

# The Future of Manufacturing in Resource-rich Economies: How mining could generate jobs and competitiveness beyond extraction of ore

El futuro de la manufactura en las economías ricas en recursos: Cómo la minería podría generar empleo y competitividad más allá de la extracción de los minerales

Gunter Pauli.

## Summary

**T**he drive towards higher levels of productivity forces companies to pursue economies of scale, manufacturing standardized products in higher volumes at ever lower marginal costs. However, whenever an entrepreneur or an established business in a resource rich exporting country attempts to build a company, macro-economic conditions often render agricultural and industrial activities uncompetitive. Countries with rich mineral reserves and part of broad free trade zones are particularly affected by the globalized economy, where increased demand for raw materials pushes up commodity prices, which increase export revenues that strengthen the local currency against the dollar. A strong local currency driven by ore exports and direct foreign investments turn imports cheaper. This leads to a de-industrialization, or the impossibility to ever build an industry, and adversely affects agriculture that is dependent on overseas markets. This phenomena is known as the “Dutch Disease”. It affects large commodity exporting nations like Colombia.

Article written by Prof. Gunter Pauli founder of ZERI and designer of The Blue Economy in preparation of the lecture at the Banco de la República (Colombia) held 7 february 2013 in the National Library Luis Angel Arango Auditorium, Bogotá,

## Resumen

**L**a tendencia hacia niveles más altos de productividad obliga a las empresas a buscar economías de escala, manufacturando mayores volúmenes de productos estandarizados, a costos marginales cada vez más bajos. Sin embargo, cuando un empresario o una empresa establecida en un país exportador rico en recursos intentan conformar una empresa, las condiciones macroeconómicas hacen a menudo que las actividades agrícolas e industriales no sean competitivas. Los países ricos en reservas de minerales y que hacen parte de amplias zonas de libre comercio se ven particularmente afectados por la economía globalizada, donde la mayor demanda de materias primas empuja al alza los precios de los productos básicos, lo que aumenta los ingresos de exportación que fortalecen a su vez la moneda local frente al dólar. Una moneda local fuerte, respaldada por las exportaciones de minerales y las inversiones directas extranjeras, abarata las importaciones.

Esto lleva a una desindustrialización, o incluso a la imposibilidad de construir una industria, e impacta negativamente a la agricultura que depende de los mercados externos. Este fenómeno se conoce como el “Modelo de la Enfermedad holandesa” y afecta a los países que son grandes exportadores de productos básicos, como Colombia.

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Colombia. The only way to respond to these adverse macro-economic effects of commodity driven export strategies is to change the business model of the mining industry.

Evolving mining from a core business, focused on the extraction of ores and the export thereof, to a clustering of mining, agriculture and manufacturing using all available resources of the mine, from land to energy and waste like rock refuse and tailings.

The design of a positive response strategy to social challenges like artisanal mining, combined with securing a cluster of businesses around mining could reverse de-industrialization. Better, this could create an economy that remains vibrant after the mining operations have exhausted their resources.

At first sight, the process of clustering industries and social needs have no relation. However this proven strategy that is now subscribed to by leading global corporations adds value and jobs, while strengthening each competitive position in every core businesses generating growth in the country.

This article describes the new business model for mining in the concrete setting of Colombia and explains how it will result in sustainable growth, while industrializing and strengthening agriculture in emerging markets, and deliver ecosystem services.

La única manera de responder a estos efectos macro-económicos adversos generados por las estrategias orientadas a la exportación de productos básicos es cambiar el modelo de negocios de la industria minera para que pase de ser una competencia central, enfocada a la extracción de minerales y a su exportación, a agrupar la minería, la agricultura y la manufactura utilizando todos los recursos disponibles de la mina, desde la tierra hasta la energía y residuos tales como los materiales de rechazo y los desechos de roca.

El diseño de una estrategia que responda de manera positiva a desafíos sociales como la minería artesanal, combinada con el aseguramiento de un grupo de empresas alrededor de la minería podría revertir la desindustrialización. Es más, podría crear una economía que conservara su vigor después de que las operaciones mineras hayan agotado sus recursos. A primera vista, el proceso de agrupamiento de industrias y las necesidades sociales no tienen ninguna relación. Sin embargo, está comprobada estrategia, que está siendo adoptada por las principales empresas del mundo, aporta valor agregado y empleo, a la vez que fortalece la posición competitiva de cada actividad central y genera crecimiento en el país. En este artículo se describe el nuevo modelo de negocios para la minería en el contexto concreto de Colombia y se explica cómo conduciría a un crecimiento sostenible y al fortalecimiento e industrialización de la agricultura en mercados emergentes, lo mismo que a la prestación de servicios ecosistémicos.

## Increase in Commodity Exports leads to De-industrialization

If a nation converts itself into a large exporter of minerals and ores, it quickly creates a surplus on its balance of trade. In most countries this is complemented by an inflow of capital required to exploit these newly discovered natural resources. This capital influx leads to a strong surplus on the balance of payments. A large export volume and a net capital inflow in dollars with costs in local currency pushes the valuta up. This affects the future of industry, rendering it quickly uncompetitive since cheap imports outcompete the previously competitive industries. This is known as the Dutch Disease Model<sup>1</sup>, [1] W. M. Corden, Booming Sector and Dutch Disease Economics: Survey and Consolidation. Oxford Economic Papers 36, 1984, pages 359-380.

