
Creating A Sustainable Development Model for the Trading of Industrial Minerals

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Abstract: The research focuses on the Sustainable Development Goal 12 of the United Nations Millennium Development Program of responsible consumption and production of industrial minerals. The research creates a unique model called the Centripetal Model using the Delphi Technique as well as other factors such as the macroeconomic concepts, cost analysis, market analysis (fragmentation and concentration) to justify the need for a Sustainable Development Framework. The Sustainable Development Model is necessary in the trading of industrial minerals since it raises the issues relating to the environmental issues and the researchers develop the centripetal model which helps in contributing the sustainable development of industrial minerals. This centripetal framework helps in responsible consumption of the industrial minerals, cement, aggregates and other natural resources which would contribute to responsible utilisation of the resources, develop the societal needs and improve the conditions of all the different stakeholders associating with the minerals industry.

Keywords: Industrial minerals, contribution to sustainable development, natural resources management

INTRODUCTION AND LITERATURE REVIEW

The 2030 agenda for the Sustainable Development Goals of the UN focusses on the environmental sustainability, social inclusion and economic development. Thereby it could be understood that the mining & extractive industry has immense opportunities to be created for human, physical, technological and financial resources, if managed better. The research paper on (Sonesson, Davidson, & Sachs, 2016) facilitates three outcomes i.e. relation between Sustainable development goal and mining, opportunities and challenges through the mining industry and the stakeholders, multistakeholder dialogue towards achieving sustainable development goals. The paper on (Monteiro, Monteiro, & Neto, 2019) studies on the SDG and its impact on promotion of jobs, socio economic improvement of community's residents, infrastructure of the environment are supportive to the industry in the remote and poor areas.

In order for achieving a cleaner environment, the production techniques play an important role in the mining and extractive industry. The paper on (Giannetti, Agostinho, & Eras, 2020) focusses on new technologies and procedures for a cleaner and efficient production to prevent damages of the environment. This research focus on how the cleaner production technologies are effective and efficient.

The mining and extractive industry is identified as one of the key industries that can improve its conditions of economic prosperity and better industrial activities for environmental sustainability. (Mesquita, Xavier, Klein, & Matos, 2017) study on the various factors benefitted with the industry which are sustainable development goal in mining has a considerable impact on the Health and Well Being of Workers: Health and well-being which has been studied with the copper mining industry in the sub Saharan Africa. There has been an eradication of many diseases amongst their labour forces especially with the improvising the conditions of the mining industry. The study also explains about the air pollution in Serbia.

The Ostrum's work on governance of metering monitoring and sanctioning can help in achieving the sustainable development goals.

Mining and Partnership for Goals: An important role of NGOs, Development agencies, private sector, banks etc. These help in bringing in transparencies and ethical roles in private institutions/corporates and research institutions.

As (Kogel, 2015) states the society's needs for products and services drives the consumption of non-renewable minerals and metal resources.

Forecasting plays an important role in exploratory and normative directions. Delphi technique helps in developing a forecast of future parameter of performance based on past parameter development and present state of art (Davis, 1976).

Similar study on implementation of Delphi technique has been done by (Menshutkin & Klekovski, 2001) on computer simulations for the dynamics of forest communities and abundance of wild animals in the Bieszczad Mountain region studying on the changing water quality and its impact on tourism and agriculture. The model helps in studying the environmental factors such as climate change and anthropogenic disturbances. The fundamental relationships in this simulation is done using the Delphi model and thereby it could be understood that the Delphi model helps in developing techniques and can be used as an efficient tool to measure the various factors associated with SDG.

For the purpose of deploying the different stages of the Centripetal Model, we focus on a sub-category of the mining and extractive industry, this one of industrial minerals and the possibilities to develop trading activities, in order to be able to counterbalance the overexploitation of natural resources and better distribute the outcome in times of overcapacity.

Objectives:

- To Study the impact of Trading of Industrial Minerals and its impact on environmental concerns.
- To Theoretically construct a framework using Delphi techniques a sustainable development framework in order to overcome the impacts.

Definitions:

1.1. Industrial minerals

Geological materials are mined for their commercial value, which are not fuel (fuel minerals or mineral fuels) and are not sources of metals (metallic minerals) but are used in the industries based on their physical and/or chemical properties. They are used in their natural state or after beneficiation either as raw materials or as additives in a wide range of applications (Jessica Elzea Kogel, 2006)

1.2. Trading Company

It could be understood that an organization which sells industrial minerals to exploit excess demands via production from a third-party source. The trading company's initial responsibility in the value chain will be from point of purchase to destination port within a terminal or a warehouse.

