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# DESIGN OF BUSINESS CONTINUITY MANAGEMENT SYSTEM AT PT PUPUK SRIWIDJAJA PALEMBANG USING ISO 22301: 2019 FRAMEWORK

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## Abstract

As a fertilizer company that is responsible for implementing the production and distribution of subsidized fertilizers to support national food program, business continuity of PT Pupuk Sriwidjaja Palembang (PSP) is important for Indonesia's food security. In this era of uncertainty and disruption, a problem that has been identified is that PSP does not yet have a Business Continuity Management System (BCMS) that establishes protocols, creates recovery system, and helps company to continue operating in the event of disruption. This problem is solved by designing Business Continuity Management System using ISO 22301: 2019 framework. The scope of the research is the core of ISO 22301: 2019 Clause 8: Operation which consists of Business Impact Analysis, Risk Assessment, and Business Continuity Strategy (BCS) Formulation. The primary data is extracted by interviewing PSP's head of divisions, departments, and sections. the research finds that there are 66 business functions at PSP with 26 (39.4%) are Critical Business Function, 26 (39.4%) are Important Support Function, and 14 (21.2%) are Non-Critical Functions. The research also finds that there are 15 high or disaster risks to CBF. BCS is formulated for disaster risks with distribution of 5 (33.3%) defer/postpone strategy, 9 (60.0%) alternate backup facility/personnel/vendor, and 1 (6.7%) recover by own business unit.

***Keywords:*** Business Continuity Management, Clause 8: Operation, Fertilizer Company, ISO 22301: 2019 Framework.

## 1. Introduction and Purpose

The agricultural sector is a sector that has a strategic role in structure of national economic development. Fertilizer has an important and strategic role in increasing agricultural production and productivity (Irawan et al, 2012). Over the past year, domestic fertilizer consumption was recorded to increase, especially for urea and NPK types (Kemenperin, 2019). For the past 10 years, Indonesia imports fertilizer to meet the shortage of domestic needs (BPS, 2022). It is revealed, from year to year there is always a classic problem regarding the disparity between the need for subsidized fertilizer and the allocation for subsidized fertilizer (DPR, 2021). The outbreak of war between Russia and Ukraine has hampered the delivery of NPK fertilizer raw materials to various countries including Indonesia (Bisnis.com, 2022). This happened because Russia and its ally Belarus are among Top 5 of Global Fertilizer Exporter (Federal Reserve Bank of St. Louis, 2022). To increase resilience in facing uncertainty and avoiding industrial disaster that often happened recently, holding company instructed PSP to design and implement BCMS. BCMS establishes protocols, creates recovery system, and helps company to continue operating

in the event of disruption. The scope of the research is the core of ISO 22301: 2019 Clause 8: Operation which consists of Business Impact Analysis, Risk Assessment, and Business Continuity Strategy (BCS) Formulation with 4 research objectives: 1) to identify Critical Business Function (CBF); 2) to determine business impact parameters of CBF namely Maximum Acceptable Outage (MAO), Recovery Time Objective (RTO), interdependencies, and minimum resources; 3) to identify disaster risks of CBF; and 4) to determine BCS of CBF.

## 2. Literature Review

### 2.1 ISO 22301: 2019 Business Continuity Management System

According to ISO 22301: 2019 Security and Resilience Business Continuity Management Systems Requirements, Business Continuity Management is a holistic management process identify potential threats and their impact to the organization's operations and provide framework for building resilience with the capability to respond effectively that can safeguard the interests of key stakeholders, brand reputation, and value creation activities. According to Continuity Central, 80% of business went bankrupt 18 months after experiencing major disaster if not have an effective Business Continuity Plan. ISO 22301: 2019 implement high level structure and PDCA framework like another ISO standard as seen in the figure 1 below:

