The Natural Radioactivity Survey of Landslides in Jawa Island.

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In this report we describe the result of investigation of landslides in Jawa from 25 July to 6 September 1978, which was carried out by professor S. Yamaguchi as representative, Saburo Nakamura, Shigeru Aoki, Yuji Takata and Nobuyuki Takahama.

The author has considered that it is desirable to use simultaneously natural radioactivity survey and electrical surveying method in order to do the drainage works more effectively. So we investigated the natural radioactivity survey as much as possible by the instrument (scintillation survey-meter type TCS 121 C) in the main landslide areas and the Sabo areas during our investigation tour.

The results of investigation which were obtained in the way described above are shown as follows.

- (1) Cipatat along the national road No. 1, west to Bandung, Bd. 22km—Bd. 24.4km, $(0.40-1.00 \times 10^{-2} \text{mr/h})$, av. $0.64 \times 10^{-2} \text{mr/h}$ (cf. Fig. 6)
- (2) Sidaradja, Bd. 60.5—Bd. 61.4km, $(0.70-1.00 \times 10^{-2} \text{mr/h})$, average $0.79 \times 10^{-2} \text{mr/h}$ (cf. Fig. 7)
- (3) Warunpeti, Bd. 68.5—68.8km, $(0.65-0.95 \times 10^{-2} \text{mr/h})$, average $0.79 \times 10^{-2} \text{mr/h}$ (Fig. 8)
- (4) Warungkiara, Bd. 126—Bd. 126.25km, $(0.20-0.50 \times 10^{-2} \text{mr/h})$, average $0.40 \times 10^{-2} \text{mr/h}$ (cf. Fig. 9)
- (5) Pasawahan, south to Pelabuhanratu, Bd. 158—Bd. 159km, $(0.30-0.60 \times 10^{-2} \text{mr/h})$, average $0.46 \times 10^{-2} \text{mr/h}$ (cf. Fig. 10)
- (6) Pasawahan, Bd. 164.85—Bd. 165km, $(0.90-1.30 \times 10^{-2} \text{mr/h})$, average $1.08 \times 10^{-2} \text{mr/h}$ (cf. Fig. 11)
- (7) Pasikusalam, south to Sukabumi, Bd. 118km, $(0.50-0.55 \times 10^{-2} \text{mr/h})$, average $0.51 \times 10^{-2} \text{mr/h}$ (cf. Fig. 12)
- (8) Rantjaorai, Bd. 117 $(0.40-0.60 \times 10^{-2} \text{mr/h})$, average $0.48 \times 10^{-2} \text{mr/h}$ (cf. Fig. 12)
- (9) Tikawung Warungpeuteui, Bd. 115 $(0.35-0.60 \times 10^{-2} \text{mr/h})$, average $0.46 \times 10^{-2} \text{mr/h}$ (cf. Fig. 12)
- (10) Tjisogan, Bd. 52km, $(0.50 \times 10^{-2} \text{mr/h})$
- (11) South to Cianjur, Bd. 125km, $(0.50 \times 10^{-2} \text{mr/h})$
- (12) South to Cianjur, Bd. 121.5km, $(0.30 \times 10^{-2} \text{mr/h})$
- (13) South to Cianjur, Bd. 116.5km, $(0.30 \times 10^{-2} \text{mr/h})$
- (14) South to Bandung, Bd. 50km, $(0.35 \times 10^{-2} \text{mr/h})$
- (15) Pintmurabaru, Bd. 46km, $(0.25 \times 10^{-2} \text{mr/h})$
- (16) Pangalengan, Bd. 38.1km, $(0.65 \times 10^{-2} \text{mr/h})$
- (17) Bandung, $(0.75 \times 10^{-2} \text{mr/h})$
- (18) The top of G. Tangkubanparahu, 1830m above sea level, $(0.75 \times 10^{-2} \text{mr/h})$