1.3. Trading Capabilities

The ability to identify and shift production from surplus to deficit areas. Trading capabilities allow the smoothing of cyclical declines in demand and profitability, forecast overcapacity issues, identifying new business opportunities, and the monitoring of future and current market trends. Trading offers producers an alternative entry into markets world-wide by absorbing surplus produced by a third party and diverting it profitably into markets that need imports. Additionally, a sustainable development component is getting also added so as to avoid the overexploitation of resources.

2. How to Identify Opportunities

In order to identify opportunities, it is important to facilitate the readings and best possible understanding of the model. The described model includes a qualitative and a quantitative analysis section. First come a brief description and reasoning for the countries' selection model as well as a fundamental analysis consisting of the country scoring activities and the fragmentation-concentration analysis. The quantitative econometric analysis follows comprising the trends affecting the industrial minerals trading sector and the cost analysis offering a view of the expenses imposed, so as to initiate trading activities in a market.

2.1. Description of the Centripetal Model

The accelerated flow of historical and macroeconomic events occurring worldwide, as well as the instantaneous local lacks and surpluses, embody a unique opportunity for outsiders to penetrate successfully new markets. As a result of the research, the paper creates a flexible and user-friendly model that will offer a prompt and concise insight of potential buyers and suppliers. The model encompasses all parameters that could affect a market and identify any inherent growth possibilities, that is the micro and macro-economic data directing the trends. It is named as the Centripetal Model, as it converges all the parameters towards the direction of a balance on market opportunities and sustainable development. General demographics, geographical and financial information and the consumption numbers, costs and prices of industrial minerals are all key variables to identify potential opportunities. The targets will be primarily to locate the prospects for trading industrial minerals within the context of a short-term entrance and harvest promising conditions as well as offering a sustainable development perspective in times of overcapacity. The intelligence factor of this model will signify the process by which information is acquired, converted into intelligence, and made available to decisionmakers. Information is raw data from any source, data that may be fragmentary, contradictory, unreliable, ambiguous, deceptive, or wrong.

Intelligence is information that has been collected, integrated, evaluated, analysed, and interpreted. Finished intelligence will be the final product of this model delivered to the project undertakers. The three types of finished intelligence are basic, current, and estimative (Publication, 2013). Basic intelligence provides the fundamental and factual reference material on a country. Current intelligence reports on new developments. Estimative intelligence calculates probable outcomes. The three are mutually supportive: basic intelligence is the foundation on which the other two are constructed; current intelligence continually updates the inventory of knowledge; and estimative intelligence revises overall interpretations of country prospects for guidance of basic and current intelligence. The model proposed will initially evolve the basic and current intelligence steps, so as to ensure the access of the company to as objective as possible estimative intelligence outcomes. The procedure followed will basically incorporate a centripetal model. This market approach makes use of both fundamental and econometric analysis. Emphasis is also placed on the interaction between markets. The process comprises stages leading to the gradual elimination of certain countries, in order to end up with the most appealing markets for potential trading activities. The first two stages of classifying are depicted in the fundamental analysis, sorted into two phases, the country scoring phase and, subsequently, the fragmentation-concentration analysis. Correspondingly, an econometric analysis is executed upon the industrial trends of development within the international context, to show which areas or, in particular cases, countries appear attractive for business. Finally, in order to avoid any extreme incidents of excessive fees or exorbitant prices, cost analysis is realised in the final selection of the countries. This centripetal model then offers a relatively unbiased result for the most promising markets among these few chosen countries.

2.2. Fundamental Analysis

The first part of the centripetal model is the fundamental analysis that embodies the country scoring and the further elaboration on the market analysis of the countries selected. During the country scoring procedure, there are two different but not antagonistic approaches of choosing the countries that are most attractive to the trading company, and that are applied concurrently; the Delphi approach and the factual even more accurate process. After having reached the countries that assemble the highest scores, there will be a thorough inquiry upon the local market, competitors and their retaliatory power, so as to get to the most interesting regions for trading activities.

2.2.a. Country Scoring

The fundamental analysis depicts the individual scoring of countries by each one of the persons involved in the decision making process, according to certain parameters set to offer them a view of the opportunities and threats in each country concerned. In this evaluating procedure, opinions must be independent, - in order to avoid subjective findings-, as well as aware of all the information assembled for the concerned criteria.