Named after the economic development of the Netherlands in the 1960s when the export of natural gas led to

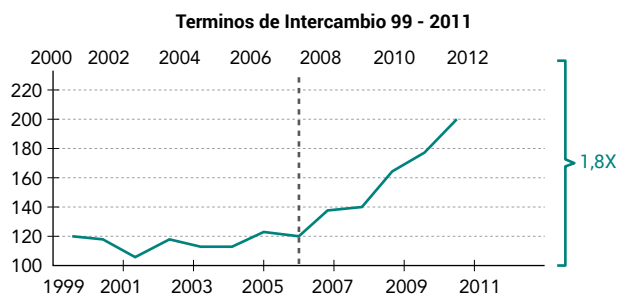
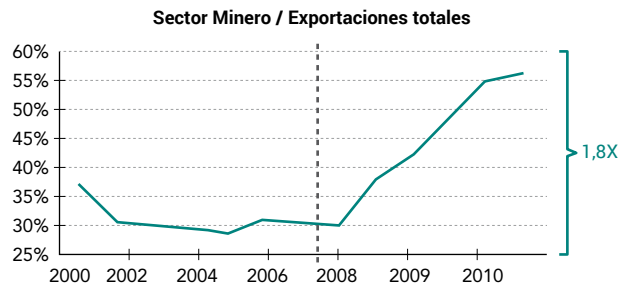
the appreciation of the real exchange rate and the rise of the relative price of non-traded goods and the subsequent loss of industry.

The companies in sectors as diverse as agriculture and textiles which traditionally relied on local resources and benefited from an integrated supply chain are forced to retrench due to this excessive revaluation. In the case of Brazil the revaluation hovers around 45%, and for Colombia it remains just under 40 percent. Over a decade The Brazilian Real, the Chilean Pesos, and the Peruvian Sol and the Australian dollar have all increased their exchange rate against the United States Dollar over the past decade, the common currency for global commodity trade. Thus, the unfolding drama is that commodity export nations have suffered from a loss of competitiveness in all sectors but mining due to foreign exchange factors which are

beyond their control. Colombian coffee, once the prime export product and highly dependent on local costs, has lost its competitive position due to the relative increase in costs turning a previous economic backbone of the nation into an area of increased rural poverty.

This affects all supply chains. A successful integrated development strategy starts from abundant and highly productive agricultural resources driven by fertile soil and sufficient labor resources. Produce is locally processed into value added goods. However, exchange rate fluctuations beyond the sectors control now jeopardize their future. A broad opening of the market under free trade agreements only exacerbates the problems already caused by monetary imbalances. The recent approval of the free trade agreement between the United States and Colombia further erodes the agricultural and industrial base. And while the Colombian macro-economic data remains positive in the short term, the long term future of the nation is undermined especially with such a young population. This stress in society dependent on mining only is likely to translate into continued high rates of violence, criminality and illicit business, while food security and provision of drinking water is increasingly under stress.

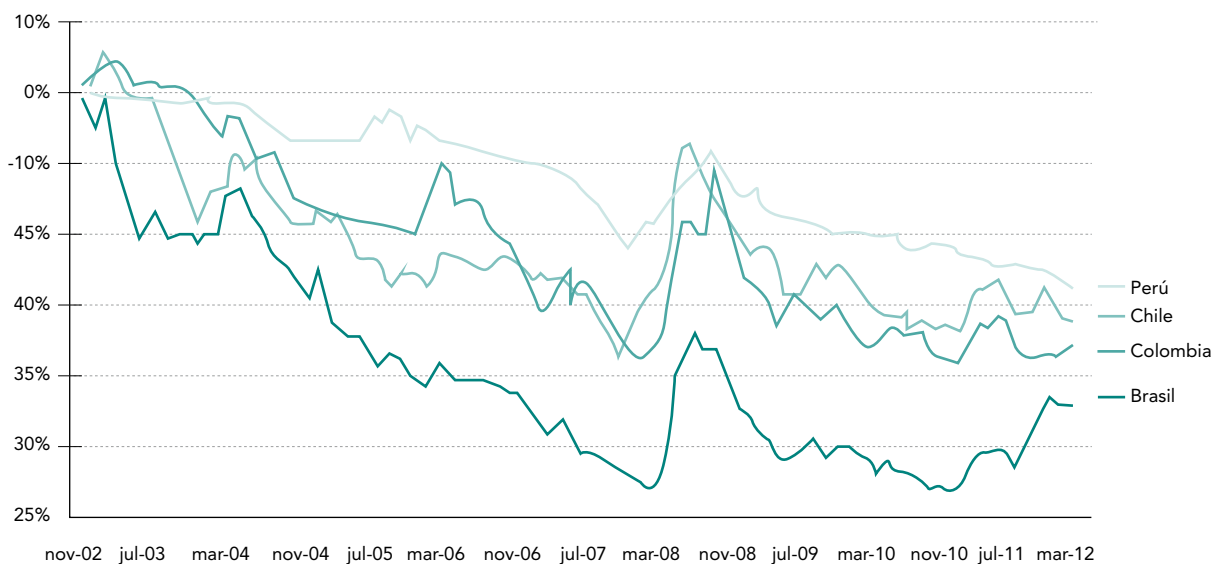
**Graph 1:** Percentage of the mining in total export the terms of trade over same "period for Colombia



