Environmental and Social Engagement Best Practice to Face Pandemic Circumstance: A Sharing from Vale Indonesia, Sorowako Site

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Abstract
The COVID-19 pandemic in 2020 has broken the normal bonds of human interaction, whether in the personal sphere or in the industrial sphere, regardless of where a person happens to live. Several industries which play important roles in fulfilling global demands, including the nickel mining and smelting industry, still need to resume operations in full regardless of the global disruption caused by the coronavirus outbreak. They also have to maintain an environmentally-friendly practice while stepping up social engagement to support community who has been adversely impacted by the pandemic. This paper focuses on how Vale Indonesia is still conducting its business operations to maintain its daily business while adhering to the precautionary measures on its surrounding communities. Vale has actually coined several innovative programs to improve environmental concern, consisting utilization of waste materials to reduce demands for single-use ones. On the other hand, the company has also focused on conducting social engagement and community support activities, especially by providing life support assistances and programs which can boost the communities to be more productive and improve their capacities to be resilient amid the devastating impact of the pandemic. Vale has calculated that Sorowako sites will be able to maintain their environmental management by contributing to energy efficiency 12,626.00 GJ, emission reduction 17 tons of PM, waste utilization (hazardous 1,994,402 tons and non-hazardous – 20,000 tons), waste efficiency 586,087,488 m3, wastewater effectiveness 19.94 tons of TSS, reclamation activity of 149 plants species and empowered more than 5,000 communities over the course of a year.

Keywords: Environmental Management, Social Management, COVID-19 Pandemic, Metal Mining Industry

Introduction

Most industrial activities will likely still focus on resuming its normal operations, although on some circumstances they also have to deal simultaneously with some kinds of an emergency situation. These emergency situations can be natural or human-made. Some natural emergency or disasters can also undoubtedly be exacerbated by humans. The COVID-19 pandemic is an excellent example of this whereby a virus or a disease spreads through human activities and interactions. The pandemic started at the beginning of 2020.

PT Vale Indonesia's operational site in Sorowako, a remote area in South Sulawesi, Indonesia (see Figure 1), has also been impacted by this situation since the pandemic has required the company to come up with some support and special operational conditions to sustain its entire business process. As one of its emergency actions, the industry has been provided integrated system to maintain its operational condition and surrounding communities. The operation focuses on business lines and their impacts to the surrounding communities, especially in terms of environmental and social impacts. Furthermore, the COVID-19 situation also requires the company to improve on its health and safety concerns, both for its employees and local communities.

Figure 1: Vale Indonesia – Site of Sorowako

The paper presents the company's industrial efforts to balance environmental management and social engagement with its operations during the pandemic. The company has come up with several innovative programs to manage these domains and it has implemented these programs well up to this moment. Some of the programs have been motivated by dramatic restrictions on human interactions and mobility due to the COVID-19 pandemic, thus serving as an impetus for the company to replace single-use, newly-manufactured materials with recycled ones to reduce distribution and logistics activities. The company also innovates with its online monitoring systems to minimize human interaction in the field while maintaining activity trends. The community empowerment effort now concentrates on its activities in skill enhancement programs for local communities in Sorowako, while providing life support for surrounding provinces.

Overview of Vale Indonesia Site Sorowako and Its Support to Covid-19

Vale Indonesia, a nickel mining and smelting industry, operates under Vale Global, one of leading base metal corporations in the world. It has several operational areas in Sulawesi Island; one of the company's sites that has been operating for more than 50

years is situated in Sorowako District, a remote area in South Sulawesi province, Indonesia. The area of operations (see Figure 2.) is surrounded by three provinces, namely South Sulawesi, Central Sulawesi, and South-East Sulawesi. This position delivered the industry to enhance community empowerment endeavors for provinces impacted by its operations. This also covers the company's COVID-19 countermeasures and emergency support, as the pandemic is still going on at the time this paper was written.