The criteria include:

- ↳ Economic features;
 1. Real GDP growth at market prices
 - ↳ Generic data upon the country's demographic attributes;
 1. Population growth
 2. Urbanisation
 - ↳ Geographical information;
 1. Size in km²
 2. Access to port, and,
 - ↳ Elements directly connected with the national industrial minerals' consumption, along with the presence of competitors;
 1. Consumption growth
 2. Domestic consumption in milion metric tons
 3. Total production in milion metric tons
 4. Production capacity in milion metric tons
 5. Imports in milion metric tons
 6. Exports in milion metric tons
 - ↳ The Comments' section includes;
 1. The main competitors
 2. The events intending to provoke changes in the previous data collected

More specifically, the first part initially presents the real GDP growth at market prices for a period of 5 years. The GDP number contributes to judge how a country is going economically and is proven to be positively related with the industrial minerals' national consumption. Nevertheless, GNP could be used as an indicator as well, if the research conductor is aware of the differences it attributes to the economy of a country. GNP determines the estimate of the total money value of all the final goods and services produced in a given one-year period by the factors of production owned by a particular country's residents. GNP and GDP are very closely

related concepts in theory, and in actual practice the numbers tend to be pretty close to each other for most large industrialized countries. The differences between the two measures arise from the facts that there may be foreign-owned companies engaged in production within the country's borders and there may be companies owned by the country's residents that are engaged in production in some other country but provide income to residents. GNP is calculated for the same reasons that statistical data is also gathered on unemployment rates, consumer price levels and the international trade balance. The results of such statistics facilitate economic policymaking by government, assist in planning by decision-makers in business, and test economic theories. If government policy makers include among their goals the promotion of economic growth and material prosperity in the national economy as a whole by means of monetary and fiscal policy, they need to have some reasonably precise way of telling how the economy is doing so as to decide whether they should be pushing on the gas or stepping on the brakes. Businessmen responsible for planning new investments in plant and equipment or the introduction of new products can use macroeconomic data and economic theory to forecast the likely levels of demand for their products and the probable trends in their various costs of production. Finally, a historical record of such statistics provides economists with the necessary data to test and refine their theories about how the economy actually works (and, in the process, perhaps to improve the policy makers' understanding of the likely consequences of their policies). GNP and GDP are among the most comprehensive measures of the overall amount of economic production taking place in a specific economy. After having perceived the national economic trend, we focused on the demographic figures. This model presents the population growth and the degree of urbanisation. Population growth along with the succeeding consumption facts facilitates the inquiry of new possibilities within a country. Population growth in combination with the other data assembled offers an integer view for the future image of a country, as well. It recognises situations like a small nation with large potential consumption growth, or a big country where consumption is predicted to remain stable. Developing countries, for example, in which population growth is moving fast, demonstrate the imminent need for construction, infrastructure, durable goods, industrialization and consequently the increase in terms of consumption. The urbanisation degree indicates the tendency of the population, as well as the will of the local government to concentrate certain groups within the cities. Both of these two alternative or complementary circumstances signal the afterward growth for the industrial minerals industry. Subsequently, urbanisation helps to appoint these countries that have a foreseeable opportunity for consumption figures to shift upwards. Moreover, geographical information is taken into account in the model. Initially, the country's size is registered as a first sign in the research. The size of the chosen country contributes mainly to the choice of the most interesting investment to undertake, according to the time of depreciation and the opportunities to harvest a considerable gain. However, this factor allows the researchers to end up to some supplementary considerations concerning the country's internal structure. More specifically, there are regions where consumption is concentrated and illustrates the imbalance existing in the regional development, e.g. in big underdeveloped countries industrial minerals consumption appears only in their central commercial points, like the capital or the ports, while in the hinterland there are not yet any buildings or production sites or routes to alleviate the local growth. The latter parameter implicates the access of the country to ports, so as to make the company's trading plan feasible. Over 85% of the world trade is done by the sea routes and therefore it must be mentioned here that maritime transportation is a major part of industrial minerals trading costs area. Shipping constitutes the most appropriate way to deliver industrial minerals promptly. The investing plan of a trading company also encompasses the construction of terminals, leading thus the company to make decisions according to the existence of ports, as well. Finally, according to this criterion, countries with access to lakes and rivers are also taken into consideration. Subsequently comes the industrial minerals industry related section with the figures concerning information, among which are consumption, local production capacity, imports and exports. The first variable in the second part is the industrial minerals consumption growth percentage for the period of 5 years. Industrial minerals consumption influences primarily the national economy, following the interrelation aforementioned between GDP and industrial minerals industry growth. Industrial minerals consumption is, at length, a critical point of reference for the industrial minerals industry, since, together with the events justifying its growth, it may be an indicator of future development, increasing the industrial minerals demand. Domestic consumption and production are indispensable factors for detecting both the need in industrial minerals and the possible opening in the market. Opportunities arise from the difference between the buyers' requirements and the production of the local industrial minerals' companies. Nevertheless, what endorses this difference is indeed the production capacity, that enables the decision makers to depict the real gap in the market, or the hidden potential that could imperil the company's trading activities. If a new comer tries to enter in a new market through trading, there is always the danger that the local producers increase their capacity and subsequently almost fully satisfy the demand met. In the model, this difference should be further compared with the imports and exports figures. Imports, - along with the presence of competitors-, denote the degree to which the market is saturated, and the possible occasion of beginning there trading activities. When imports are equal to the local production, while the demand seems to be fully satisfied by the national amount produced and no exports are shown, then the country disposes only grinding facilities to transform imported clinker into finished industrial