Source: Bancolombia, DANE

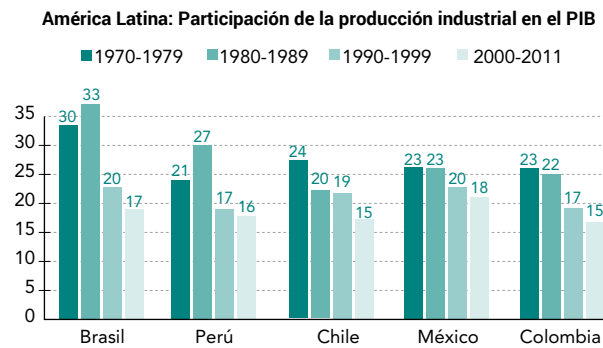
**Graph 2:** Exchange rate parity of main Latin American currencies vs US dollar

**Paridad cambiaria monedas principales Latam vs USD  
(última década base 2002)**



Source: Bloomberg

**Graph 3:** Importance of industry in GDP measured in percent.



Source: ANIF based on data from World Bank

Since the prevailing view of the traditional economist is that the market will correct these imbalances, there is no option to create a rebound effect for agriculture or industry within that conservative logic. This particular situation is one where globalization loses its logic and is incapable of creating any trickle down effect of the benefits of mining to the large majority of the population. It is clear that factors beyond control of all economic actors determine the future of competitive and labor intensive sectors. In the case of Latin America in general, and Colombia in particular, the strategy to embrace an open market combined with this commodity boom will over time eliminate most of the benefits gained. While the economic growth at macro-economic level is first confirmed, it will soon face a stunted growth. It then leads to an increase in unemployment and underemployment, that evolves into heavy pressure on the social partners since most sectors of the economy can only influence the role of labor in a drive to regain competitiveness.

Instead of submitting to the traditional economic logic, this article will propose a fundamentally different option. This possible solution operates within the free market philosophy. However, the future relies on a fundamental change of the mining business model which evolves from a core business centered around a core competence, to a clustering of activities that exploits all available local resources, generating multiple benefits for the mining companies, its industrial partners, the local communities and even the environment. This clustered approach ensures that the Dutch Disease will not smite the com-

modity trading countries. On the contrary, the design of a new business model for mining ensures that the whole economy regains competitiveness, including the farming and industry which have already faced a downturn.

## Clustering of Mining, Agriculture and Industry

A shift in the business model for mining provides a chance to reverse this trend of deindustrialization in commodity exporting countries. In order to accelerate its effectiveness, it is ideally combined with a shift in taxation policies. As long as mining companies remain core business focussed with the aim to extract more ounces from the Earth, and ship these out of the country at lower costs paying a fixed percentage as tax to the government on each unit exported, then there is no solution. However, if we rethink the activities of the extractive industries and how these could be redirected to respond to both global and local demand, maintaining a focus on minerals, while ensuring an effective use of all opportunities made possible by the mining boom, then there is a future for agriculture and the local industries. If the government were to recognize the tremendous potential of this multiplier effect, then a smart shift in taxation can steer mining towards the clustering of productive activities. Mining and the commodity trade will then turn into a catalyst of local economic development instead of being a cause of de-industrialization and rural poverty.

## Mining and Basic Needs

Let us take a gold mine as a case in point. Just about every goldmine in the world needs water to process ore. Actually, most mines require water and seldom find abundance in their area of influence. The traditional response of the mining engineers has been to pump water from aquifers, to pipe water over long distances, or to install reverse osmosis facilities if there is salt water in close proximity. These are major infrastructural adjustments increasing both capital and operational expenses of the mine at a cost of water per cubic meter that the local population would never be able to afford. Time to think different. While not all regions in the world can provide lasting solutions exactly like the one described below, most mining zones can undergo a major regeneration of native vegetation, or a reforestation in order to turn

the hydrological cycles from excessive water consumption by mines and perceived drought and contamination of water to abundance of water for private, agricultural and industrial consumption. Since five to eight years will span between the discovery of a mine and its commercial exploitation, there is enough time to reverse the water supply in the region using all available resources.

## Convert a Cost into a Revenue

If we were only considering the regeneration of forests for the purpose of water, then this represents a cost. This still reduces capital and operational expenses of the mine, since water production and filtration by a natural forest remains cheaper than installing water catchment areas and water treatment systems. However in the business philosophy of the Blue Economy, we are not only interested in merely reducing expenses, we are keen on increasing revenues, not just for the company concerned, but for the local economy. A mining project in the Colombian Andes offers the opportunity to regenerate part of the bamboo forest that once reigned the region. Bamboo, especially giant bamboo (*Guadua angustifolia*) is well known for its capacity to regenerate water cycles, purifying contaminated water, while regenerating top soil and increasing rainfall since a bamboo cover of the land decreases the surface temperature and therefore increases precipitation. The academic work of Prof. Dr. Luis Miguel Alvarez Mejía and his colleagues from the University of Caldas, Colombia amply confirms these statements.

