Report title: Vietnam:: Initial economic effect of bauxite Projects in Highland
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Biography
Born: October 19, 1948 at Son My commune, Huong Son district, Ha Tinh province, North Central, Vietnam in farmer family.
From 1956 to 1963 as pupil of Son My primary and basic popular Schools in Son My commune, Huong Son district.
From 1963 to 1966, as pupil of Huong Son secondary popular School in Huong Son district, Ha Tinh province.
From September 1966 to 1970, as student of Geographical-Geological Department of Ha Noi University and has graduated at July 1970.
From November 1970 to December 1971, working in No.45 Geological researching Unit under General Department of Geology, now Vietnam Institute of Geosciences and Mineral resources (VIGMR), Ministry of Natural resources and Environment.
From December 1971 to 1975, to join the army, participated in the fight to anti-aggression of American troops in South Vietnam battlefield.
From 1976, after liberating the South part (April, 1975) and unifying the Land, to return old organs as VIGMR and working here up to now.
In June 1991 has successfully defended a doctorate thesis at Scientific Council of Vietnam Institute of Geosciences and Mineral resources.
As the main responsible person for many works on investigation and prospecting for deposits of industrial minerals and development of technological testing (R & D) on processing and effective usage of mineral resources and gathered many important successes.
It has published over 60 articles and scientific works in inside and outside journals, in which are about 20 papers published in Industrial minerals Magazine from 2003 to now, has took part in five international Conferences held in Vietnam.

It was awarded by Ministry of Heavy Industry the Medal for cause of Vietnamese Geology (1995) and awarded by Ministry of Industry and Trade the Medal for cause of Vietnamese Industry (2000).
Vietnam: Initial economic effect of bauxite Projects in Highland

Tran Kim Phuong
Vietnam Institute of Geosciences and Mineral resources

Tan Rai (Lam Dong) and Nhan Co (Dac Nong) bauxite & alumina Projects are Vietnam’ National main point works aiming at target to transfer the economic structure after fastly increasing direction of industrial proportion in GDP, taking part in giving Vietnam to become the country of developing industry at 2020. This is the first important Projects on deep preparation of bauxite ores with complex technology, carried out in Highland, the area of special difficult economic conditions. However by strengthen of engineers and workers of the Vietnam Industrial Group of Coal - Minerals (VINACOMIN) after four developing years (2011 – 2013), these projects have obtained very significant initial economic effects.

I. The great potential of Highland bauxite

Bauxite resource is very abundant and widely distributive in many locations of Vietnam, especially in wide Highland. This is favourable condition for exploitation and development of aluminium industry in large scale. After two projects of bauxite mining and aluminium production during 2010 – 2020, four following projects in Highland will be founded. Other two aluminium production projects of smaller scale in Northeast Bac Bo region also will be founded after that. This important industrial sector requires very large investment and exploitation of the mineral resource is connected with many elements of economy and environment. Hence Vietnam Government welcomes and creates every favour conditions to the foreign investors for development of aluminium industry, aiming at putting forward Vietnam will become the leading country in the Southeast Asian region and the world in last 21 century.

In North Vietnam, bauxite was found in provinces of Lang Son, Cao Bang, Ha Giang, Lai Chau, Dien Bien, Hai Duong and Nghe An. But the concentration zone of bauxite mines is only in Lang Son, Cao Bang and Ha Giang provinces with small deposits and occurrences. The bauxite ores appear, either deluvial placer ore or primary one in limestone with total reserve attaining over 306 million tonnes.

In South Vietnam, in weathering basalt rocks bearing very large reserve of bauxite ores, able to industrial mining, discovered and evaluated, especially in Dac Nong and Lam Dong provinces in South Highland.

Total reserve of bauxite ores in South Vietnam was explored and estimated to 2006 is 5, 616.394 m tonnes, in which Dac Nong as 4,237.6 m tonnes., Lam Dong 763.4 m tonnes, Gia Lai - Kon Tum 367.39 m tonnes; Quang Nam and Quang Ngai 0.694 m tonnes; Phu Yen and Dac Lac, 30.23 m tones and Binh Phuoc- Dong Nai, 216.70 m tonnes.

