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1.2 Case study of ILVA, Italy: The impact of failing to consider sustainability as a driver of business model evolution

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Abstract

The case of ILVA steel works in Taranto, Italy demonstrates the potential impacts associated with failing toadequately consider environmental and social sustainability issues within the business model of the firm. This paper provides a review of the situation at ILVA today; the decisions and actions that contributed to the current situation since privatisation of the firm in 1995; and the choices now facing government, the local community, and the firm's owners going forward including a review of Best Available Techniques (BATs). The review is supported with relevant sustainability literature and explores how a more comprehensive assessment of sustainability considerations might be better integrated into business model evolution. The paper demonstrates that an inappropriate technology investment strategy that fails to consider broader concepts of value for the society and environment does not pay in the long-term, and that expectations of government support to mitigate negative impacts of business are becoming increasingly untenable.

Keywords:

Best Available Techniques; Business Model Innovation; Steel industry;Sustainable Manufacturing

1 INTRODUCTION

ILVA Taranto, Italy's leading steel producer made headline news across the world after being sequestered on the 26th of July 2012 by Taranto's regional PHJ(Preliminary Hearing Judge). ILVA was accused of creating an unprecedented environmental disaster; due to this, the PHJwanted ILVA to shut down theirblast furnaces and to encloseuncovered mineral stockpiles. The Judicial review court stated on the 6th of August 2012 thatthe ILVA disaster over the years isattributed to constant and repeated polluting activity perpetrated wilfullyby the owners and managers. In particular, the ILVA operating practices were such that they produced a malicious disaster through actions and omissions with a high potential for destructive outcomes for the environment (and society).The protracted action to force changes at ILVA Taranto was notable not just for the environmental violations and related health issues, but also for the strong counter-arguments presented by the labour trade union and the local community for continuing production in order to protect their employment, and the political activities to find a financing solution for the necessary improvements. The complexity of the situation, the economical, environmental and social trade-offs under discussion and the large set of stakeholders involved make the ILVA case a particularly interesting scenario for the discussion of sustainable business models[1].

This paper reviews the current situation at ILVA in terms of economic, social and environmental impacts, and explores the options available to ILVA and the Italian Government for improving/restoring the situation. The aim of this paper is to suggest that a more comprehensive assessment of sustainability considerations might be better integrated into business model evolution in order to avoid complex situations like the one reported.

The considered industrial case (steel) is of particularinterestwith respect to the concept of industrial sustainability [2]. All three TripleBottom Line (TBL)sustainability dimensions (environmental, social, and economic)are included,with apparent strong conflict between each dimension. Technology (afourthdimension from an industrialperspective) is also included as in this case it is crucial to determine and influence the first three dimensions.

Asustainability value mapping tool[3]can be used to assess the various forms of value and conflicting demands of the key stakeholder groupsas illustrated in Table 1.

The sustainability problem can be categorised as:

- **Environmental:**Assuming that the current level of pollution is the cause of health problems and disease in the region, is it possible to mitigate and fix this issue through selective and incremental interventions to improve the health and conditions of workers and surrounding populationwhile still preserving employment?
- **Social:**What is the social cost of a potential definitive closure or liquidation of ILVA Tarantoon the direct/indirect worker population (approximately 19,000 employees), and more broadlyon the related plants in other parts of Italy (Genova and Novi)? How can this be balanced with long-term health issues in the region?
- **Economic:**Can ILVA Taranto (Riva Group) afford the investments necessary to improve and upgrade the plant(s) in order to reach the required standards as suggested by BATs and related Reference Documents (BRefs) [4]? And if not, could the Government supply resources for these investments by applying several conditions and constraints to the ownership?
- **Technological:** are the BATs suggested in the AIA (integrated environmental authorisation) directive

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[5]issued by the regional government really effective for the specific case and how is the best way to implement them?

Table 1: Value mapping analysis

Stakeholder group	Value currently captured	Value destroyed or missed	New Value opportunity
Value chain actors incl. investors, suppliers, etc. (Economicvalue)	Profit maximisation; Long-term relationships with suppliers;Localised operations	Reduced outputand potential stoppage; Reduced profitability/ market share	Investment in technology to conform to EU standards to boostproductivity and growth
Customers (Use value)	Price, product quality, supply lead-time	Reduced supplies and potential need to search for alternative steel producer	Switch to alternative non-Italian producer
Environment (Ecological Value)	Partial capture and containment of emissions and pollutants	Pollution; Loss of biodiversity; Reduced food production in region	Reduce emissions and pollution with technology; Contribute to clean up of contamination
Society (Societal Value)	Jobs (12,000 direct + 7,000 indirect in supply chain); Multiplier effect on regional economic activity and taxbase	Health risk and long-term care costs(respiratory disease, cancers); Job losses of forced layoffs;Agricultural contamination	Enhance living conditions for community; Safe jobs; Job creation; Reduce healthcare burden; Regenerate farming sector