## Supporting Agriculture

When 20,000 hectares of bamboo are planted, then a portfolio of agricultural and industrial benefits complement the direct interest of the mine in water. Bamboo can be harvested three to five years after planting. Its poles have multiple proven uses. First, the local high altitude bean farmers within the mine's influence zone require several million posts a year to string on the bean plants. They used to plant eucalyptus, a water depleting tree, but since the region never replanted after harvesting, the bean farmers now need to import poles. The local environmental authorities are wary of the risk of soil erosion and therefore restricted the harvesting of any trees. The local farmers are prepared to provide their

depleted land, receive for free the new bamboo cover which provides first and foremost much needed water. The farmers are prepared to harvest bamboo on location for making posts, and bring the rest down to the valley.

## Supporting Social Housing

A social housing project, of the type implemented by "Hogares de Cristo," a social enterprise in Guayaquil (Ecuador) requires a continuous supply of 3 meter bamboo posts. The daily assembly of 42 pre-fabricated homes relies on an ongoing harvesting process of bamboo from a 2,000 HA terrain. While the bean farmers take a few meters meters, another 3 meters is dedicated to housing which offers a very basic home at a minimum sales cost of \$950 per unit with a monthly repayment of US\$ 17. A more solid structure commands \$2,000 per house. This housing scheme is funded through micro-financing. Since a typical bamboo measures 25 meters, there are still 20 meters of biomass left.

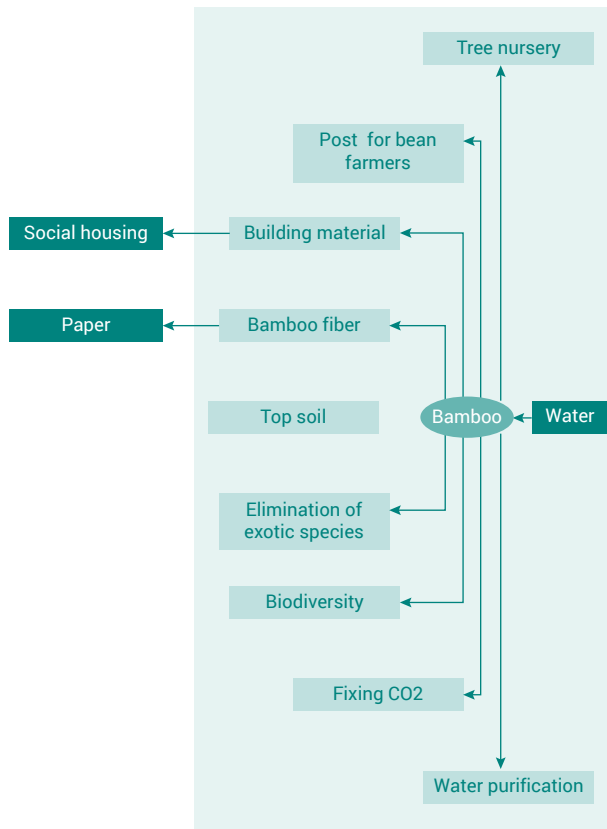
This cascading of bamboo generates multiple interests and multiple cash flows that makes the regeneration of the local forest attractive beyond the mere needs of water by the mine and the local community which suffers from gastro-intestinal diseases due to poor water supply. This bamboo reforestation strategy to provide water "forever" stimulates the economy, makes better use of local resources like land and biodiversity, improves disposable income of farmers by reducing their need to import and buy from outside the region, while this enhances the capacity to respond to housing needs at low cost further strengthening the purchasing power of the bottom of the pyramid.

## Substituting Eucalyptus

The largest potential demand for bamboo is not coming from social housing or local farmers, rather it is coming from a major shift in the supply of fibers for paper products, especially water absorbent paper. The industry has been reliant on fibers mass produced on monoculture eucalyptus or pine farms. After three to four cycles of planting and harvesting evidence has been gathered that this farming practice depletes the soil more rapidly than expected. Further cycles of planting monocultures like eucalyptus and pine trees require irrigation and

chemical controls which lead to a rise in costs. Bamboo offers variety and quality fibers at a competitive cost.

**Graph 4:** How water security through regeneration of bamboo stimulates the economy



Source: Pauli/ZERI

More importantly, based on in-house research of the ZERI Foundation, we know that specific bamboo species offer over their lifetime an efficiency in fiber generation which is 60 times higher than even the best genetically modified trees. The reasons are: bamboo can be harvested for 70 years without any need for replanting. Since it is a grass, it grows again. The density of bamboo is up to ten times the density of any tree; and, the fiber content reaches 70 percent triple the amount available from a soft wood tree. The added advantage is that bamboo replenishes top soil and re-establishes the hydrological cycles, producing water in the process while growing on marginal land. Major paper processing companies have already strategically decided to shift from eucalyptus to bamboo, creating demand that will put pressure on the supply

of this fast growing grass. Since the mining companies figure amongst the largest land owners in the country, their need for water and a shift in preference for fibers can create one of the powerful engines for development.

