47,54	
fixed carbon	15,47	20,25	41,87	11,91	15,80	39,07
dry volatile	21,47	28,11	58,13	18,57	24,64	60,93
ELEMENT PERCENTAGES						
% C	22,80			17,67		
% H	2,13			1,76		
% S	0,48			0,51		
% O	11,14			9,97		
% N	0,47			0,56		

In addition to the coal outcrops on the locations, from which samples were taken, there exist also other locations, on which coal is encountered. M. Madjakir informed us that in the neighbourhood of the investigated area there were several locations, where coal was identified (Fig. 5). Almost all these locations are situated in the valleys of brooks and rivers and their orientation is generally toward the north-west and south-east i.e. in the direction of expansion of a coal-bearing basin called Bengkulu. Local inhabitants pointed also to some locations, where coal was noticed.

COAL MINE »BUKIT SUNUR«

There is an active coal mine called P.T. Bukit Sunur — Odeco about 30 km far from the investigated localities of coal toward the north-west. In the mine we got a specific impression of the geological and structural relations of the whole coalbearing basin and characteristics of coal layers, while the analyses of coal from this mine can be compared with the results obtained by analyses of coal from the investigated area. Other

mining and commercial elements relevant for further exploration activities could be envisaged as well.

The coal mine is located almost in the centre of a Tertiary coal-bearing basin called »Bengkulu« in a mountainous area. There are 3 main coal layers, the thickness of which ranges from 1 to 6 m (Plate I, Fig. 1). The coal deposits are intensively tectonically disturbed which could be ascertained through various positions of coal seams. So, completely horizontal coal seams and the ones being very steep coud be noticed (Plate I, Fig. 2).

The coal layer basement is built mainly of crumbly tuff and quartzite sandstone, while the overburden consists of clay marl and tuff covered with humus.

Thinner seams of clay and andesite rocks 10—15 m thick can be found between coal layers.

A sample was taken from the coal deposits of this coal mine and a chemical analysisi was made ascertaining the following values (Table 3).

Table 3. Data obtained by chemical analyses.

Tablica 3. Podaci dobiveni kemijskim analizama.

	as delivered	dry basis	combustible
TEHNICAL ANALYSIS			
moisture	1,68	—	
hygro moisture	10,01	10,18	
total moisture	11,69	—	
ash	7,78	7,91	
combustible	80,53	81,91	
total sulphur	0,52	0,53	
high heat value HHV kJ/kg	25.518	25.954	31.686
low heat value LHV kJ/kg	24.300	24.757	30.539
PROXIMATE ANALYSIS			
coke (char)	50,37	51,24	
volatile matter	49,63	48,76	
moisture	11,69	10,18	
ash	7,78	7,91	
fixed carbon	42,60	43,33	52,90
dry volatile	37,93	38,58	47,10
ELEMENT PERCENTAGES			
% C	66,66		
% H	4,16		
% S	0,34		
% O	8,58		
% N	0,79		

From the results obtained by the analyses it can be found that there exist significant differences in characteristics of coal layers at individual locations. These differences can be interpreted in several ways, for exam-

ple by different rate of subsidence of particular basin parts as well as by different distance of magmatic activities from the coal deposits and its influence upon the coal layers. Besides the aforementioned, it is necessary to point out that the samples taken from the outcrops on the locations No. 1 and No. 2 were taken from the soil surface and in the brook itself i.e. in the water, while the samples taken in the coal mine »Bukit Sunur« were taken from a deeper coal layer at the depth of about twenty meters. Therefore a significant difference results in the content of total moisture, which amounts only to 11,69% in the mine sample, while its amount in the samples taken on the locations No. 1 and No. 2 ranges from 33% to more than 50%.

This certainly affects the order data as well, for example the heating value. So, for example, a mine sample has got Kj/kg 25512, while the heating value of the samples taken on the locations No. 1 and No. 2 ranges from kJ/kg 6300—15000. However, the pure combustible matter is approximately equal: in the mine sample it amounts to kJ/kg 31678, and in the samples taken on the locations No. 1 and No. 2 it ranges from kJ/kg 21347—26998. The other measured data have got approximately equal values, too.