minerals. Existing exports, on the other hand, contribute to the more precise calculation of the uncovered needs, since this amount is added to the difference between local demand and supply. In the final part of the country scoring model which assembles the comments, two categories of information are taken into account. The first part collects the main competitors in the local market. In this case, major world players, as well as their existing alliances are disclosed. Moreover, local producers and the government's intervention are divulged, so as to offer to the decision-maker some hints about the creation of a relevant market penetration scenario. The latter part of the comments comprehends the macroeconomic and global events that are meant to signify the potential opening for industrial minerals trading in the near to longer term. This information is collected mainly by the projects of the World Bank, the IMF, and major countries like the USA. Funds are allocated to promote certain areas of infrastructure and industrial development as well as new technologies. Furthermore, some important data about the internal situation in each country are raised and may be exploited further, such as stability and growth potential. After presenting the parameters taken into consideration and justified their role in the model, the analysis proceeds to the scoring of all chosen countries (when the model tested in real market conditions over 150 countries have been tested , so as to arrive to the 30 (1/5) final states that could underlie an opportunity for industrial minerals trading. The factors are divided into primary, - which are graded one by one-, and secondary, - which are counted as a group. The maximum amount of points that one country may get are 100 and are dispersed among the parameters according to their importance (see country scoring calculation). Beginning with the primary factors, the most important factor is the part of the comments assembling 25 points since they give a clearer view about the economic and social development of a country in the future. In addition, the real GDP growth, along with the consumption growth and the domestic consumption-production difference together with the production capacity accumulate 15 points each- GDP growth is the sole figure providing information for the economic expansion of each country. Concluding, the parameter of the existence of port facilities counts for 10 points, as it is an important element for the industrial minerals' transportation. The secondary components are the demographic and geographical information and assemble as a group the maximum of 20 points.

Country Scoring Calculation

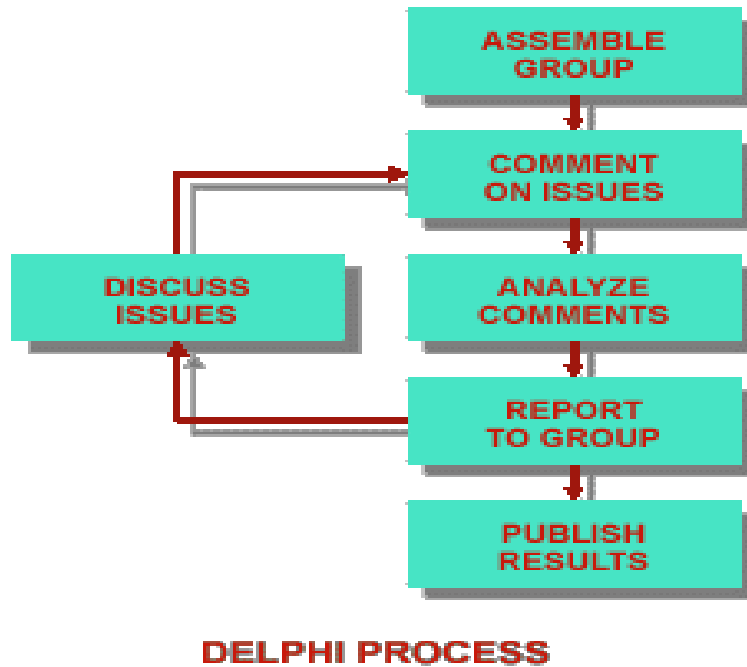
Primary factors	GDP growth	15
	Port facilities	10
	Consumption growth	15
	Cons.-Prod. difference & production capacity	15
	Comments	25
Secondary factors	Demographic	20
	<input type="checkbox"/> Population growth	
	<input type="checkbox"/> Urbanization	
	Geography	
	<input type="checkbox"/> size in Km²	
	<input type="checkbox"/> exports (potential)	
TOTAL:		100