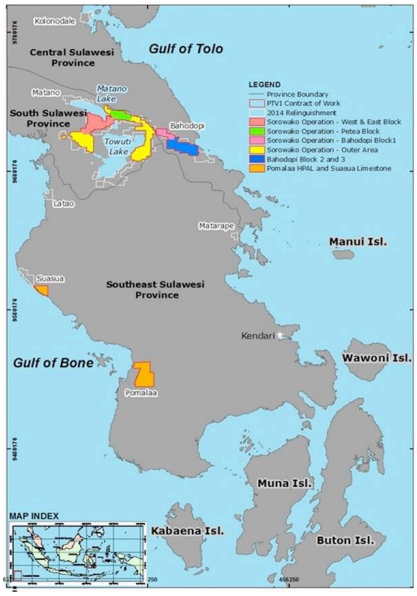

Figure 2: Provinces Impacted by Vale Indonesia's Operations

The company's COVID-19 community support program comprises distributing personal protection equipment, providing rapid tests and conducting educational programs to educate the public on the pandemic and how to prevent further virus infections in the community, distributing meals and setting up emergency shelters where people can gather. You can see a summary of these countermeasure activities in Figure 3.

Figure 3: Support Activities during COVID-19

To date, the industry, along with its stakeholders, have supported local communities via these activities across the three provinces mentioned above, as can be seen in detail in table 1.

Table 1: Cumulative Community Support Comprised within the Company's COVID-19 Countermeasures and Prevention Acts

No	Area	Quantity	Unit price	Plan quantity	Actual Quantity Per 11/9
1	East Luwu	Rapid Test	6.30	10,000	-
	East Luwu	Alcohol Swab	0.04	10,000	-
	East Luwu	Lancet	0.03	10,000	-
2	South Sulawesi	Rapid Test	6.30	30,000	40,000
	South Sulawesi	Alcohol Swab	0.04	30,000	-
	South Sulawesi	Lancet	0.03	30,000	-
3	Morowali	Rapid Test	6.30	10,000	3,500
	Morowali	Alcohol Swab	0.04	10,000	-
	Morowali	Lancet	0.03	10,000	-
4	Central Sulawesi	Rapid Test	6.30	20,000	26,500
	Central Sulawesi	Alcohol Swab	0.04	20,000	-
	Central Sulawesi	Lancet	0.03	20,000	-
5	Kolaka	Rapid Test	6.30	10,000	10,000
	Kolaka	Alcohol Swab	0.04	10,000	-
	Kolaka	Lancet	0.03	10,000	-
6	South East Sulawesi	Rapid Test	6.30	20,000	20,000
	South East Sulawesi	Alcohol Swab	0.04	20,000	-
	South East Sulawesi	Lancet	0.03	20,000	-
7	North Luwu	Rapid Test	6.30	5,000	5,000
	North Luwu	Alcohol Swab	0.04	5,000	5,000
	North Luwu	Lancet	0.03	5,000	5,000
8	North Kolaka	Rapid Test	6.30	10,000	10,000
	North Kolaka	Alcohol Swab	0.04	10,000	-
	North Kolaka	Lancet	0.03	10,000	-
9	Palopo	Rapid Test	6.30	5,000	5,000
	Palopo	Alcohol Swab	0.04	5,000	5,000
	Palopo	Lancet	0.03	5,000	5,000
10	North Toraja	Rapid Test	6.30	**5,000**	**5,000**
	North Toraja	Alcohol Swab	0.04	5,000	3,000
	North Toraja	Lancet	0.03	5,000	3,000
11	Toraja	Rapid Test	6.30	**5,000**	**5,000**
	Toraja	Alcohol Swab	0.04	5,000	3,000
	Toraja	Lancet	0.03	5,000	3,000

(As per Mid-Sept 2020)

We all want that the industries and communities across the globe impacted by the unprecedented pandemic to recover to a better situation soon. It is therefore important for everybody to maintain his or her health and safety situations while also taking care of the environment.

Materials and Methods

This paper discusses some innovations in environmental management by utilizing and optimizing waste instead of utilizing single-use, newly-manufactured materials. Social empowerment for the impacted community is also taking into account as part of their capacity building and preparation for economic improvement after the pandemic. A schema on waste utilization is depicted in Figure 4.