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- (19) A hot spring, south to G. Tangkubanparahu, 1500m above sea level (1.35×10^{-2} mr/h)
- (20) Maribaya, north to Bandung, (0.95×10^{-2} mr/h)
- (21) South to Maribaya, (0.65×10^{-2} mr/h)
- (22) Surabaya, (0.45×10^{-2} mr/h)
- (23) Tokol Sabo-dam, (0.23×10^{-2} mr/h)
- (24) Selorejo dam, (0.20×10^{-2} mr/h)
- (25) Malang, (0.45×10^{-2} mr/h)
- (26) Karangkates dam, (0.15×10^{-2} mr/h)
- (27) Lahor dam, (0.32×10^{-2} mr/h)
- (28) Wlingi dam, (0.20×10^{-2} mr/h)
- (29) K. Putih sand pocket, (0.25×10^{-2} mr/h)
- (30) Tjandipenataran, (0.25×10^{-2} mr/h)
- (31) Jatilengger sand pocket, (0.25×10^{-2} mr/h)
- (32) Marukomuryo Coffee garden, (0.15×10^{-2} mr/h)
- (33) The top of G. Kelut, 1200m above sea level, ($0.30-3.5 \times 10^{-2}$ mr/h)
- (34) The crater lake side of G. Kelut, (0.35×10^{-2} mr/h)
- (35) Cocoa garden, west to G. Kelut, 550m above sea level, (0.27×10^{-2} mr/h)
- (36) Badak Sabo-dam, ($0.20-0.30 \times 10^{-2}$ mr/h)
- (37) Penataran, 390m above sea level, (0.20×10^{-2} mr/h)
- (38) Salam sand pocket, 220m above sea level, (0.20×10^{-2} mr/h)
- (39) Kalitemas weir, Subersari dam, 200m above sea level, ($0.15-0.20 \times 10^{-2}$ mr/h)
- (40) Sarangan, 1100m above sea level, ($0.60-0.80 \times 10^{-2}$ mr/h)
- (41) South to G. Law, 1870m above sea level, (0.70×10^{-2} mr/h)
- (42) South to G. Law, 1900m above sea level, ($0.40-0.50 \times 10^{-2}$ mr/h)
- (43) Tawangmang, 1300m above sea level, ($0.40-0.55 \times 10^{-2}$ mr/h)
- (44) Yogyakarta, (1.0×10^{-2} mr/h)
- (45) Yogyakarta, ($0.50-0.70 \times 10^{-2}$ mr/h)
- (46) The upper stream of Kalikrasak, 790m above sea level, ($1.00-1.10 \times 10^{-2}$ mr/h)
- (47) The upper stream of Kalikrasak, ($0.90-1.20 \times 10^{-2}$ mr/h)
- (48) Kalibugun sand pocket, ($0.75-0.90 \times 10^{-2}$ mr/h)
- (49) The down stream of Kalikrasak, Juropo raised bed river, (0.90×10^{-2} mr/h)
- (50) The down stream of Kalikrasak sand pocket, 200m above sea level, ($0.90-1.00 \times 10^{-2}$ mr/h)
- (51) The upper stream of K. Putih dam, 860m above sea level, ($0.90-1.10 \times 10^{-2}$ mr/h)
- (52) K. Blongkeng, (0.80×10^{-2} mr/h)
- (53) K. Krasak, ($0.70-0.80 \times 10^{-2}$ mr/h)
- (54) Kaliputih dam, ($0.90-1.10 \times 10^{-2}$ mr/h)
- (55) Kaliboro, 1120m above sea level, ($0.80-0.90 \times 10^{-2}$ mr/h)
- (56) Chikamori point, 900m above sea level, ($0.80-0.90 \times 10^{-2}$ mr/h)
- (57) Borokidur sand pocket, 420m above sea level, ($0.70-0.90 \times 10^{-2}$ mr/h)
- (58) Sukolini dam, 340m above sea level, ($0.70-0.85 \times 10^{-2}$ mr/h)
- (59) Kalisinpun dam, 210m above sea level, ($0.80-0.93 \times 10^{-2}$ mr/h)
- (60) Kaliurang, 1020m above sea level, ($0.80-1.00 \times 10^{-2}$ mr/h)
- (61) Kaliurang damsite, 850m above sea level, (0.80×10^{-2} mr/h)
- (62) Sangiran agricultural channel, ($0.30-0.75 \times 10^{-2}$ mr/h, average 0.52×10^{-2} mr/h) (cf. Fig.

13)

According to the distribution map of landslides published by Engineering geology section of Indonesian geological survey, many landslides occur centering around Bandung in the western part of Jawa. (Cf. Fig. 1)

Fig. 2 and Fig. 3 show that the measured values of natural radioactivity surveys in the landslide areas along the roads in the western part of Jawa. In the figures No. (4)–No. (9), No. (11)–No. (15) are landslide zone in Tertiary on the coast of the Indian ocean, and the measured value of natural radioactivity survey is low, $0.25-0.51 \times 10^{-2} \text{mr/h}$ (The value of No. 6 is high because of the part of acidic igneous rocks).

On the other hand No. (16), No. (10), No. (1)–No. (3), No. (17)–No. (21) are landslide zone in Quaternary volcanic products distributed in and around the center of the western part of Jawa, and the measured value of natural radioactivity survey is high, $0.50-0.95 \times 10^{-2} \text{mr/h}$ (The value of No. 19 is high because of the place of hot springs).

From the viewpoint of the intensity of natural radioactivity survey, the measured value is extremely low, $0.15-0.25 \times 10^{-2} \text{mr/h}$ in and around the volcanic Kelut in the eastern part of Jawa, compared with the other zones. (Cf. Fig. 4–Fig. 5)

This measured value is similar to that in Mikabu greenrocks zone in Japan.

It is the same in Japan that a large change of the measured value relatively appears in the active part of landslide areas, compared with the other zones. However, in the Sangiran landslide north to Surakarta the measured value of natural radioactivity survey is low, which may be because of being rich in clay, and the value on the boundary between displacements is relatively high, as shown in Fig. 13.

References

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Fig. 1 Distribution of landslides in Jawa.

Fig. 4 Measured points and the results of natural radioactivity survey in the eastern part of Jawa.

Fig. 2 Measured points and the results of natural radioactivity survey in the western part of Jawa.

Fig. 3 The natural radioactivity values in the western part of Jawa

Fig. 5 The natural radioactivity values in the eastern part of Jawa.

Fig. 6 The measured values of natural radioactivity survey
(1) Cipatat, along the national road No. 1, west to Bandung.

Fig. 7 The measured values of natural radioactivity survey
(2) Sidaradja.

Fig. 8 The measured values of natural radioactivity survey
(3) Warunpeti

Fig. 9 The measured values of natural radioactivity survey
(4) Warungkiara, Bd. 126-Bd. 127.

Fig. 11 The measured values of natural radioactivity survey
(6) Pasawahan, Bd. 165.

Fig. 13 The measured values of natural radioactivity survey
(62) Sangiran, agricultural channel.

Fig. 10 The measured values of natural radioactivity survey
(5) Pasawahan, south to Pelabuhanratu.

Fig. 12 The measured values of natural radioactivity survey
(7) (8) (9) South to Sukabumi.