Each member of the decision-making group must grade autonomously each country, using the entire scale of points from 1 to 100. After having gathered all scoring sheets, there is a person responsible for the first screening of the countries that will sum up all scores for each country and find the average score, using following the equation:

$$\Sigma(Ni, i=1)/n,$$

The parenthesis denotes the sum of the individual sums of points and n signifies the number of people involved in the decision-making process. Finally, the 30 countries with the higher scores will enter the second phase of the analysis. The procedure followed by this model to select the most important markets is known as the Delphi approach. Olaf Helmer and Norman Dalkey originally developed the Delphi process in the 1950s, both scientists at the RAND Corporation, as an iterative, consensus building process for forecasting futures and making scenarios. It has since been deployed as a generic strategy for developing consensus and making group-based decisions in a variety of fields. An interest group is typically assembled, either through correspondence or face-to-face discussion, to assess issues of mutual concern. While the individuals in the group share a common interest (the subject of the Delphi), they usually represent different points of view. Each member of the group is asked to give their comments regarding a particular set of issues. A facilitator analyses the individual comments and produces a report documenting the response of the group. The individuals then compare what they said to the group's normative response as a basis for discussion. The discussion, again via remote or face-to-face conversation, is used to share, promote, and challenge the different points of view. Once this is done, the

participants, having the benefit of the previous discussion, anonymously comment on the issues again. A new group report is generated and the process repeats itself. This process continues until the group reaches consensus or stable disagreement. Objectivity is achieved when accurate information and self-reliant opinion are respected during the scoring stage.



2.2.b. Factual Scoring Approach

At this point, it is necessary to propose a collateral, purely factual comparison of the countries examined, so as to examine the objectivity of the Delphi approach results. This study lies upon the strict calculation of the different factors of each country multiplied by the points given to each criterion. The estimation used in this part for each factor is:

(Factor’s number of the country / Max number met among the countries) * Grades given for this factor

Following the same procedure for all six criteria presented in the scoring calculation frame, the process ends up to a sum that shows the distance between the country’s accumulated result and the maximum possible outcome that is 100 points. The total equation for each country may be depicted as follows:

$$\sum [(F_{1,1}/\max F_1) \times P_1 + (F_{2,1}/\max F_2) \times P_2 + \dots + (F_{6,1}/\max F_6) \times P_6]$$

F is the number for each country’s factor, max F is the maximum number that is found for this factor among the countries observed, while P reflects the points that this criterion assembles.

Some observations must be mentioned, concerning the comment factor evolved in this procedure. The part of the comments gets 25 out of the 100 points as it is indeed the most significant factor for discovering the opportunities to enter a market, otherwise, it would be easy to count the numbers and simply find out the countries reserving the highest score. Comments describe the realistic opportunities and threats within a country, that is why they must be included in this study, so as to get effective results. Nevertheless, they cannot be estimated in objective numbers, leaving, hence, the only solution of using the results of the Delphi approach for this criterion. Comments are graded by the same outcome they had accumulated during the first model. On the other hand, the factors are drawn by numbers, facilitating this process of verifying the first country scoring’s outcomes. In the part of the consumption-production difference and the production capacity, it must be noted that the case of countries importing clinker and turning it into industrial minerals through their grinding mills is taken into consideration, since these domestic supply figures are not at length real. This is the example of all countries whose domestic consumption, supply and imports present approximately the same total sum. Additionally, during the factual scoring model production capacity is excluded from the average grading since the result would not show a real industrial minerals production indicator leading to countries’ accurate selection. That is, this factor would normally demonstrate that the countries with the lowest amounts would be more

attractive markets while the model has as target to assemble the countries with the highest scores. Finally, concerning the secondary factor in this model, the demographics and the geographical size of the country - the exports potential is excluded as it is already calculated indirectly in the demand-supply factor-, they are initially calculated separately, and then their weighted average is cited in the model. Consequently, maximum accuracy of results is pursued by the decision-makers. The outcomes of both models propose to the traders a series of countries among which it is better to choose those that are common. However, the analysis must move forward to a superior level of market segmentation, which will allow the decision-makers to know more about the internal situation in the local industrial minerals market for each one of the 30 countries that are picked. In the following stage, to describe analytically the model, the Delphi country scoring results are preferably used.

2.2.c. Concentration - Fragmentation Analysis

At the end of the previous evaluation come the first resulting group of countries assembling the highest scores according to the previous criteria and points' ranges set. On the second phase of the model, an advanced level of evaluation must be implemented, in order to end up with the most appropriate three to five countries determined as emerging opportunities for trade. The definition of such a market is actually based upon the parameters used in this part of the fundamental analysis. When analysing industrial minerals markets, analysts tend to focus on per capita consumption and a consensus on GDP forecasts. While this is no doubt useful, it is more important to focus on pricing power and market fragmentation to find the real winners in those emerging industrial minerals industries. In this phase, the decision-making process refers basically to certain criteria so as to define fragmented or concentrated industrial minerals markets:

- The presence of few or many players
- The presence of well-defined market leaders (oligopoly), or not (fully fragmented market)
- The presence of international companies which can introduce a strong price discipline
- The degree of balance between consumption and production
- The degree up to which there is a limit to import threat, especially for companies willing to establish long-term activities in the market (plant facilities, building warehouses, etc.)