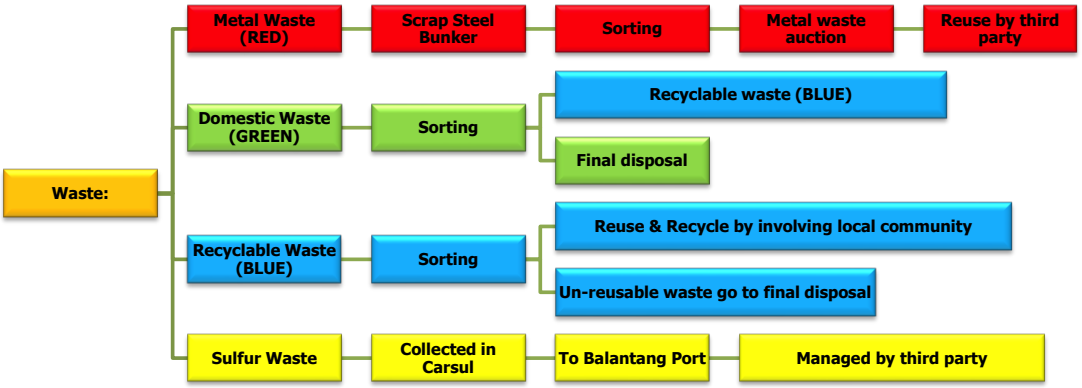

Figure 4: Schema on Waste Utilization in Vale Indonesia

This paper also mentions an Android-based online monitoring system to make monitoring easier while minimizing human mobilization to prevent the virus spreading all the same. The system uses database optimization, with IT-based materials and software installed in computers or personal devices.

On the community empowerment aspect, we recycle waste into organic fish feed. To accomplish this, we need a fishpond, compost fertilizer and local micro-organisms. We use a typical fishpond while testing the compost fertilizers and local micro-organisms using organic materials. We will explain each innovation in our highlighted programs below:

Energy Efficiency: Self-Machining of Electric Boiler Spare-parts

Electric boilers can create high-voltage steam, worth 11 kilovolt (kV). The HVJ electrode steam boiler produces steam using a short process whereby before turning into steam, the boiler will heat the water beneath it before pumping the steam directly to the electrodes which terminals have been attached to high-voltage electricity. About 97 percent of the steam will be formed between the nozzles and electrodes while the remaining ones will fall beneath the boiler before once again creating steam between the electrodes and counter-electrodes. To maintain steam pressure constant, the water pump circulation has been designed to operate and rotate using the variable-frequency drive control according to the steam pressure condition and the burden applied on the boiler on that moment. The construction process of the electric boiler can be seen in Figure 5.

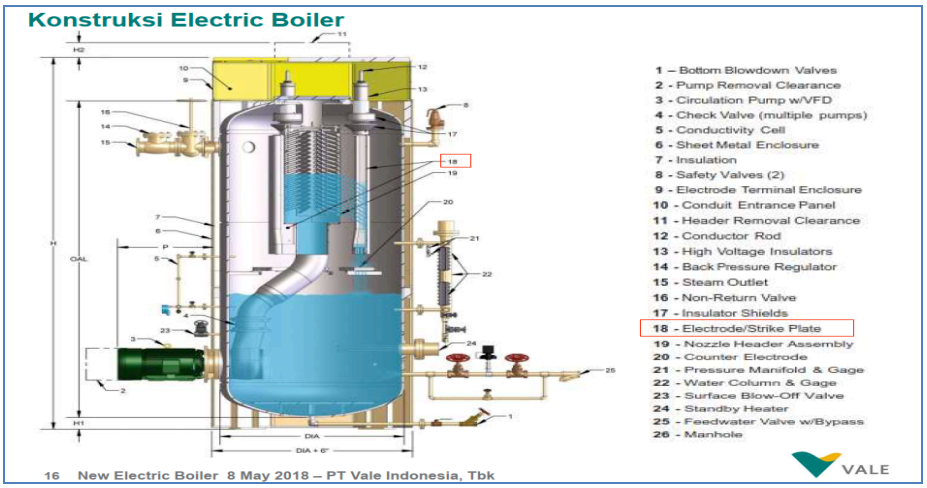

Figure 5: The Construction of the PTVI Electric Boiler

Practically, we will always have to change the spare parts of the electric boiler and yet oftentimes we face an obstacle in procuring the machineries required. This is because the electric boiler is available only in overseas countries, while the procurement process usually takes quite a long time. Therefore, to optimize the operational process without having to shut down some operations while waiting for the boilers to be shipped from overseas, we need to innovate by manufacturing the necessary spare parts, including electrodes or strike plates (see Figure 6), by ourselves.