The cost of one ton of pulp for industrial paper fluctuates between \$800 and \$1,000 per ton with a market characterized by an upward trend. This means that imported eucalyptus fiber must compete with local bamboo fiber. Since the combination of social housing and posts for bean farmers dramatically reduces the landed cost of the bamboo, and with the advent of local processing facilities, compounded by the upward trend of paper fiber, renders the compilation of the business plan for a pulping facility in the vicinity of the plantations a viable operation.

### Demand for Nurseries

There is no culture of large scale bamboo reforestation, certainly not in conjunction with its traditional symbiotic plants like the arboloco (*Montanoa quadrangularis*), alder (*Alnus glutinosa*) and at higher altitude the *Chusquea* genus of thin evergreen bamboo. However, the National Federation of Coffee Farmers (FNC) has an unparalleled infrastructure available including nurseries which are operating at lower levels due to the coffee crisis. For every 100 HA of bamboo reforestation, there is a need for 5 HA of nursery. Thus the land, equipment, trained staff and deployment capacity of the FNC that otherwise faces an uncertain future now can capture a new breath. If the trend towards bamboo fibers is confirmed, then this could represent a major revenue stream for coffee farmers, not the least because of their capacity to sequester carbon and supply water. This generates additional revenue for coffee farmers, while it reduces the cost for the nursery, thus also the plantation, an obvious win-win solution that is only viable if one is prepared to cluster activities and use what is locally available.

### Mining: a Catalyst in the Economy

The mine - solely using its available space - both the land it owns and its influence zones can thus stimulate farming, housing and paper making. The farmers lower their costs, and use local materials, substituting imports. Then the farmers reduce the expense for social housing, which



selects the parts of interest to their business, and the leftovers - which are the softer fibers ideal for consumer paper products – should never have been considered waste in the first place. Now that large volumes of imported materials, commodities like paper pulp, are substituted by local materials which are cheaper, generate multiple benefits including the commons (water, filtering contaminated water and top soil generation), this process creates what is most needed - community. It also secures an influx of cash into the local economy that otherwise would have been lost to imports, kick-starting the multiplier in the local economy. This is not a drive towards autarky, nor a blind import substitution program. It is the application of a sound economic policy that prescribes that you use what you have. The expansion of money in the local economy is non-inflationary since it goes hand-in-hand with additional output from the existing agricultural and industrial base, increasing material productivity.

### Wages vs. Purchasing Power

A mine that generates water, produces raw materials for farming, supports existing nursery infrastructure, housing, pulp and paper has a different impact than a mine that requires water, creates a disequilibrium in the labor market by offering higher wages in the region while depleting the environment. This mine secures that there is an increase in economic activity and in purchasing power. This is key. Increased wages for miners only cause a rift in the local society. However, if and when the mine uses its existing leverage on the economy to grow the local economy as measured by an improvement of disposable income including the reduction of the cost of basic needs such as housing, water and food, then pressure on wages will be minimal. Now this impact of the new “water strategy” is only the first step in the shift of the business model which should evolve from “mining” with all the negative connotations to a process company that brings gold to the market and emerges as a catalyst in the local economy, including the mobilization of complementary investments.

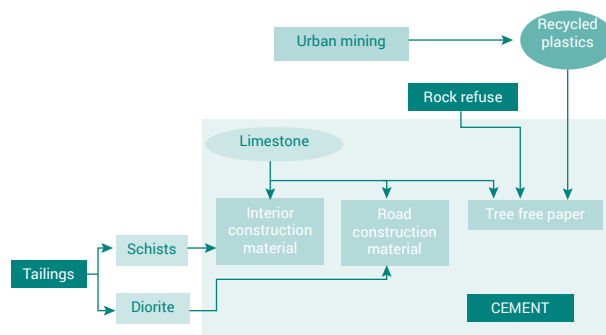
### Cascading of Opportunities

This portfolio of opportunities mines could create becomes even more evident when we consider rock waste and tailings. Any mine - unless one can simply

harvest from the surface like the coal mine El Cerrejon (Colombia) - has to move mountains of rocks and sand. While sand could be moved around, rocks usually end up in a solid rock refuse as close as possible to the mining site. Valleys turn into mountains. Any mine needs to crush ores in order to extract gold, or any other valuable metal, and therefore has the equipment to grind rocks into dust of a few micron diameter. A new market opportunity emerges: rock paper.

The concept of rock paper first emerged in China when it became obvious that the present supply of fibers would never be able to fulfill the demand for paper in the emerging markets, as well as the additional two billion citizens who will be added in the next few decades. Paper is a blend of fibers and fillers, mainly mined material including chalk and calcium carbonate. Then, the massive supply of demolition construction waste and its high removal costs triggered the design of a new paper type that is hydrophobic, blended with post-consumer plastics that can be recycled indefinitely. While the cost of production is still high due to its limited volumes, this “tree free paper” has generated an appeal on the market, not the least from plastic recyclers and advertising agencies. Water repellent, with a fine spread of rock dust permitting a better distribution of pixels than fiber-based advertising billboards could offer this product to a ready clientele. Since there is no production in Latin America, it is an opportunity to manufacture and distribute this innovative product with multiple benefits on the market.