Consequently, what is important for the further inquiry of trading opportunities within a small number of countries is to measure the degree of fragmentation within the markets already selected by the initial country scoring. Based on opinions of industry practitioners which have been contacted, there are over 10,000 large corporations or SMEs operating in the industrial minerals markets. The following criteria will basically indicate three measures for the wider conception of the internal situation of each country's market:

- Market leadership (% of share of the largest company)
- Competitors (the number of companies in the market)
- Concentration or fragmentation

The model will disclose therefore six parameters to assemble all sufficient information about these measures. The first element is the identification of the market leaders. Following is the market share of the leader, denoting the size of its presence in the market, as well as a first view of the potential that a company has to enter and retain its own share. The national consumption, meaning the yearly domestic demand, is also depicted in this second stage, as it will be exploited calculating the concentration factor. The number of competitors is represented here for the ensuing market concentration calculations. The final index contributing to the fragmentation analysis is the calculation of the absolute demand-supply difference. More specifically, this number depicts the potential of the market from the external, mainly trading companies' view, and numbers are the same with the ones used in the factual country scoring part. In this model again, the people involved in the research will grade the group of the selected countries. There is no need to apply the Delphi approach for grading, so the points may result by the team's consensus after a broad discussion.

The conclusions concerning selecting a small group of countries by this model are for the investigators to be drawn. Currently, for a trading company there is no absolute direction to which it should orient its plans, since short-term opportunities for trade could arise at any moment. The main use of the current analysis is to be aware about those countries' fragmentation, so as to perceive different perspectives of entering the market, according to the conditions imposed by this status.

Concentration

Beginning with concentration, it is usually applied in a country either by the presence of a small number of competitors from the initial creation of the industrial minerals market, by recent consolidations between companies, and acquisitions of local producers by foreign players. As concentration increases in a market, its structure changes resulting to greater stability, higher prices and improved profitability in formerly low return markets. With few players, supply can be more easily matched to demand and price wars are less likely to occur. These arguments have proven a powerful incentive for the majors to enter developing markets.

On the other hand, tendency towards concentration has also other side effects like modernisation, greater vertical integration, and market segmentation. The response to the threat of take-overs by large competitors, so

as to distribute market shares among fewer companies, usually is a push towards greater modernisation and rationalisation. Additionally, as producers begin to understand the importance of distribution channels, expansion into ready-mix concrete becomes a top priority. Furthermore, companies apply more and more a client-focused strategy which leads to inventing ways of fully satisfying the very specific customer needs, subsequently to segment the market. However, a great disadvantage in concentrated markets constitutes the high barriers to entry, in order to support high prices and avoid momentary speculation. Moreover, concentrated markets depict an oligopoly imposed and strictly controlled by the two or three major players.

Fragmentation

Fragmentation is met to competitive markets, where there are too many suppliers and they are not able to control both the industrial minerals flow and its price. This lack of tendency towards oligopoly, as well as of consolidation allows buyers to seek for various types of industrial minerals from multiple suppliers and elaborate a market research so as to find some opportunities for more economic deals. Markets are vulnerable to imports and to lower price attacks. External companies exploiting short-term gaps may easily cover instant imbalances of supply-demand situations. Further evolution in the production processes, along with the modernisation of distribution channels and facilities rely solely upon the personal initiative of companies. In general terms, companies willing to enter dynamically these markets are not impeded by the local competition. In both cases, strategy must be designed according to the targets that the trading company wishes to meet. Nevertheless, it must be mentioned that an incremental strategic planning must be pursued, as, even in the short term, competitive edge is achieved by applying the managerial expertise, retaliatory power, geographical diversification and cost leadership, according to the conditions met in each different country. In any case, the decision upon the countries that must be chosen for the last phase depends definitely to the researcher responsible and his company's possible preferences.

