The Result of Water Analysis surrounding the Nickel Mining Sites and the Nickel Processing Plants in Taganito, Claver, Surigao del Norte in August 2018
(Dates of Water Sampling: August 25 and 26, 2019)

Sampling Location No.	1	2	3	4	5	6	7
Date of Sampling	2019/8/25	2019/8/25	2019/8/25	2019/8/25	2019/8/25	2019/8/26	2019/8/26
Time of Sampling	12:55:11	12:59:21	13:17:07	13:46:14	14:22:50	10:38:01	10:55:55
Location of Sampling	The drinking water program by consumers' cooperation in Taganito (Social Development Management Program=SDMP)	The mouth of Taganito River(Brgy. Taganito)	The mouth of Hayanggabon River (Brgy. Hayanggabon)	The water tank installed by PGMC and located near the left side from the entrance of the resettlement site for the Mamanwa people (but outside of the resettlement) (Brgy. Cagdianao)	Water to be able to get along the road near the resettlement site of Mamanwa and to be used for drinking and domestic purpose (Brgy. Cagdianao)	The mouth of Taganito River(Brgy. Taganito)	The mouth of Hayanggabon River (Brgy. Hayanggabon)
Latitude and Longitude	N9 32.609 E125 49.413	N9 32.612 E125 49.498	N9 32.353 E125 50.233	N9 30.769 E125 52.304	N9 31.159 E125 52.015	N9 32.612 E125 49.498	N9 32.353 E125 50.233
Result of on-the-spot examination by simple detector tube for hexavalent chromium (mg/L)	ND	ND	ND	**0.05**	**<0.05**	**<0.05**	**Trace**
pH	5.6	7.5	7	7.7	7.7	7.7	6.8

Sea Water / Well Water / River Water

The gate of Taganito Mining Corporation (TMC)	The gate of Taganito HPAL Nickel Corporation
N9 32.609 E125 49.110	N9 32.237 E125 49.794

<The results of examination on metsl by ICP-MS, or Inductively Coupled Plasma Mass Spectrometer, at the laboratory in Japan> (Unit: μg/L)

ug/L	1	2	3	4	5	6	7	(Avarage concentration in the sea water)	Japanese Environmental Standards (Cr=Cr6+) mg/L	Japanese Water Supply Act (Cr=Cr6+) mg/L	Control Target under the Japanese Water Supply Act mg/L	WHO Guidelines for drinking-water quality (Cr=Total Cr) mg/L	
Cr	0.1	6.1	10.6	44.3	17.6	16.1	12.0	**0.212**	0.05	0.05			Cr
Ni	0.3	22.5	11.8	5.6	59.8	42.7	16.2	**0.48**			0.01		Ni
Zn	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**0.350**		1			Zn
B	47.5	4040	1510	3.8	7.1	4080	1770	**4500**	1	1			B
Mn	0.7	36.2	1220	5.1	8.9	69.4	1220	**0.020**		0.05	0.01	0.4	Mn
Cu	0.5	0.9	1.3	0.3	0.2	0.2	2.3	**0.150**		1			Cu
As	0.1	1.7	0.5	0.0	0.0	1.8	0.7	**1.2**	0.01	0.01		0.01	As
Se	0.0	4.2	1.2	0.0	0.1	4.4	3.4	**0.155**	0.01	0.01		0.01	Se
Cd	0.0	0.1	0.0	0.0	0.0	0.1	0.0	**0.07**	0.01	0.003			Cd
Pb	0.1	0.3	0.3	0.1	0.0	0.2	0.0	**0.0027**	0.01	0.01			Pb
Hg	0.0	0.7	1.1	0.0	0.0	0.3	0.3	**0.00014**	0.0005	0.0005			Hg
Fe	3.5	117	260	144	12.5	227	243	**0.030**		0.3			Fe
Co	0.0	1.6	1.6	0.1	0.2	2.9	2.1	**0.0012**					Co
U	0.0	2.9	1.1	0.0	0.0	2.8	1.3	**3.2**			0.002		U
Na	6270	12500000	3850000	2650	1980	12400000	4800000						
Ca	1130	579000	610000	2430	933	585000	641000						

Comments
(by Mr. Junichi Ohnuma, Former Lecturer of Kinjo-gakuin University / Former Lecturer of Chubu University / Former Principal Investigator of Environmental Investigation Center in Aichi Prefecture)

1) In the previous analysis of water in this area, the results of examinations by simple detector tube for hexavalent chromium are parallel well to the result of examinations by ICP-MS, or Inductively Coupled Plasma Mass Spectrometer, at the laboratory in Japan. This result was repeatedly confirmed in the field of Coral Bay Nickel Corporation (CBNC), in which contaminated the hexavalent chromium. This result was shown in the previous surveys (December 2018, May 2018, February 2013, and May 2012). However, the reason why the No. 7 is Trace might have some interference.
2) We showed the results of examinations on Sodium (Na) and Calcium (Ca), too, this time, in order to indicate the mixing rate between the river water and the seawater. The Na^+ s concentration in the seawater is around 12,000 mg/L (12,000,000 μg/L). Although No.2 and No.6 are water from the river, the water is almost 100% seawater due to the sampling location is near the river mouth.
3) Hexavalent chromium was detected only in No.4, which is almost the same as the Japanese Environmental Standards and Japanese Water Supply Act (0.05mg/L). Although this water is not allowed to drink, it is problematic to supply to the tank as delivery water. The reason why hexavalent chromium was not detected in other samples is probably due to the absence of precipitation during the dry season. The universal mechanism was repeatedly shown as the process which after the laterite drilling, nickels are stored in stockpiles outside, and rainfalls in the mining areas liquate hexavalent chromium. Furthermore, the concentration level of nickel exceeded the Control Target under the Japanese Water Supply Act (0.01mg/L) in No. 2, 3, 5, 6, and 7. No. 5 is spring water, which seems to be liquated in water by a mechanism different from hexavalent chromium. It could be the result of the contact between nickel ore and groundwater underground.
4) No. 4 and 5 are from springs which residents use for drinking, so immediate measures are required.
5) These results have proved that serious contamination by hexavalent chromium has been occurring in shallow underground water, which the local community is using for domestic and/or drinking purposes, in the whole area of Taganito, Surigao del Norte. In addition, given that the same kind of contamination has been proved in Rio Tuba, Palawan, the hypothesis could be build up that open-pit mining of laterite in the tropics would universally cause the contamination by hexavalent chromium. In any case, the appropriate measures must be established and implemented as quickly as possible in Palawan as well as Surigao del Norte, as there are concerns over the health damage of the local communities and the destruction of ecosystem in bays and coastal areas. If any appropriate measures could not be established, it should be taken into account to suspend or stop the projects.
6) Although the nickel development projects in Rio Tuba, Palawan, have been promoted mainly by Japanese companies, the projects in Taganito, Surigao del Norte, have been promoted not only by Japanese companies, but also the other countries' companies, such as China. In order to ensure any regulation for the development, it is necessary that the governance for environmental conservation is decisively implemented by the Philippines government, which the international society could also put some pressure on or could have cooperation with.
7) Boron in No. 2 and No. 3 and No. 6 and No. 7 are considered to be derived from seawater. The fact that the boron : sodium ratio is almost the same supports the result.