In Dac Nong area, there are 12 deposits, distributing on area of 638.0 km² of total reserve as 4,236.6 m. tonnes (occupying 75 % total reserve), of which clean ores (+1mm) are the reserve of 1,869.78 m. tonnes with average content Al₂O₃ 48.3%, SiO₂ 2.6, Fe₂O₃ 18.93%, MSi 18,5% and a recovery of 44.6%. (Table 1)

In Lam Dong area, there is 2 deposits, distributing on area of 287.0 km², with total reserve of 763.4 m. tonnes, of which clean ores (+1mm) are the reserve of 313.05 m. tonnes.
The Tan Rai (Lam Dong) and Nhan Co (Dac Nong) deposits were detailed prospected for development of Tan Rai and Nhan Co bauxite and alumina Projects.

Fig. 1. Bauxite prospected area in Dac Nong and Lam Dong (Highland)
Bauxite ore quality and reserve in Dac Nong and Lam Dong provinces

Table 1

<table>
<thead>
<tr>
<th>No</th>
<th>Area/Deposit name</th>
<th>Area (km²)</th>
<th>Commercial ore quality</th>
<th>Reserve (m. tones)</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Al₂O₃</td>
<td>SiO₂</td>
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<tr>
<td>I</td>
<td>Dac Nong</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>Nhan Co</td>
<td>49.9</td>
<td>49.47</td>
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<tr>
<td>2</td>
<td>“1th – May”</td>
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<td>48.30</td>
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<tr>
<td>3</td>
<td>Gia Nghia</td>
<td>45.0</td>
<td>47.99</td>
<td>2.58</td>
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<tr>
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<td>North Gia Nghia</td>
<td>44.6</td>
<td>48.74</td>
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<td>Dac Rung</td>
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<tr>
<td>10</td>
<td>Dao Nghia</td>
<td>90.9</td>
<td>-</td>
<td>-</td>
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<tr>
<td>11</td>
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<td>19.1</td>
<td>-</td>
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<tr>
<td>12</td>
<td>Dac Ton</td>
<td>59.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>∑638.0</strong></td>
<td></td>
<td><strong>4.237.6</strong></td>
<td></td>
</tr>
</tbody>
</table>

| V  | Lam Dong                  |            |            |            |     |           |           |
|    |                           |            |            |            |     |           |           |
| 1  | Tan Rai, of that          | 220        | 44.69      | 2.61       | 17.1| 385.4     | 176.59    |
|    | - West zone               | 42         | -          | -          | -   | 148.76    | 59.83     |
| 2  | Bao Loc, of those         | 67.0       | 44.7       | 2.6        | 17  | 378.0     | 136.46    |
|    | Thang Loi hill zone       | 2.5        | -          | -          | 20  | 7.04      | 3.09      |
|    | Nam Phuong hill           | 0.5        | -          | -          | -   | 2.90      | 0.80      |
|    | **∑287.0**                |            | **763.4**  |            |     | **313.05**|

The deposits of bauxite in Dac Nong and Lam Dong provinces have median and large reserve scale, occurring one another near distance and one another connected into each deposit groups, favourable to mining in the large scale.

Covering soil layer on orebodies is thin (0.5 – 1.0 m), plateau terrain is rather flat, favourable for mining. Alumina bearing mineral in bauxite ores is loose gibbsite (Al₂O₃. 3H₂O); Alumina content in concentrate is from 44.4 to 53.2 %; silica only from 1.6 to 5.1%, suitable with production technology by Bayer method in lower temperature, little expense of energy, product cost is low, then it was estimated as one of the best bauxite ore kinds in the World.

II. Project of Tan Rai Bauxite and Alumina

The Tan Rai bauxite and alumina Project in Lam Dong province with design capacity of 650 000 tpa, with aiming to manufacture of alumina for chemical industry. Tan Rai deposit, supplying raw material to the plant, lies between two districts of Bao Loc and Di Linh, Lam Dong province. The laterite weathering crust of Pleistocene age is from 20 to 26 m thickness, In upper part are bauxite beds of industrial value of 1 – 12 m thickness. The bauxite beds are formed in hightness 800 – 1000m altitude. Its mineral composition consists of gibbsite (59.2%), goetite (17.4%), kaolinite (8.8%) and ilmenite (3%). It was determined 385.4 m. tonnes reserve in C₁ + C₂ categories (Indicated and
Inferred) with average recovery of concentrate as 44.4%. Reserve of bauxite concentrate is 171.6 m tonnes with average concentration (%): Al$_2$O$_3$ 44.69, SiO$_2$ 2.61, Fe$_2$O$_3$ 23.35, TiO$_2$ 3.25, LOI 24.30 and MSi 17.1, in which the West zone being mined to have 42 km$^2$ area with reserve of 148.76 m tonnes, and concentrate as 59.83 m tonnes. It is mined an open cast, thin covering bed (0.5 – 1.0 m), easy to mining. Each 2.2 to 2.5 tonnes of crude ores will recover 1 tonne of concentrate from 45% upwards. Each about 2 tonnes of concentrate or more somewhat may be manufactured 1 tonne of alumina with Al$_2$O$_3$ content is 98.6%.