2.3. Econometric Analysis

For the purpose of this model, econometric analysis is examined to assist in identifying opportunities through trends that are correlated with growth. This analysis can be used in conjunction with fundamental analysis or on its own as a tool that can assist in making forecasts prior to conventional macroeconomic indicators. Identifying variables or trends that may presuppose traditional economic measures would make such analysis. Econometric analysis coupled with fundamental is part of the screening process used before cost analysis is performed. For example, one may follow the activity of the International Monetary Fund (IMF), and observe a loan program that may be set up to stimulate regional domestic growth in an economic area and use that information to identify future potential growth. Currently, billions are being sent to a country e.g. Turkey or Russia as a rescue package for economic support that will hopefully translate to economic growth. The idea is to find trends in the market place that may give insight into growth before it becomes common information. It is a way of forecasting through interrelated movements of variables that may give your company an edge in identifying areas for new opportunities. The variables all maintain a common characteristic that they effect growth in GDP. Growth in the quasi-cyclical industrial minerals industry is highly correlated with a systematic risk (beta) greater than 1 to growth in GDP. For instance, an increase of one per cent in economic growth might cause an additional three per cent in industrial minerals consumption (this is an empirical rule-of-thumb used widely by industry practitioners in the area of building aggregates which contain industrial minerals and it easily transferable for other sectors with similar consumption trends). The volatility factor principles as stated, show that the growth of industrial minerals demand accelerates with an increase in economic growth ($C=f*G$). Growth in the industrial minerals' consumption causes growth in imported industrial minerals, which is inversely related to the import market share ($C1=C*1/x$). These combined factors give the variables needed for the volatility formula:

$$C1 = f * G * 1/x$$

C1 = Growth in industrial minerals import volume

F = Acceleration Principle for capital Investment

G = Increase in economic growth

x = Market share import volume

This formula shows that for an industrial mineral import operation the effects of economic growth are far more drastic. For example, if a country supplies 90 per cent of industrial minerals consumption, and 10 per cent is supplied by importers, then a 1 per cent increase in economic growth will cause a 3 percent growth in industrial minerals consumption, which in turn creates a 30 percent increase in imported volume. Determining the variables that have an effect on growth in an economy is the challenging part. We have identified such measurable information such as the strategies of progressive global manufacturers as in an industry like textiles or high tech. JC Penny's from the U.S. is an historical example of an organization in textiles that continuously moves into emerging markets to take advantage of low labour costs and tax or tariff incentives. Other trends to follow which could be used to identify growth may be trade zones set up by specific governments to stimulate

exports as is the case with countries in Central America, Israel, and the Far East, especially China. We suggest that for testing the model, the decision makers should take a sample of the most aggressive global manufacturers from the Fortune 500 and benchmark their movement while at the same time follow the IMF, the U.S. Dept of Commerce (USDC), and World Trade Organization (WTO) initiatives. This approach will give insight to development around the world that benefit any organization interested in exploiting new markets.

2.4. Cost Analysis

The fundamental and the econometric analyses are the tools used in order to identify the potential markets for industrial minerals trading, considering the current and the future needs within different geographical areas. However, according to the philosophy and the strategy that the trading company will follow, we have to take into account the competition that operates to each country. As far as the future potential markets are concerned, by examining the future trends of the local economy and the GDP growth as well we are able to identify them. Apart from the above tools, the specified countries have to be screened also by a cost–profit analysis, in order to find to which of those is feasible to import industrial minerals. The most important part of the cost–profit analysis is to estimate, or better calculate the total costs required from the moment that the industrial minerals bought from the supplier until it is transported and stored it at the port of the importing country. Second is to see whether the total costs subtracted from the sell price in bulk gives the required profit margin. The selling price is more or less fixed for each market and therefore we will focus our attention mainly on the calculation of the total costs. To begin with, we must say that the supplier plays a crucial role as far as the total cost is concerned. This role consists of two dimensions. The first one is the buying price of the industrial mineral and the second one is the distance between the supplier’s and the importer’s country. At this point, we have to note that the transportation costs contribute a lot at the total costs. Therefore, it is obvious that the bigger the distance is between the two countries the higher the costs are. The other major factor that influences the total costs is the building, maintenance and operating costs of the terminal that is going to be used for the industrial mineral importation. This terminal could be either an existing one or a new, which will be built to exploit the market potential. Finally, we have to take into account the unloading costs, the insurance costs, the port costs for both countries involved and any importation fees, if such as exist. Also, there is a non—monetary issue that has to be taken into consideration. This is the environmental regulations that each country has and the required permits that a company has to get in order to unload and store industrial minerals t. These regulations have to do mainly with the dust pollution that the industrial mineral unloading creates. In order to create a formula for the cost calculation, we have first to analyze each cost factor separately and identify the variables that influence it. After that, we have to calculate the cost per ton of an industrial mineral.

Purchase cost per ton (P)

Purchase cost, we define as the cost per ton of industrial mineral that has to be paid to our supplier in order to bring and load the industrial mineral to the chartered vessel. This is the price per ton of industrial mineral and it will be agreed between the supplier and the trading company.