Figure 6: Strike Plate Part No. 17

Through our designs and fabrications, we need to optimize our machineries while saving time and cost. The company will use the materials available internally or can be procured domestically, while making use of mild steel plates or carbon steel. These materials have a lifetime of six months; original spare parts, meanwhile, will only last for 10 months max. In terms of costs, the optimization could save up to 90 percent material substitution costs. Therefore, the company can still maintain the electric boiler's maximum operational efficiency.

Emission Reduction: Bag House Improvement of Electric Furnace #4

One of the emission controllers in our electric furnace is the bag house, which main function is to control particulates. In its operational activities, however, Bag House often faces some obstacles in terms of leakage capacity, thereby requires some upgrade. Some improvements or upgrades we have conducted on the Bag House include: increasing the surface width of the bag house filter from 4.24 meters to 5.5 meters. In addition to that, we also add more chalk on the filter bag, while conducting routine tests using the vicolyte technology applied on all the bag houses across all operational areas. The Bag House activities can be seen in Figure 7.

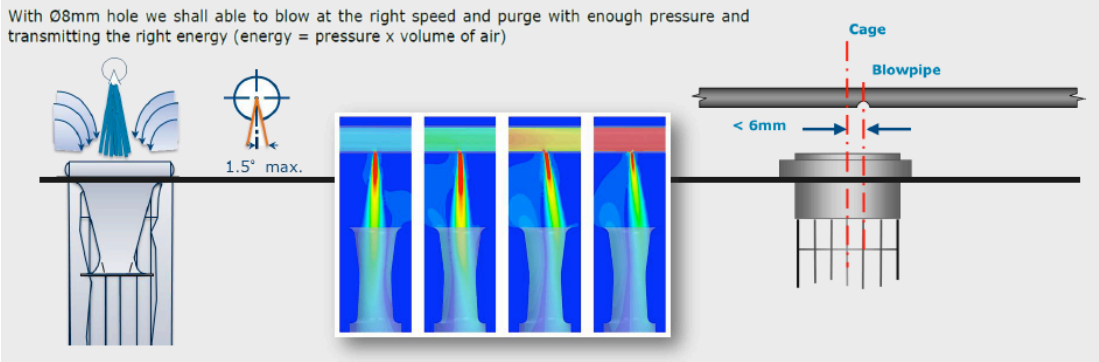

Figure 7: Illustration of Bag House Improvement

The program will be effectively launched in 2020; we expect that it will increase the conventional emission-reduction efforts – in this case, to bring down our particulate emission from 90-120 milligrams per cubic meter to 60-90 milligrams per cubic meter.

Hazardous Waste Management: Utilization of Green Aggregate from Slag Waste

Slag is a non-metal solid waste of furnace metal melting process while also being an aggregate of oxide in a melted form and is separate from the liquid metal form in the melting process. Slag has ***heavy physical characteristics,*** thus is highly potential to be used to sustain a heavy load, making it useful for processes like road construction.

Our activities using slag to construct additional mining roads in PT Vale can be seen in Figure 8.

Figure 8: The Use of Slag to Construct Mining Roads

PT Vale produces slag which, among others, can be used to construct mining roads. The slag is also used as a green aggregate which we call Ecoterako Vale. In total, the program can use up to 1,994,402 tons of slags per annum, with waste utilization rate on average accounting to 90-100 percent.

Solid Waste Management: Utilization of Chipping Materials from Waste Reject Dryer

Area Process Plant creates diverse types of waste, including the Reject Dryer waste. For every 100 metric ton of SSP product processed in the Dryer Process Plant, an average of 15 metric ton of reject dryer waste cannot go into further processing (called the Kiln Processing). We try to make use of the unused waste by recycling it as a substitute for quarry blasting materials in the upper foundation layer in logistical roads. In order for us to use the reject dryer materials as LPA materials, we have to crush the reject dryer to mold them into a maximum size of 28 millimeters, according to the flowchart below. We use the materials for the road upon subjecting them into a series of tests – be it laboratory test or fieldwork test to really gauge the standard quality of the roads made with them, using the process which can be seen in Figure 9.