In March 2011, at the Tan Rai deposit (Bao Lam district, Lam Dong prov.), the Vietnam Industrial Group of Coal - Minerals (VINACOMIN) began mining for ore supplying to alumina plant at the Tan Rai bauxite-aluminium Combination. The Tan Rai alumina Plant has fulfilling the final works and go into operation in October 2013. (Fig 2)

**Fig 2, Panorama of Tan Rai (Lam Dong) alumina production planr**

![Panorama of Tan Rai (Lam Dong) alumina production plan](Photo: News Agency of Vietnam)

1. **Production technology:** At present are about 100 plants in 27 countries in the world manufacturing alumina after Bayer method. The project of Tan Rai alumina production is also application of this technology.

The norm for evaluation of bauxite ore quality after Bayer method is mainly based on consuming measure of bauxite and alkaline (Na$_2$O) for manufacture of one alumina tonne:

1. Good grade consumes 2.2 tonne of bauxite ore and < 40% alkaline
2. Mean grade consumes from 2.2 to 2.9 ore tonnes and from 40 to 80% alkaline,
3. Poor grade consumes > 2.9 tonne of bauxite ore and > 80% alkaline.

Research results shown the lateritic bauxite in Highland is chiefly gibbsite, easy to dissolve and separate in temperature of 105°C with solution concentration of 210 g/l Na$_2$O or 145°C with solution concentration of 160 g/l Na$_2$O; separating time is 2.5 – 3 hour and may reach effect to over 90%. Consuming measure is from 2.15 to 2.30 ore tonnes for manufacturing one tonne of alumina. Thus, bauxite ore quality of Tan Rai deposit belongs to rather good grade.

In production process after Bayer technology, it had carried out following steps:
Ore crushing: First of all, bauxite concentrate after processing is handed in crushing system. In that, bauxite is crushed wet in crushing mill, after ore mixed with alkaline solution (NaOH), supplying from intermediary tub after defined solid/fluid ratio, usually about 50/50. Bauxite ore of 1 – 20 mm grain size is crushed to fineness of 500µ grain size (Fig.3).

Fig.3, Bauxite concentrate gave in preparation workshop

Silic rejected: suspension after crushing be previously rejected the silic in 95 – 100°C during 10 hours period., for transferring of active silic to hydrated sodium alumsilicate of general formula Na2O.Al2O3.2SiO2. .2H2O in solid form.

Dissolve - separating: giving the mixture in separating equipment together with condensed solution, mixed after suitable ratio. In here, it happened soluble reaction of alumina in bauxite, transferring alumina from solid phase became in alkaline solution under pressure of about 5 at and low temperature (140 – 145°C) after reaction:

\[ \text{Al}_2\text{O}_3.3\text{H}_2\text{O} \text{ (solid) + 2Na(OH) (liquid) } \rightarrow 2 \text{NaAl(OH)}_4 \text{ (solution).} \]

Oxides of iron and titanium should be low as they function only as material passing to the insoluble residue (“red mud”, mainly as iron oxid, which is red colour, in addition still as titanium and silic oxides ), which remains after extraction of alumina.

Settle – filtering: for rejecting the impurities, NaAl(OH)3 solution is moved to filtering equipment, using usually membrane kind. After filtering, the solution of solid matter content below 3 mg/l will be cooled, for transferring of sodium alumosilicate solution to pass a supersaturated state and gave in seed forming equipment. In here, sodium alumosilicate solution will be differentiated oneself and formation of alumino hydroxite Al(OH)3 after reaction::

\[ \text{NaAl(OH)}_3 \text{ (solution) } \rightarrow \text{Al(OH)}_3 \text{ (solid) + Na)OH) (solution)} \]

Some aid -settle matters used, helping to prompter settling process, because the Tan Rai bauxite ore belonging to difficult setting kind.