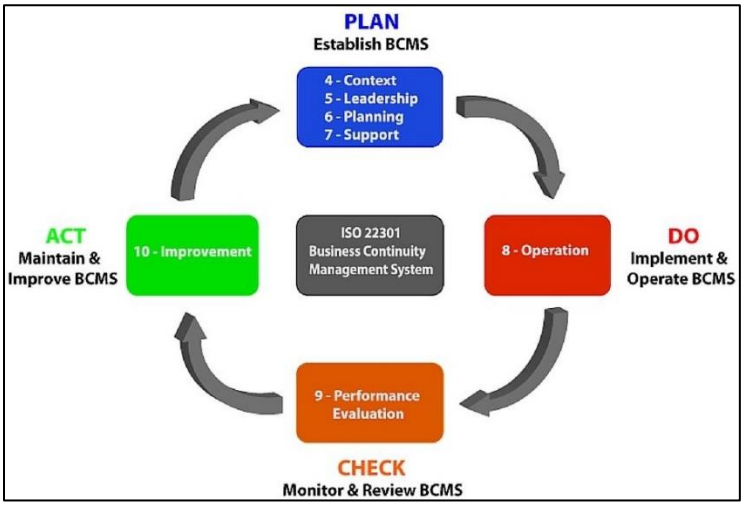


Figure 1. ISO 22301: 2019 framework

This framework implements the Plan (establish), Do (implement and operate), Check (monitor and review), and Act (maintain and improve) (PDCA) cycles to implement, maintain, and continuously improve the effectiveness of an organization's BCMS. This research will specifically discuss Clause 8 – Operations section 8.2 Business Impact Analysis (BIA) and Risk Assessment (RA) and section 8.3 Business Continuity Strategies and Solutions.

### 2.2 Business Impact Analysis

Based on ISO 22301:2019, Business Impact Analysis is the Process of analyzing the impact over time of a disruption on an organization. The organization shall use a process for analyzing business impact to determine business continuity requirements. The process must:

a) Determine the types and criteria of impacts that are relevant to the organizational context

b) Identify activities that support the provision of products and services

c) Use the type and criteria of impact to assess the impact over time due to the disruption of these activities

d) Identify the period during which the impact of discontinuing activities becomes unacceptable to the organization. This period can be referred to as the Maximum Acceptable Outage (MAO).

e) Establish prioritized timeframes within the time identified in d) to resume disrupted activities at minimum acceptable capacity. This time frame can be referred to as the Recovery Time Objective (RTO)

f) Determine what resources are needed to support recovery activities.

g) Determine dependencies, including partners and suppliers, and interdependencies of recovery activities.

### 2.3 Risk Assessment

Risk assessment is the process of identifying potential disasters and analyzing what might happen if a disaster occurs. According to ISO 22301:2019 clause 8 Operations, the Organization must:

a) Identify the risk of disruption to the organization's critical business functions

b) Analyze and evaluate the identified risks

c) Determine which risks require treatment

### 2.4 Business Continuity Strategies and Solutions

Based on the outputs from the business impact analysis and risk assessment, the organization should identify and select a business continuity strategy that considers both pre- and post-disruption options. A business continuity strategy must consist of one or more solutions. According to ISO 22301:2019 clause 8 Operations, identification should be based on the extent to which strategies and solutions:

a) Meet the requirements to resume and restore prioritized activities within the identified time frame and agreed capacity

b) Protect the organization's priority activities

c) Reduce the possibility of interference

d) Shorten the disturbance period

e) Limiting the impact of disruptions to the organization's products and services

f) Provide adequate availability of resources

## 3. Research Methodology

Based on understanding of theories and concepts of BCMS, Business Impact Analysis, Risk Analysis, and Business Continuity Strategy according to ISO 22301: 2019, research design is created. Research design contains steps to design BCMS in PSP. The first step is to list the work units or departments that will be included in the research. Among 43 departments within PSP, only 34 departments are included in this research. 9 departments related to research and governance are excluded off this research according to internal management's policy that departments related to governance and research are not critical to business continuity in the event of disaster. The next steps are involving data collection and analysis. Primary data for this research is taken by interview and discussion with PSP head of division or Senior Vice President (SVP) if available, head of departments or Vice President (VP) and head of section or Assistant vice President (AVP) as Subject Matter Expert (SME) of business functions. Interviews conducted were structured interview. Structured interview is done using a questionnaire filled out by researchers, based on a predetermined series of identical questions, and referred as "quantitative research interviews" to collect quantifiable data. Before conducting interview, list

of interview question is prepared as well as specific Business Impact Analysis and Risk Analysis criteria (see appendix).