Figure 9: Flowchart of the Utilization of Chipping Stones from Waste Reject Dryer Facility to Construct Road Base

The area in which we construct a new road utilizes new materials constructed using the reject dryer materials mentioned above. Our old roads, meanwhile, have been recycled using road stabilizers. We utilize these materials in our logistics road areas for overlaying purposes requiring new materials, plant site areas, yard areas such as the Delaney tyre shop, Delaney tyre storage and the community support area, etc.

Figure 10: Application and Utilization (Left: Before the Program; Right: After the Program)

The program can also replace 20,000 tons of broken stones from the blasting process per annum. Besides that, the innovation also reduces risks associated with workers' exposure to the explosion process, thereby increasing their work health and safety quality by reducing the intensity of explosion activities.

Water Efficiency: Larona Canal-Lining

This is a linear neomembrane installation which covers over the coarse canal surface. The program makes the canal surface smoother, thus accelerating water flow, resulting in higher electricity produced by hydro power plant with the same water discharge volume. The coarse canal surface slows water velocity down, while leakages at the canal's walls and bottom have weakened the canal ground integrity, which could lead to a canal rupture, while increasing the seismic design from 0.2 gram to 0.4 gram in accordance to the latest standard. Documentation on the construction process after the lining installation can be seen in Figure 11.

Figure 11: Lining Installation in the Larona Canal (Left: The Coarse Canal Surface, Center: After Geomembrane Installation, Right: The Canal's Condition After Being Watered)

During the effective implementation of the program, the company is able to create 586,087,488 cubic meter of water efficiency. The comparison of electric power (in Megawatts) produced before and after the program can be seen in Figure 12.

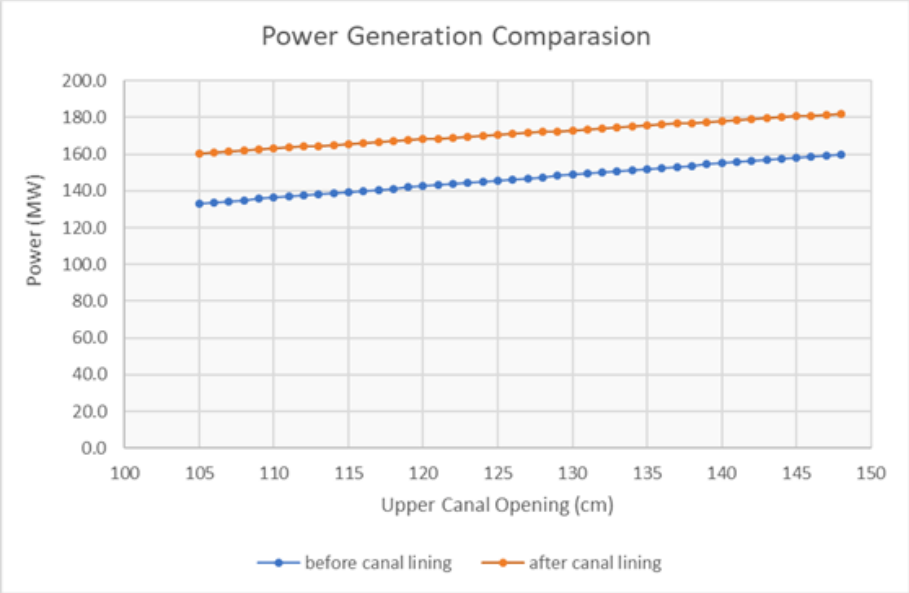

Figure 12: Comparison of Electric Power in Canal

The company implements the program only in the seven-kilometer-long Larona canal starting from the Batu Besi dam straight to the headpond. The canal supplies water from Towuti to the Larona generator.