**Graph 5:** The economic impact of stones and tailings on urban mining and cement



Source: Pauli/ZERI

## Compete on Price

Here is a second cluster of economic activities emerging by the strategic option not to deposit stone refuse at a financial and environmental cost, but to give this by-product an economic value. When paper fiber competes on the world market for US\$950/ton then there is a substantial difference with a waste rock dump where each ton could cost as much as one hundred dollars to dispose of. Making rock paper instead of filling valleys results in a considerable improvement in capital requirements and operational costs, since this alternative is market driven and successful only when it excels in price and quality. The mine's business strategy offers the local construction and the plastics industry an opportunity to create value with existing material flows, while undoing the potential damage to the environment by creating a product that now has a unique selling proposition. Plastics are hardly recycled, and if these are recovered today, then these end up in container shipments to China at a revenue of \$150/ton, with only one third ending up in the pockets of the waste scavengers and the rest earned by middlemen. Defunct rotary cement kilns could even be used to improve the efficiency of solid municipal waste recycling. The stone paper offers an opportunity to lift people out of poverty by generating more value with available resources and using the new mining model as a catalyst while cutting closure costs.

## A Shift in the Business Model

The same logic is applied to all challenges in and around a mine. One of the core principles is that if there is a problem, we look for another problem as to resolve all within an integrated system that evolves into a portfolio of opportunities. Two additional major challenges are tailings and artisanal mining. The tailings are the slurry waste from the ore extraction and processing which contains approximately 50% solids and 50% water. It does not make sense to use water to ship the waste to a far-away dam where the mud-like material is accumulated over time only to be converted in some sort of permanent fill or permanent mount. A closer look reveals that the water could be extracted and that the solids - in one case - could be separated based on their specific weight into schist and diorite. Schist looks like mica, a colorful material with limited structural strength,

but blended and reinforced with cement these tiles serve as decorative floor or wall tiles. This definitely generates a higher value than dumping it in a dam constructed for this purpose. Diorite, which is stronger than granite, is an ideal construction material but under traditional business conditions, it is too expensive to process, and therefore no one in the business could afford it, until the mine could blend it with cement and offer a high quality road construction mix.

## Mining and Cement

The combination of construction materials with mine waste seems obvious, and yet even with cement processing plants located within miles from these mines, such concrete opportunities are overlooked since business is blinded by its core business core competence approach. However, since the construction industry is looking for a better value and wishes to move from a mere commodity dealer to become a market maker operating with higher margins, the combination of the two industries is a near perfect match. The capital and operational expenditure of a mine into a tailing dam quickly runs into the billions, whereas the potential gains could add billions to the bottom line. This provides a third round of economic impulses rendering local industries more competitive, using available resources, while reducing the investment requirements for the mine, and eliminating once and for all an adverse effect society would have had to tolerate forever. This translates for the mine in a reduction of closure costs, the major uncertainty mines face in a world with changing standards and too many moon landscapes as a proof of failure.

## Small versus Large

The mine could subject its new business model to a further and more detailed scrutiny than undertaken in this paper, identifying costs that could become revenues, or could even get capitalized turning the mine into a broad-based engine of the local or even the national economy. However, there is also the social dimension of such portfolio of new large investments. The arrival of a multinational corporation to operate a mine always creates tensions between the existing small scale mines, especially the artisanal miners



who rely on harsh chemicals and hard labor to extract ores often at high personal risks.

The business model of these small operators is not attractive since their profits are skimmed off by hardware suppliers who are keen on pre-financing in order to control the gold harvest. Worse, the business of artisanal mining suffers from too many questionable intermediaries who buy gold well below market price. Large scale mining companies, quoted on stock exchanges have the transparency, the quality control and the business ethics that could be combined with the capacity to target niche deposits by the small operators. This could lead to a fresh approach, rendering the livelihood of the artisanal miners next to the large mining facilities viable and even complementary. If this were to succeed, then the mining corporation could add 20 to 30 percent to its turnover with relatively minor investments.

## Distinct Process Engineering

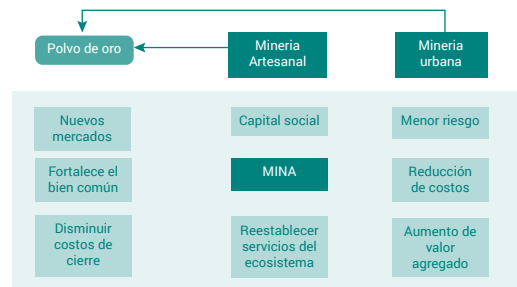
The process engineering and the technologies of the large and small mining models are at present not compatible. However, the latest chelating technology, which functions small scale, could introduce the art of processing gold by artisanal miners to the point that it eliminates mercury and cyanide, while it isolates a 99.9% pure precious metal (and all cations) on a flexible film. All metals can be removed while reconditioning the film for a next batch of extraction. Artisanal miners offer labor and the capacity to operate in small volumes. The installation of dozens, perhaps even hundreds of these chelating machines could not only render this type of mining safer, legal and transparent, if and when the mining giants are prepared to undertake the quality control and marketing of the final product, then the revenue of the small scale operators could double or even triple, while accessing the established markets through professional channels ensuring health and safety, environmental stewardship and social capital. It would be the cheapest turnover increase for the multinational.