The data collection started with identification of business function of each department. Generally, a department has more than one business function and each is managed under a section. This step is important to understand the workflow of company business process as a whole. The next step is conducting Business Impact Analysis of each business function. This is the foundation of BCMS design. This step aims to identify and filter the Critical Business Functions among all business functions in organization. Only Critical Business Functions will later be included in BCMS design. This is done by scoring each business function according to its impact to the organization if the business function is not running. The impact is categorized into five criteria: financial, operational, customer, company reputation, and law & regulatory impact. To determine Critical Business Function, each impact score is summed so total business impact score is obtained. Then the classification of business function is determined using these criteria:

Table 1. Quantification of Business Impact Rating

| Total Score | Business Function Classification |
|---|---|
| 20 – 25 | Zone A: Critical Business Function |
| 10 – 19 | Zone B: Important Support Function |
| 1 – 9 | Zone C: Non-Critical Function / Periphery |

After Critical Business Function is identified, the next step is to identify the requirements of Critical Business Function that is MAO, RTO, interdependencies, and minimum resources in the event of disaster as per described in part 2.2. This data is needed for formulation of Business Continuity Strategy later in this research.

The next stage is conducting Risk Assessment of Critical Business Functions. This stage aims to identify and filter high or disaster risk among all risk faced by Critical Business Function. This stage will form the basis for the formulation of business continuity strategy. To determine high risk based on its likelihood and consequence, the following matrix is used:

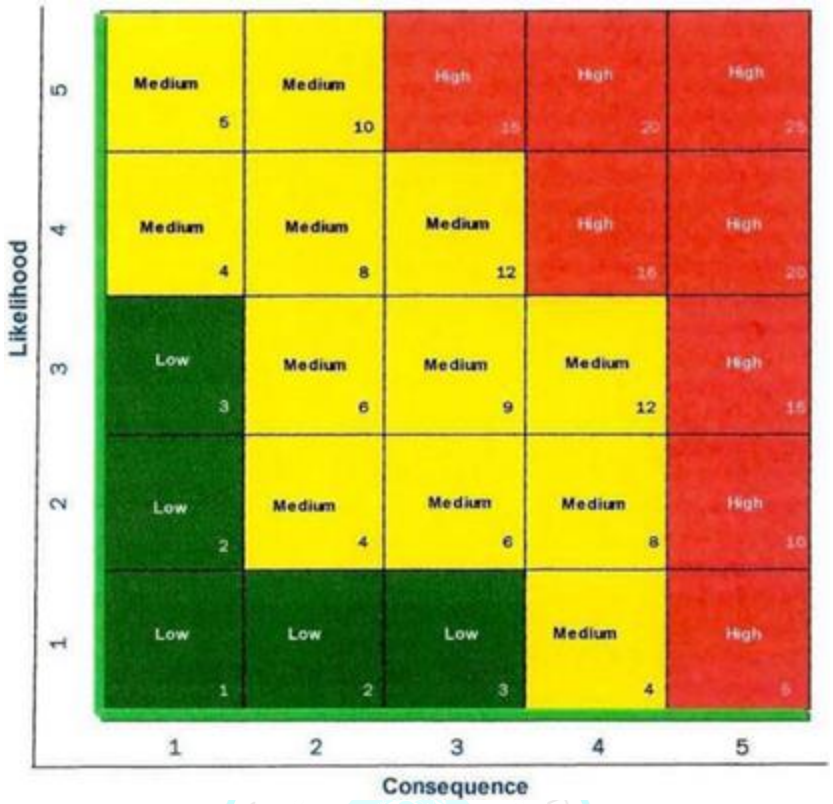


Figure 2. Risk Matrix

The final step is formulation of Business Continuity Strategy of Critical Business Function for high-risk disaster. Based on ISO 22301: 2019 concept and management instruction, business continuity strategy needs to be formulated only to high-level risk that happened on Critical Business Function. This step is done by involving SME of business function and the requirements of Critical Business Function in the event of disaster identified previously.

## 4. Result and Discussion

### 4.1 Identification of Critical Business Functions

Based on business impact rating and score acquired in interview, identified 66 business functions at PSP that can be classified into 3 zone: Critical Business Function, Important Support Function, and Non-Critical Function. According to Duckert (2011), Critical Business Functions are what an organization does to meet the demands of its critical stakeholders daily while operating. Critical Business Functions must be executed with the utmost precision and attention to detail to meet the expectations of customers, stakeholders, other key parts of the organization, outside vendors and so on who rely on them every day to deliver them. Critical Business Functions are those parts of an organization that are responsible for generating cash and/or utilizing cash efficiently. If an organization's Critical Business Functions are not operating effectively and efficiently, with minimized risk, then the entire organization can be compromised. There are 26 Critical Business Functions or 39.4% of total business function researched.