Wastewater Management: Re-construction of Lamella Gravity Settler

The Lamella Gravity Settler, as have been mentioned in our previous publications, is a wastewater processing unit seeking to reduce suspended solid materials. In PT Vale, LGS is one of the wastewater innovations aiding the mining activities of minerals like nickels. Generally, nickel mines use settling ponds to reduce their suspended solid materials. The pond, however, requires a bigger area width, while in LGS, the width can be reduced by 90 percent.

In the previous LGS construction activities, the company has built an interconnected slurry processing unit, but upon constant effectiveness monitoring which has been done for more than six operational months, the company has discovered that the unit does not effectively reduce the suspended solid materials. Therefore, it requires the slurry solidification process to be reconstructed through a major shutdown by mud removal in the mixing and blade areas, as well as adding more screens in the LGS inlets in the mixing area. There are at least two concerns regarding this process: slurry pump performance which has often been obstructed by tree branches in the inlet flow (causing lots of downtime) as well as the slurry pump performance which could remove mud from the LGS.

The effectiveness of slurry processing in the LGS mentioned previously can be seen in Figure 13.

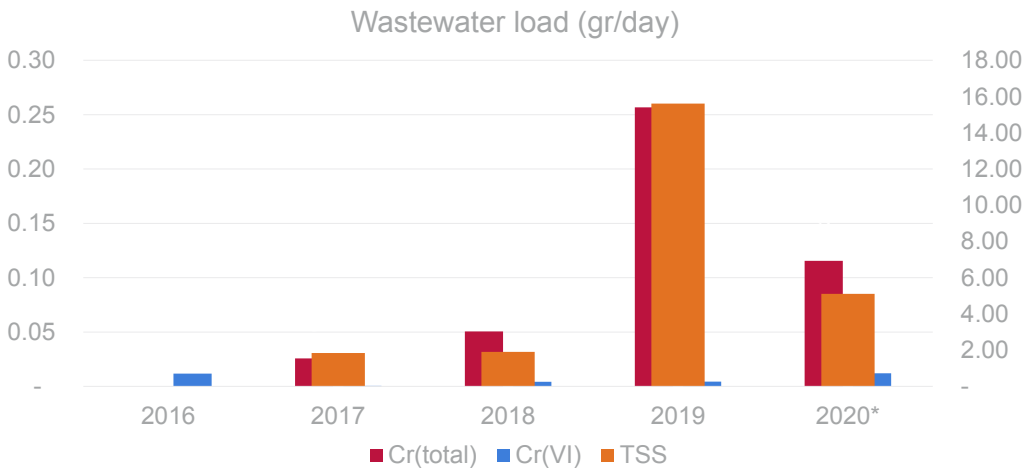

Figure 13: Comparison of LGS Slurry Effectiveness

The picture shows that the program can bring down suspended solid materials thereby also bringing down pollution burden by 19.94 tons per annum.

Biodiversity Conservation: Nursery Information System: Android-Based

PT Vale is developing an Android-based virtual monitoring system to support its nursery activities, which is known as the Vale Indonesia Nursery Information System. The application seeks to address difficulties in recording data on a real-time basis during the monitoring process since the recording is still conducted manually and oftentimes not well-documented. The innovation makes direct monitoring easier; the direct data input on the application has also brought incidences of human error down, and bringing greater impact especially on the management of data production in the Nursery Area under a single database system.

The NISVI application interface can be seen in Figure 14.