## What Business are you in ?

Companies have at regular intervals the need to ask a basic question: in what business am I? Is the mine operator in the mining business of processing and selling

ore. I would argue that the sale of high quality ores is the sole reason of existence. The digging of holes and operating heavy earth moving equipment is only a means to an end. If this is a shared view amongst the management of the mining company, then the mining could be open pit mining, underground mining or it could even be urban mining. This opens a new field of business initiatives, further widens the portfolio of revenue streams. This article already addressed spin-off effects from the mining and processing of ores including the blending of recycled plastics into rock paper. This is an example of urban mining. The chelating technology adapted to artisanal mining on the mine deposits could be expanded to artisanal mining in an urban environment recovering the gold in electronic equipment. This is a different business proposal for mining, using the same technology. This opens new avenues for accessing purified ores. It also opens opportunities to enter higher end markets like the supply of processed gold and platinum group metals to the electronics industry.

Graph 6: Multiple benefits for the mine



Source: Pauli/ZERI

## Ingots or Powder?

The electronics industry is one of the largest consumers of processed and purified ores. While their appetite covers tons of materials applied in minute volumes, the delivery is in powder form. Now if the raw material from urban and artisanal mining recovered through the chelating technology offers “dust-size” particles, then it makes sense to offer the electronics industry the same particle sizes. Instead of selling ingots as a standard to intermediate processing companies - because that is the way the industry has delivered ores for the past century - one

should supply powder saving considerable energy in the process. The business model that started to evolve since the beginning of the article is taking a definitive turn from low value large volume competitive commodities quoted in American Dollars towards higher value added products, tapping into a competitive market segment that is pricing its products according to the capacity to deliver the unique requirements of the customers who belong to a high growth market segment. Or is the gold mine solely interested in producing jewelry?

## Shift the Business Model - Redefine the Product

While at the outset, I proposed to shift the paradigm of mining by embracing innovations and designing a new business model, it is clear that in the process we are redefining the product as well. Instead of undergoing the swings of the commodity market, this new model shapes a series of higher value segments like electronics. Now the power of mining according to the business model described above does not only impact its own sector, it achieves the same for all other partners in its cluster including agriculture, housing, cement, pulp and paper, electronics and plastics industries. Better even, it positively impacts biodiversity, natural water cycles and social conditions helping the area to move forward on achieving its Millennium Development Goals. This requires new structures, processes, partners and even funding mechanisms. The power of the proposal is that multiple cash flows are identified, and assets are known to increase in value, while the closure cost is put under tight control. This shift is not about the design of the mine of the future, this is about the company of the future capable of redefining its purpose on the market and its contributions to society. This will ultimately impact the communities future.

## Multiple Benefits

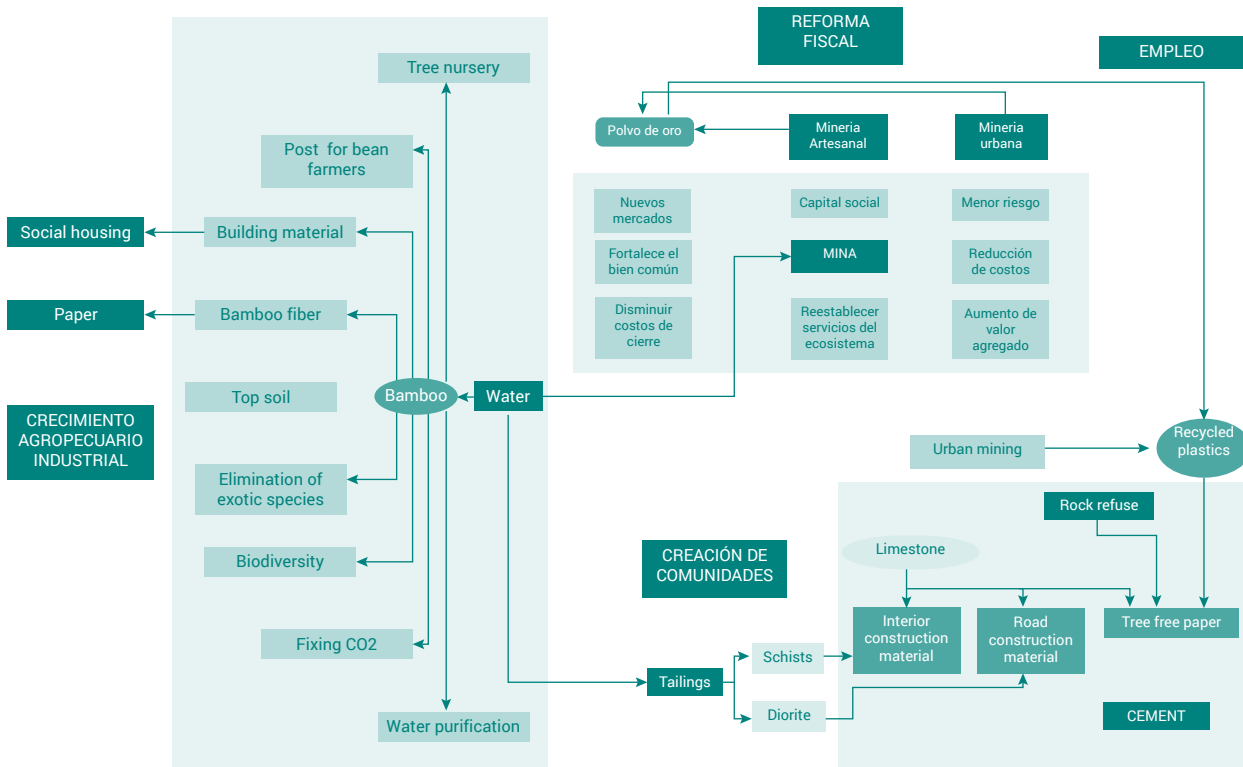
The power of this shift from a traditional mining model to a more profitable and more resilient corporation that faces lower risks, is that the implementation of this micro-economic business model has the potential to impact the country's economy where this cluster is operating. The companies achieve lower costs not by further cutting