Based on the above-mentioned value it can be assumed that a decreased heating value of the samples taken on the locations No. 1 and No. 2 in relation to that of the mine sample is conditioned by the place from which a sample was taken i.e. that the coal on the locations No. 1 and No. 2 has been exposed to atmospheric influences and the action of running streams for a long period, thus causing the decrease of its heating value. The above results in the assumption that the coal taken from the deeper layer under the surface would have a higher heating value than the sample taken from the surface. This assumption is supported by the statement that in this case, generally speaking, the same coal-bearing basin is in question, which has suffered the same volcanic-tectonic activity and that there exists a great similarity in the macroscopic characteristics of coal.

CONCLUSION

Through a geological prospection of a part of the Bengkulu basin of the island of Sumatra an intensive tecto-magmatic activity has been noticed. There were ascertained coal outcrops, from which samples have been taken for chemical analyses. The analysis results show that it is a high quality brown coal.

The coal is attributed to the Neogene and Quarternary age. Magmatic activity, however, has significantly affected it causing its metamorphism and increased carbonization.

It is necessary to carry out a detailed geological exploration, through which coal deposits of an important commercial value might be proved.

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Prospekcija ugljena u području rijeke Simpur — JI od mjesta Bengkulu na otoku Sumatri (Indonezija)

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Područje rijeke Simpur smješteno je jugoistočno od mjesta Bengkulu u južnoj Sumatri. Udaljeno je oko dvadesetak kilometara od obale Indonezijskog oceana. Teren je dobro razveden s nadmorskim visinama od 300—700 m, i obrastao je gustom tropskom vegetacijom (tipična džungla). Do sada je slabo istraživan pa nedostaje osnovna topografska i geološka dokumentacija.

U navedenom području izvršena je geološka prospekcija s ciljem da se registriraju osnovni geološki elementi i eventualni izdanci ugljena.

Na temelju oskudne stručne dokumentacije i terenske prospekcije konstatirano je da je istraživani teren dio tercijarnog bazena (Bengkulu bazen) izgrađenog pretežno od neogensko-kvartarnih klastita i eruptivnih stijena. U njima su mjestimično razvijene ugljene naslage.

Zapažena su intenzivna tektonska kretanja koja su posljedica regionalne tektonike, ali i magmatske aktivnosti koja je bila osobito značajna u mlađem tercijaru i kvartaru. Ugljene naslage pojavljuju se mjestimično u više horizonata razdvojenih mlađe tercijarnim (miocenskim) klastitima i vulkanskim stijenama (andeziti, tufovi i dr.).

Magmatska aktivnost se značajno odrazila na naslage ugljena koje su pretrpjele metamorfozu i tako postigle veći stupanj karbonizacije.

Tokom prospekcije registrirana su dva izdanka ugljena iz kojih su uzeti uzorci za kemijske analize. Također su uzeti uzorci ugljena iz novootvorenog ugljenokopa smještenog na SZ rubu istraživanog terena, koji su također kemijski analizirani.

Rezultati kemijskih analiza pokazuju da se radi o smeđem ugljenu dobre kvalitete čija kalorična vrijednost ponegdje prelazi kJ/kg 25000.

Pri tome se značajno razlikuju vrijednosti dobivene kemijskim analizama, osobito stupanj vlažnosti, uzoraka uzetih s površine koji su bili izloženi duže vremena utjecaju vode i onih uzetih iz dubljih dijelova ležišta.

Obzirom na morfostrukturne karakteristike i geološki sastav Bengkulu bazena razmatrano područje može se smatrati interesantnim i perspektivnim za daljnja istraživanja i pronalazak značajnih zaliha ugljena.

PLATE — TABLA I

Fig. 1 »Bukit Sunur« coal mine. Steep coal beds are visible.
Sl. 1 Rudnik ugljena »BUKIT SUNUR«. Vide se strmi slojevi ugljena.

Fig. 2 »BUKIT SUNUR« coal mine. Coal is exploited in three floors. Deposits of coal are reversely faulted.
Sl. 2 Rudnik ugljena »BUKIT SUNUR«. Ugljen se eksploaira u tri etaže. Naslage ugljena su reversno rasjedane.

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