Crystallized: after passing seed formation stage, the seed containing sodium alumsilicate solution will flow pass crystallized equipment. Under action of additional seed , alumino hydroxite crystals will be crystallized to requiring size, then handing pass separating zone. Crystallized technology application into sand form alumina is suitabler form compared with aluminium electrolysis technology at present.

Heating: the used equipment to heating alumino hydroxite (Al(OH))3 into alumina at Tan Rai plant is the heating equipment in boiling bedding kiln. In here, with high temperature (1100 – 1200°C) alumino hydroxyte rejected water, forming alumina.
$\text{Al(OH)}_3 \text{ (solid)} \rightarrow \text{Al}_2\text{O}_3 \text{ (solid)} + 3\text{H}_2\text{O} \text{ (steam)}$.

Bayer progress of alumina production needed meeting demands of aluminium electrolysis is complex hydro-refine progress, consisting of stages reliazed one another. Production process in Tan Rai alumina plant has realized strictly the demands of technology and combined closely, therefore it has arrived the forwarded tagets and requirements. (Fig.4)

Fig.4. Preparation plant of alumina at Tan Rai bauxite deposit

Fig. 5. First product haul of Tan Rai alumina plant released from factory

Alumina product is gave in storage, packaging and released from the factory (Fig 5)
**First product lot exporting**: In testing production process, the plant has produced over 110,000 tonnes alumina of 98.6% pureness, guaranteeing to exporting standard. Calculating to October 2013, over 80,000 tonnes has been consumed. Domestic and international consumers shown to satisfied to product of Tan Rai alumina plant. This is really glad news to workers and ingineers of VINACOMIN, marked a turning – point in young aluminium industry of Vietnam.

Since going in operation to July 30, 2014, the Tan Rai Plant was exported 474,000 tonnes alumina (year 2013 as 214 000 tonnes and year 2014 as 260 000 tonnes). To july 2014, the Plant has sold 252,000 tonnes for the companies of Switzerland, Hong Kong, South Korea and Singappor. In addition, it has signed the principal contracts for long consume with companies of Marubeni Co from Japan (300,000 tpa) and Vannam aluminium Co. from China (150,000 tpa). As though, it is possibe to confirm that, problem of product consume is completely not worthy of minding as a former public opinion has once spoke up.

The output of 2014 is anticipated to reach 540,000 tonnes and in 2015 will reach the design capacity of 650,000 tonnes

Cost of alumina is increasing fastly in world market. Anticipating, every year the alumina cost increases about 10 -12 USD/tonne and to 2020 can up to 400 USD/ tonne. In 2014, the contracts to deliver goods have been accepted by consumers to buy alumina with cost in level of about 18% of aluminium cost (LME), about the same 320 – 330 USSD/ tonne (POB) in Go Dau port (Dong Nai province), same transact cost of world market.

Exporting alumina product is transpired after two lines: Line 1 from provincial road 726 (Lam Dong) and after National highway 20 to Da Lat City, after National highway 27 down Phan Rang – Thap Chap City (Ninh Thuan province) and then after National highway 1 running on North site to Cam Ranh port (Khanh Hoa province), with distance of 300 - 350 km, and Line 2., going from the provincial road 725 (Lam Dong) to National highway 20, after provincial road 769 (Dong Nai) and after National highway 51 to Cai Mep port (Ba Ria – Vung Tau) with distance of 400 – 450 km.

2. **Problem solution of red mud treatment and environment protect**: Process of bauxite mining and ore processing will discard in environment of red mud and oxalate mud from final washing stage. Especially, discarded red mud from processing process, out impurities such as iron, silic, titanium and calcium oxides, it still contains compounds of chemical link with alkaline (silic – aluminium – natrium hydroxides), having high pH (12 – 13). Each tonne of manufactured alumina (Al₂O₃) can discard the environment from 0.4 to 2 tonnes of red mud. Therefore, the red mud treatment and environment protect is problem especially concerned by public opinion when development of Highland bauxite projects.

**Red mud treatment**: In the Tan Rai project developing progress, 6 filtering sewers system was built. The impurities and chemicals recovery of bauxite processing process and alumine production is realized in dry form. Discard sodium hydroxide is recovered, surving to production. Technology has been applying in Tan Rai alumina Plant at present and of Nhan Co alumina project also will be red mud recovery in dry form, being applicating in about 70% of alumina production Plants in the world. Therefore, it is affirm that dam breaking threat of large red mud containing tank as the dam broke in the Ajka (Hungari) red mud tank in October 4, 2011 will can not happen.