expenses, but rather by generating multiple revenues. Since the model generates multiple benefits beyond the mine, and beyond business. This innovative approach generates value for all including social capital, while enhancing the commons and increasing disposable income. Local industries regain a future, the currency will not appreciate beyond reason. The entrepreneurs generate a better cash flow without having to fall into the traditional trap of cost cutting and cheap imports, driven by this never ending search for ever higher labor productivity which leads to automation and job losses in a young and vibrant society.

## Tax or Stimulate?

This connection between the micro-economic business model and the macro-economic stimulus of the nation is likely to entice macro-economists like central bankers to balance the dynamics of mining investments and commodities exports with a pro-active policy to strengthen the local agriculture and industry. This concrete case shows how a shift in business models for mining can provide a solid antidote to the Dutch Disease. This is most important for determining the government's tax policy. The Government could relax its tax burden on mines in order to steer investors towards the design of business models that use what is available. The primary and extractive sectors are exceptionally well placed in achieving this catalytic effect. This creates a pathway that includes the lifting of the population out of poverty. Therefore, the Government should develop a growth policy through stimulating this mine induced multiplier effect.

**Graph 7:** The clustering of social, ecological, business and macro-economic benefits “ ” through a new mining model



Source: Pauli/ZERI

## From Micro- to Macro-Economics

The macro-economic trends are the amalgamation of the micro-economic shifts. When an all-encompassing mining business transforms its operations from a singular search for one specific ore, to a comprehensive and competitive business design with lower capital expenditures, lower operational expenses, reduced closure costs and higher value added, then the cluster of companies will be in a better position to serve their clients using all available resources. Then a new dynamic growth model emerges on the Colombian market. This will generate jobs and better wages - not because it is mandated or enforced through strikes - rather thanks to the creation of new opportunities that soon could become the norm of the industry since it is good for business, good for shareholders, good for the community and good for the environment. This is better than a triple bottom line, the whole business operation is designed to increase output, embrace innovation and generate jobs with social capital.

The question is if the shareholders understand this fundamental shift. If they prefer to focus on

one core business only, then there will be no mandate for the management to shift their strategy. Then we should wonder if the analysts in the key investors' circles grasp the pervasive impact this has on the company, its cash flow and the risks. Are the analysts, who are expert in one narrowly defined sector capable of translating the reduced CAPEX and OPEX, and the reduction of closure costs into a buy or hold advise for the shares of the company that pursues this strategy. And those experts of rating agencies, would they be prepared to upgrade the rating of a country that is committed to stimulate mining along these lines? While the mind of the expert may still force them to watch for narrowly defined parameters and targets of corporate performance, I am convinced

that their heart and soul will be happy to know that there are so many hidden assets and unknown opportunities to cut costs and generate more revenue in the extractive industry that no one had ever seen before. Once a broader base of shareholders and analysts see the power of clustering and get out of the excavation of gold and more into the generation of wealth, then a large majority of the population will accept mining as an integral part of society.

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## The Author



### Gunter Pauli

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Gunter Pauli established a track record as an entrepreneur. He is an author of 19 books. His latest “The Blue Economy” has been translated in +30 languages and distributed in + one million copies. He translates technological breakthroughs in innovative business models. He identifies for companies and governments new development opportunities, and how to implement these. He does not divide between good and bad, rather always searches for the better. He adapted his insights in science that is the underpinning force of these innovations into fables. With 104 fables written and a commitment to compile 365 by 2016. He is professor in system design at the Italian Politecnico di Torino (Faculty of Architecture), at the Hungarian University of Pécs (Faculty of Business and Economics), and at the Business School of the Monterrey Institute of Technology (Mexico). He is fluent in 7 languages, is father of 5 children.

For more information on The Blue Economy <http://www.youtube.com/watch?v=1af08PSlaIs> or go to [www.zeri.org](http://www.zeri.org) and [TheBlueEconomy.org](http://TheBlueEconomy.org) register at Twitter [@MyBlueEconomy](https://twitter.com/MyBlueEconomy) for daily updates