Shipping costs per ton (S)

Shipping costs are the total required costs from the moment that the vessel is loaded until it arrives at the port of the importing country. Shipping costs include the total costs for chartering the vessel, the fuel consumed during this period and the fees that have to be paid at the ports of both exporting and importing countries. More specifically, the total shipping cost is going to be calculated as the sum of the following factors:

Trip and return back days, delays, cleaning days * Ship rent per day

Loading and discharging days * Ship rent per day

Trip days, delays * fuel consumption per day with cargo

Return back days * fuel consumption per day without cargo

Trip and return back days, delays * diesel consumption per day of trip

Loading, discharging days, cleaning days * diesel consumption per day of harbor

Port of supplier fees

Port of importer fees

Canal fees (depending of the sea route)

After that, we will divide the above amount of money with the number of tons transported from the specific vessel and the result will be the total shipping cost per ton of an industrial mineral.

Insurance expenses per ton (I)

Insurance expenses is defined as the premium that has to be paid in order to be covered from partial or total damages of the industrial mineral cargo that is going to be transported. This premium will be divided with the

number of tons transported from the specific vessel. In most cases the insurance premium is the 0.25% of the total value of the industrial mineral cargo.

Operating expenses per ton (O)

Operating expense is the amount of money needed annually in order to operate within a terminal or warehouse (the unloading equipment and the storage facilities). This will be divided by the estimated total number of industrial mineral tons traded via this terminal or warehouse. More specifically, in order to calculate the operating expenses, we use the following cost variables:

Lease of property or rental

Personnel

Maintenance, energy

Administration, miscellaneous

For the operating expenses of the discharging equipment, we used the following cost variables:

Operator cost

Energy cost

Maintenance

Administration, miscellaneous

To close with the operating expenses, we have to mention that the discharging costs are included into the operating costs of the discharging equipment.

Total cost per ton (TC)

Total cost per ton is defined as the sum of the above six different cost factors. If we wanted to express it as a mathematical formula it would have the following form (in US\$):

$$TC = P + S + O + I$$

Apart from the cost factors that we just mentioned, there are some others that can affect the cost of the industrial minerals. These are cases of substantial importation costs that may exist on account of government policy or tariffs imposed on trade like customs fee and importation taxes.

Selling Price

The selling price of the industrial minerals are different from market to market. The price that the trading company is going to sell the traded industrial mineral will be derived from the retail price only in the markets where it is going to enter directly with own selling network. In the markets that the trading company will enter directly, it is going to sell to an independent importer at a price that will allow them to operate profitably within the local market. At this case, the selling price will be the price for delivering the industrial mineral up to port and definitely will be less than the retail price of the industrial mineral at this market, however it will have to match the competition. The industrial mineral cost per ton will be lower in cases like those, due to the fact that in those markets the trading company will not enter directly and therefore, the the operating costs (O) are going to be zero.

Potential Profits

After calculating the total cost per ton required in order to bring and store the industrial mineral at the port of the importing country, we subtract this number from the retail price of the industrial mineral and finally measure whether the industrial minerals trading in this market is profitable. In markets that the trading company is going to sell directly, the profit margin per ton of industrial mineral will be the difference between the retail price and the total cost per ton. In the markets that the industrial mineral is going to be sold to an independent importer, the profit margin will be included in the final price, which is going to be agreed between the trading company and the importer.

CONCLUSIONS:

The Centripetal Model is an effort to create a basic information platform model for evaluating the market opportunities and counterbalance the overexploitation of natural resources. The Model combines 3 steps:

1. Initially a fundamental analysis (in two stages with a).country scoring and b). fragmentation-concentration analysis),
2. Followed by an econometric analysis and
3. Finally a cost analysis for pricing.

The 3 steps practically contribute to an industrial-sectoral framework needed for implementing the Sustainable Development Goal 12 of the United Nations Millennium Development Program. By combining tools like the Delphi approach or the volatility factor under the econometric part of the model, we enhance the quantification of tacit knowledge of decision makers and the heuristic tools, which exist in many industries, and they can be integrated in the daily monitoring of markets and resources optimization. The Centripetal Model is based on a

20 years industry expertise and experience and has been tested in industrial minerals, mining and extraction, cement and aggregates industries as the basis for building market intelligence platforms (data remain property of the major industry player and under confidentiality). It is becoming actual, under the perspective of the Sustainable Development Goals, which is a mental shift on the extraction and natural resources operations globally, especially seen under the perspective of the previous financial crisis of 2008 and the current developments with the pandemic of Covid 19. Especially, the Sustainable Development Goal 12 emphasizes on responsible consumption and production. Thereby this Centripetal Model for industry research will help in implementing a responsible consumption of industrial minerals.

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