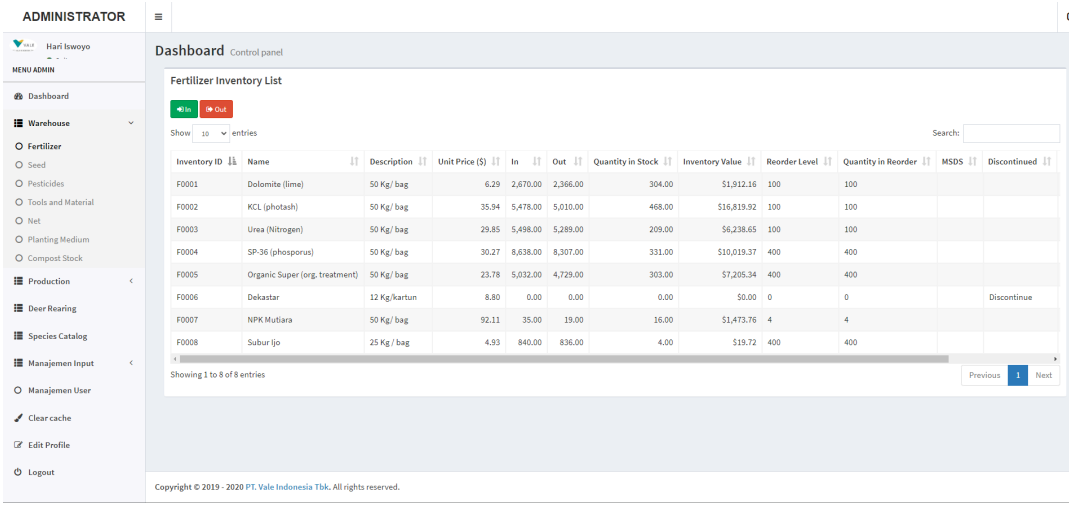

Figure 14: The NISVI Application Interface

Previously, the monitoring data is scattered across several Microsoft Excel files, increasing the likelihood of data duplication as well as creating difficulties in the reporting process. The Android-based application can just be installed in smartphones

and directly synchronized with the company database. As a result of this innovative development, we have come to know that there are at least 149 types of plants which we can cultivate in PT Vale's nursery area, to be later used for reclamation. Currently, the application is undergoing an integrated testing process with an automated nursery watering system, which will be explained in a different publication.

Community Shared Value and Development: Organic Fish Feed

PT Vale also initiates an organic fisheries program to support its beneficiary community so its members can fulfill their daily intake needs of nutritious fishes and enhance their economic income. In the fisheries breeding process, operators allocate the biggest chunk of cost to procure feed, which can constitute 60 to 70 percent of the total production cost. This oftentimes burden the fishermen to a point that it has actually motivated them to manufacture their own feed using high-quality yet affordable organic probiotic technology.

PT Vale has helped its beneficiaries from the fisheries sector to manufacture their own fish feed, whether manufacturing the feed directly in their pond or making vegetable-based fish feed made of materials are already available in nature. You can look at the process in Figure 15.

Figure 15: Manufacturing Organic Fish Feed

For our independent fish feed manufacturing process, farmers have to prepare organic materials available around their breeding area, before turning the materials into compost or organic microorganism. We have to manufacture the feed before we start breeding the fishes inside the pond, because the feed has to be scattered at the bottom of the fishpond when the pond is dry. Meanwhile, the company uses several plants such as water hyacinth, watercress, sweet potatoes, taro and papaya leaves, indigopera, Azzola, etc. to manufacture vegetable-based feed.

Both types of organic feed are beneficial for fish breeders as they can just make use of natural resources to improve their breeding quality. In terms of cost-benefit, the

program could reduce operational production costs by approximately more than 100% per annum, and is capable of boosting fish feed productivity to 12 tons per annum.

Conclusions and Recommendations

We conclude that as a whole, our mining and nickel processing operational activities need to carry on properly even as we are facing a pandemic. Therefore, we need to pay extra attention to the work health, hygiene and safety aspects in our operational area and people who live in its vicinity. The company's essential role can be seen in two aspects: internal affairs, comprising energy and environment management as well as external affairs, comprising community empowerment. Yet, speaking specifically of COVID-19 prevention and mitigation, the company considers the protection of each entity in its internal operational area as well as the larger community in the external environment of its operational area using as many means as possible as a calling. Our model programs and innovations turn out to bring about the following benefits:

1. Energy efficiency worth 12,626.00 GJ per annum
2. Slag waste recycling worth 1,994,402 tons per annum
3. Chipping waste recycling worth 20,000 tons per annum
4. Bringing down dust emission by 17 tons per annum
5. Creating water use efficiency by 586,087,488 cubic meter per annum
6. Reducing waste water pollution burden by 19.94 tons per annum
7. Boosting reclamation monitoring effectiveness by 149 species types.
8. Boosting community economic activities by more than 100% per annum.

We would also like to recommend monitoring energy and environment management regularly; hopefully this management can be done smoothly and more effectively in the future by taking into account several potential disasters which could hobble the area.

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