Studying results obtained some re-products, as iron in during red mud treatment. In testing haul carried out at May 2012, from 10 tonne of red mud with recovering output of 71% iron oxid, has obtained 2,539 tonne of steel having high press strong.
The Thai Huong Ltd Company, a unit developing the project of testing production of red mud treatment shown that up to April 2014, the Company’ plant has implemented the treatment of red mud tonnes hundred and hundred (each haul from 40 to 200 tonnes). From 2.4 red mud tonnes can be recovered 1 tonne of 62% iron concentrate of value 1.9 m VND (about 95 USD), whilst production expenditure of about 1,4 m VND/ tonne (about 70 USD/tonne).

Guarantee to supply water for production: Process of bauxite exploitation and alumina production consumes a amount of very large water, especially in ore washing stage and alumina separation. It is considered that one plant of 650, 000 tpa alumina capacity need uses about 10. 10^6 water m^3/year for ore processing and 4.5.10^6 water m^3/year for alumina production. Total water amount needing to Project of Tan Rai bauxite and alumina in Lam Dong is about 20. 10^6 water m^3/year. The Highland is the region of no-much rain water amount and only occurs in rain season (from May to October). Therefore, guarantee to supply water for production is problem concerned very much by publish opinion.

The water source serving for ore processing and alumina proccuction in Tan Rai plant fully met by large lake of 20 m m^3 capacity, also has been built completely.

In dry seasons, out serving for alumina production, water from this lake still contributed part to overcome in drought situation in agricultural production, which is very cheerful for local people.

Exploitation in combination with land return: By geological character of Highland region in general, and in Tan Rai bauxite deposit area in particular, the cover bed on bauxite orebodies has very little thickness, usually from 0.5 to 1.0.m, that is why when mined, the quarry area enlarges very fastly, restricting considerably the forest land area, attacking to environment. For diminishing bad impact to environment, in Tan Rai bauxite and alumina Project, mined ore to wherever, the land returning be executed to there. Anticipating the land return will fulfilled after three mined years.

So, it is perfectly possible affirm that the Tan Rai bauxite and alumina Project, one of two main point Projects of Vietnam’ mineral exploitation industrial sector hosted by VINACOMIN, has completed as outstanding all planed targets and tasks after about 30 months to executing. Even in 2013, the Tan Rai alumina Plant can be producted about 300,000 tonnes and will attain designing capacity of 650,000 tpa in 2015 or 2016.

III. Project of Nhan Co Bauxite and Alumina

Project of Nhan Co Bauxite and Alumina is developed in Dac Nong province, the area is the largest bauxite reserve in Highland, Vietnam.

In Dac Nong province were found and estimated 12 deposits of total reserve as 4,236.6m. tonnes (occuppping 75% total reserve of Highland), of which are large deposits as Nhan Co, Dao Nghia, Gia Nghia, Quang Son and 1st May. Therefore, Dac Nong is worthy choosed to become centre of Vietnam’ aluminium industrial development in future. Nhan Co bauxite and alumina combination is the starting project for many large projects will be constructed in following years, as:

- The Nº1 Dac Nong aluminium project with capacity of 1,900,000 tpa..
- The Nº2 Dac Nong aluminium project, with capacity of 1,500,000 tpa. Now, the detailed prospecting of Gia Nghia deposit for mining ores to supply to plant, has been carying out.

The Nhan Co bauxite deposit is of distributional area 49.9 km^2, with reserve 359.3 m. tonnes, of those clear ore as 164.6 m tonnes.. Here is also deposit of the best ore quality in Dac Nong province, with content Al_2O_3 49.47 %, SiO_2 2.34% and Msi 23.1%

The Nhan Co project was corrected designing, raised capacity from 300 000 tpa alumina after beginning design (2006) to 650 000 tpa (2008) and it is capable to
expanding up 1.200, 000 tpa. The target of project is alumine production used for aluminium electrolysis.

The Project has been start founding in early 2012 on area of 850 ha, with two main Plants as the plant of bauxite processing and that of alumina production... Now all activities on building site have occurring after right rate. The contract packs of alumina plant have been realized in 72/73 articles, in which all equipments have been transported to to project base. The contractors have executing assemble of equipments, in which completed work amount reaching over 60%.(Fig.5 to 8).