Important Support Functions are functions that are necessary for the functionality of the Critical Business function. Running an organization without these functions running at peak efficiency is nearly impossible. Example of this functions are production of side product, stock taking of

raw material and product, laboratory services, employee health management, company taxation management, budgeting and reporting, and handling of legal cases. There are 26 Important Support Functions or 39.4% of total business function researched.

Non-Critical Function or Periphery comprises all existing functions and owes its existence to the fact that the Critical Business Function is fully functional and operational. In other words, it's a very simple formula: no Critical Business Function, no need for peripheral functions. Indeed, it is very important to have all those types of functions when an organization has well-established critical business functions, but lacking this, there is absolutely no need for these functions at all. Example of this functions are selling plant services, employee assessment and recruitment, company asset management, and corporate social responsibility. There are 14 Non-Critical Function or 21.2% of total business function researched.

Critical Business Function in the company can be classified into 3 types: raw material & spare part preparation, fertilizer production & equipment maintenance, and product warehousing & distribution. There are 5 raw material & spare part preparation function or 19.2% among Critical Business Function, for example: 1) Setting raw and auxiliary materials specification, doing material planning to ensure availability and quality control, 2) Planning maintenance activities of equipment and material needed, 3) Conducting goods and services procurement processes, and 4) Warehousing all spare parts and material (chemicals & bags) and monitoring stock.

Fertilizer production & equipment maintenance takes most of the Critical Business Function with 14 or 53.8%. Example of this Critical Business Functions are: 1) Urea & Ammonia production, 2) Utility production using natural gas & coal, 3) NPK production, 4) Managing safety work permit, 5) Inspection and maintenance of plants.

Product warehousing & distribution contribute to 7 or 26.9% of Critical Business Functions in the company. Example of this Critical Business Functions are: 1) Warehousing & bagging of urea and NPK, 2) Loading fertilizer to truck and ship, 3) Providing infrastructure facilities for warehouse, 4) Issuing sales orders for picking up fertilizer at warehouse.

Based on interview, Critical Business Functions requirements in the event of disaster has been identified. Maximum Allowable Outage (MAO) and Recovery Time Objective (RTO) has been determined. Product distribution function is identified with the lowest MAO & RTO with 1 day MAO & 1 hour RTO, meaning that it is the most important function to preserve and recover. This is because product delivery is closely related to customer service and revenue, while production function is having backup plant and product minimum stock.

Interdependencies of Critical Business Function is classified into 3: upstream internal dependencies; downstream internal dependencies; and external dependencies. Upstream internal dependencies are other business functions that provide important input to the Critical Business Function, while downstream internal dependencies are other business functions that depend on the work or output of the Critical Business Function. External dependencies are external parties or vendors that important to support the work of Critical Business Function. The example of external dependency is gas supplier because without gas supply from it, the production function cannot operate.

Minimum resources for recovery activities of Critical Business function are divided into 6: IT, human resources, communication, equipment, building, and vital records. IT related to hardware and software needed. Human resources are the number of staff needed according to its work hours shift or non-shift. Communications are tools needed for staff to communicate with others like handy talkie for plant operators or cell phone for office staff. Equipment are tools needed by staff to work, for example safety equipment and plant equipment for operators or inspection and maintenance equipment for technician, and computer or laptop for office

staff. Building are place for staff to work like control room for operators and office building for office staff. The last, vital records is data or documents needed for staff in recovery activities.

### 4.2 Identification of Disaster Risks to CBF

After Critical Business Function parameter is identified, the next step is identification of high or disaster risk of Critical Business Function according to risk matrix by processing risk likelihood and risk consequence data acquired from interview. There are 15 disaster risks identified that can be classified into 4 types that is 1) natural disaster, 2) industrial accident and technology failure, 3) supply chain and product distribution failure, and 4) extraordinary event.

Natural disaster risk identified are: 1) earthquake causing damage to plant main equipment and 2) flood or earthquake causing raw material, product, or maintenance tools warehouse damage. Natural disaster rarely happens, but when it happens, the damage done can be enormous. Based on Indonesia's disaster-prone index, Palembang City has high risk of flood and medium risk of earthquake.