The Nhan Co alumina plant will complete and going operation at Quarter Three, 2015.

Total capital to investment for two Projects of Highland to midle 2013 is more 18,000 billion VND (about $900 m). Anticipating the capital retrieving of Tan Rai project is 12 years and Nhan Co project as 13 years... Two plants after going stable production (2016 or 2017) can pay the annual budget of about 850 billion VND (about $425,000) As though, it is affirm that these Projects will bring up high economic effect.

In last september 4th, 2014, Vietnam has began the construction of the Project of the first aluminium electricity in Nhan Co industry Zone, Dac Nong province. Project invested by Tran Hong Quan metallurgy limited Company, with capacity of 300,000 tpa aluminium, orienting to increase a capacity up 450,000 tpa, with total capital to invest up $575m.

It is project using material supplied by the Nhan Co (Dac Nong) and Tan Rai alumina (Lam Dong) plants of VNACOMIN. Anticipating, the Dac Nong aluminium electricity plant will begin giving its product from last 2016, completing to raise a capacity in last 2019. When, receipts wishing to reach $1.35 billion/year. The project is also important solution raising the bauxite resource value, consuming stable alumina, lessening for transport of alumina material by land from Highland to sea ports.

Fig. 6. Assemble of heating kilns
Fig 7. Crystallization tubs were assembled

Fig 8. Nhan Co alumina plant building site, October 2013
IV. Investing to development of aluminium industry, a prior sector

Orient of aluminium industry development in coming 10 – 15 years is put forward Vietnam to become one of leading aluminium production countries in the region, consequence, Vietnam Government will create every favour conditions and has much prior polycies to domestic businesses and foreign investors to invest in aluminium production industry. Out two large projects hosted by VINACOMIN as Tan Rai and Nhan Co, many other projects have been prepared:

- The Nº1 Dac Nong aluminium project with capacity of 1,900,000 tpa.
- The Nº2 Dac Nong aluminium project with capacity of 1,500,000 tpa.
- The Kon Ha Nung aluminium project of 1,000,000 – 1,500,000 tpa, using bauxite ores of two mines of Kon Ha Nung and Mang Den in Gia Lai – Kon Tum provinces.
- Construction of two aluminium plants in Cao Bang and Lang Son provinces (Northeast Bac Bo), each plant having capacity of 500,000 aluminium tpa.

Database for these projects were prepared and ready to supply for investors as reserve scale of deposits, ore quality and enrichment ability, mining conditions and transport, the econo – social situation of area etc.

Now, it is looking into ability to 2020, the bauxite deposits in Highland must guarantee to mining from 54 to 75 m tonnes of crude ores aiming a recovery of 21.5 to 30 m tonnes concentrate supplying to Plants for production of 7.2 to 8.3 tonnes alumina.

Mineral Law 2010 had some amended points after direction to create more favourable conditions for foreign investors to development of mining industry, in which it is worthy of most attention to be “Auction of the right to mining the mineral resources”, after that, the busineeses of able finance and advanced technology is easy to gain the large Projects of prospecting, mining and processing of mineral resources, in which are projects if bauxite mining and aluminium production in Highland, Vietnam.

After Premier’ deicion, the projects invested in aluminium production in Highland will be duty - free to business income in four years since having to income bearing tax, reducing 50% paid tax in nine following years and will be applied tariff level of 10% during 30 years. At the same time, the projects also will be duty - free to importing tax for commodities for creating the projects’ fixed property after define of
Law in effect at present on export-importing tax. In addition, the projects still will be rented by State the land. after define of Law in effect at present applied for the projects belonging to specially prior sectors to investment.

**Conclusion**

Initial, two bauxite and alumina projects of Tan Rai and Nhan Co are effective to social – economic development of two provinces of Lam Dong and Dac Nong in particular and on area of Highland in general, at the same time it has active moving on economics, reducing the loose suffering time down to 1 to 2 years, compared with initial planning of about 4 to 5 years. In addition, the testing result shown that may be manufacture of some re-products, as iron during red mud treatment, taking part in increasing the economic effect and solving problem of environment.

With source of profuse bauxite resource, favourable mining condition, the development of bauxite and alumina projects in Highland will contribute part considerably in compensate of aluminium short in world maket, firstly after Indonesia stoped exporting the bauxite concentrate.

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