Industrial accident risks come from the fact that fertilizer industry is a high-risk industry, from raw material, product, equipment, production process, and workplace condition involved in it. The hazardous conditions of the fertilizer plant are its natural gas raw materials which is flammable and explosive, presence of high temperatures and high pressure in the equipment production process that could potentially cause fire or explosion. In addition, there is exposure to ammonia that is poisonous in certain limit. Technology failure risks arises due to the long series of fertilizer production processes that involve a lot of equipment and technology. Damage to the main plant equipment that does not have redundancy can cause unscheduled shutdown which causes huge losses for the company. There are 6 risks identified which are: 1) Industrial accident from equipment or human error causing explosion or fire & damage to plant main equipment, 2) Leakage or damage to the ammonia storage tank causing poisoning and pollution, 3) Blackout because of electrical system or equipment failure, 4) Failure of gas metering system equipment to supply gas to plant, 5) Failure of coal handling critical equipment (fix grab for coal unloading from barge or conveyor system) causing coal unloading cannot be performed, 6) IT system disruption in the form of ERP or other IT system failure, IT equipment failure, virus, or cyber-attack.

Supply chain failure comes from the dependency of fertilizer industry to continuity supply of raw materials which are natural gas, NPK raw materials, and coal. Natural gas is supplied by pipeline and used for raw material of fertilizer production and for fuel for creation of utilities like steam and electricity. NPK raw materials are imported and consist of many materials, for example Diammonium Phosphate from China, Rock Phosphate from Egypt, Potassium Chloride from Canada and Laos and delivered by ship. Coal is used for fuel and delivered by barge from surrounding region. The sudden failure of natural gas supply through pipeline can cause plants to cut rate even shut down immediately, while for NPK raw materials and coal there are buffer stock, but prolonged supply failure will cause plant to cut rate and eventually shutdown due to lack of raw material. Product distribution failure related to failure in transportation of product from plant to outside. The fertilizer is transported by truck and by ship. There are 6 risks identified which are: 1) Failure of natural gas supply from gas supplier causing plant to stop operating, 2) Failure of coal supply from coal supplier because of vendor internal problem like sudden equipment maintenance or production loss, 3) Failure of NPK raw material import supply from vendor because of Ukrainian War or supply chain disruption, 4) Disruption of land transportation distribution lines due to road damage or flood causing truck tonnage limited, 5) Disruption of marine distribution routes due to silting of the Musi River causing ship tonnage limited, and 6) Bag distribution period is wrongly printed causing bag product cannot be distributed.

The last disaster risk is extraordinary event. This is a very unusual, remarkable, or surprising event that causing disruption to Critical Business Function Operation. Example of this risk is pandemic outbreak. There is 1 risk identified that is shortage of personnel because of pandemic.

### 4.3 Business Continuity Strategy Formulation

Business Continuity Strategy is formulated for all disaster risks to Critical Business Function. There are 3 type of strategy that can be employed. The first strategy is deferred or postpone. Using this strategy, business function is postponed or not operated until the impact of the disaster has been passed. This happen because the business function does not have backup to keep it running in the event of disaster. For example, the operation of plant to produce fertilizer is halted while waiting for maintenance of broken critical equipment. The second strategy is alternate backup in the form of facility, personnel, or vendor. In this strategy, implementation of business recovery is done by using alternative facility, personnel, or vendor. This strategy needs preparation of backup so that when disaster happen, the backup can be deployed quickly. The third strategy is recovery by own business unit. Implementation of business recovery is carried out by business units alone. This strategy can be carried out if the business unit has its own capability and resources to quickly recover from disaster. Meanwhile, Business Continuity Strategy execution is divided into 2: prevention strategy or before disaster and recovery strategy or after disaster. Prevention strategies relate to efforts made to reduce the likelihood and impact of a disaster, while recovery strategies are ways to return business functions to operations after a disaster occurs.

From 16 disaster risks that threaten Critical Business Functions, Business Continuity Strategy formulated divided into 5 (33.3%) defer/postpone strategy, 9 (60.0%) alternate backup facility/personnel/vendor, and 1 (6.7%) recover by own business unit. This means that majority of disaster risks can be recovered quickly without postponing the operation of Critical Business Function by using alternative backup or recovery by own business unit. It shows good design of BCMS that promote organization resilience to disaster. Table 5 below is one example of strategy formulated:

Table 2. Business Continuity Strategy of Critical Business Function

| No | Department | Critical Business Function | Disaster Risk | Strategy Type | Business Continuity Strategy |
|---|---|---|---|---|---|
| 1 | P-IB, P-IIB, P-III, & P-IV Operation | - Producing ammonia<br>- Producing urea<br>- Producing utility (steam, electricity, water, & air) using gas | Failure of natural gas supply from gas supplier causing plant to stop operating | Defer / postpone | **Prevention strategy / before disaster**<br>1. Maintaining contract continuity of natural gas (long term contract)<br>2. Coordinating natural gas demand with natural gas supplier via Gas Coordination Monthly Meeting<br>3. Calculating amount of natural gas supply needed so that the Plant can minimally operate<br>4. Communicating and coordinating with natural gas supplier intensively and quickly in case there is change in supply and demand because of shutdown or maintenance in gas supplier facility or in internal plant |
| | | | | | **Recovery strategy / after disaster**<br>1. Lower internal production rate to minimum conditions and maximizing the use of coal for Utility Plant<br>2. Coordinating with natural gas supplier for monitoring restoration of gas supply<br>3. Increasing production rate back to normal |

## 5. Conclusion and Recommendation

The purpose of the research is to design Business Continuity Management System at PT Pupuk Sriwidjaja Palembang (PSP). This has been accomplished by using ISO 22301: 2019 Business Continuity Management System clause 8 – Operation framework. The primary data is extracted by interviewing Subject Matter Expert (SME) of business functions. By conducting Business Impact Analysis, business functions at PSP can be classified into Critical Business Function, Important Support Function, or Non-Critical Function. By conducting Risk Assessment to Critical Business Function, High or Disaster Risks can be identified. Also, Business Continuity Strategy can be formulated for each Disaster Risk to Critical Business Function.

The limitation of the research is that it only covers clause 8 – Operation of ISO 22301; 2019 framework. This research should be followed up by preparation of Business Continuity Plan and Procedure which contain detailed structure to response the disaster and manage operations during disaster and detailed procedure to manage communications and warnings.

This Business Continuity Management System is designed for fertilizer company, especially urea and NPK fertilizer, and is generic. Therefore, it can be applied to other urea and NPK fertilizer company as well. This research can be developed for other fertilizer product like ZA & SP-36.

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## Appendixes

Risk Likelihood Criteria

| Rating | Frequency | Speed |
|---|---|---|
| 5 | Happened more than 2 times in the last 1 year | Estimated that it will happen soon |
| 4 | Happened twice in the last 1 year | Estimated that it will happen this year |
| 3 | Happened once in the last 1 year | Estimated that it will happen next year |
| 2 | Happened once in the last 2 to 5 years | Estimated that it will happen in the next 2 years |
| 1 | Happened once in over the last 5 years | Estimated that it will happen over the next 2 years |

Risk Consequence Criteria

| Rating | Description | Consequence to the operation of Business Function |
|---|---|---|
| 5 | Catastrophic | Operation stopped for < 1 day |
| 4 | Major | Operation stopped for 1 – 2 days |
| 3 | Moderate | Operation stopped for 3 – 4 days |
| 2 | Minor | Operation stopped for 5 – 7 days |
| 1 | Insignificant | Operation stopped for > 7 day |

Business Impact Analysis Criteria

| Type of Business Impact | Description | Rating and score | | |
|---|---|---|---|---|
| | | Low = 1 | Medium = 3 | High = 5 |
| Financial Impact | Impacts affecting cash flows, revenues, financial losses, and the overall financial performance of company | Small impact on the company | Constrained sales, delays in receiving payments, but not too influential on the company's finances | Decreased profits of more than 5%, lost a large market share, and greatly affected the company's finances |
| Operational Impact | Impacts affecting company's fertilizer production and distribution | Company operations is slightly disrupted | Company operations is stalled for less than 1 day | Company operations is stalled for more than 1 day |
| Customer Impact | Impacts affecting company's customer satisfaction | There are customer complaints but have no effect on the customer satisfaction index | Customers still make repeat orders but with smaller numbers and complaints are coming the company | Loss of customer loyalty, significant decline in the customer satisfaction index, difficulties in getting new buyers |
| Reputation Impact | Impacts related to effects on company image, brand, and reputation in external environments | There is no negative news and very little impact | Negative coverage arises in local or regional media but does not damage the company's image | Negative coverage arose in the national media which resulted in damage to the company's image |
| Legal & Regulatory Impact | Impacts related to the adherence to laws and regulations governing company operations and activities. | Verbal warning from the government and not stopping the company's activities | Sanctions or fines but does not stop the company's activities | Litigation liability and serious legal violations that result in license revocation and stopping company activities |