2 BACKGROUND TO CASE

Italy is the second largest manufacturing nation in Europe with major strength in mechanics, machine tools, steel, chemical-pharmaceutical and rubber-plastics industries, foods and textile and clothing industry. However, the country is now in its longest recession in 20 years, and has languished in more than a decade of almost non-existent growth. Unemployment is at more than 11%; for under-25s it is more than 36%. Italy also has the second highest ratio of sovereign debt to GDP in the EU imposing severe austerity measures on the nation. Reinvigoration of the industrial sector to stimulate economic growth and employment is a major focus of policy makers.

Concerning environmental sustainability Italy is subject to EU regulations on emissions and pollutions. However, the judiciary system is slow-moving and sometimes alarmingly politicisedhence implementation and enforcement of environmental legislation has often been weak or none-existent. This is compounded by frequent changes in the political system that undermines continuity, and a significant level of crime and corruption within the country.

Within this context, the subject of this case study is the ILVA steel production plant in Taranto in the region of Puglia, Southern Italy (biggest steel production plant in Europe). ILVA is a joint stock company owned by the Riva Group, which is mainly based on the production and processing of steel. ILVA was previously the State-owned company IRI acquired bythe Riva family in the early 1990's. The group now consists of 42 plants operating in 8 countries across the world. Based on 2011 data the Riva group is the outright leader in Italy, the 3rd largest steel producer in Europe, and the 21st in the world by production volume.

The steel production process of a plant such as ILVA Taranto, and the process inputs and outputs including emissions and potential pollutants at each stageare illustrated in Figure 1.

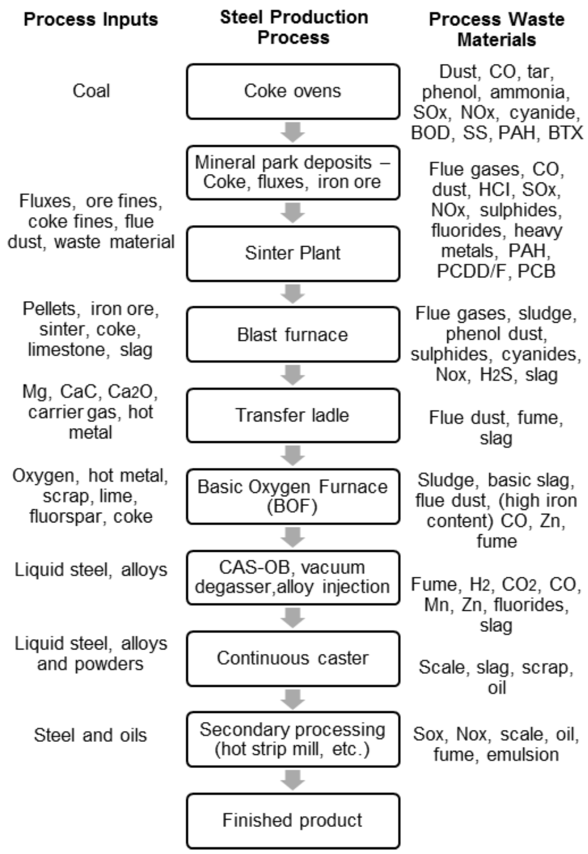

Figure 1: Typical steel production process (Source: adapted from [4])

The operating equipment and facilities at ILVA Taranto integrated steel works consist of:

Hot area

- 10 Coke oven batteries
- 2 Agglomeration plants
- 5 Blast furnaces
- 2 LD steel works (each equipped with 3 converters of 330t. and 350t. respectively)
- 5 Continuous Casting machines (2 strands) for slabs

Rolling mill

- 2 Hot rolling mills for coils
- 1 Hydrochloric pickling line
- 1 Coupled pickling tandem rolling line
- 1 Electro galvanizing line
- 1 Hot-dip galvanizing line
- 1 Batch annealing line with 54 furnaces and 125 bases
- 2 Tandem skin pass mills Finishing and cutting lines
- 1 Heavy plates (2 stands) quarto reversing mill

Pipe mill

- 1 Longitudinally ERW pipes plant
- 2 Longitudinally SAW pipes plant
- 6 Pipe external coating and internal lining plants
- 1 External coating weighing down with concrete line

From the environmental point of view, the main polluting elements are PM10 (Particulate Matter smaller than 10 micrometres that are capable of penetrating deep into the respiratory tract and causing significant health damage), polycyclic aromatic hydrocarbons (PAHs) in particular the benzo(a)pyrene,dioxinsand heavy metals that can be carcinogenic. Stages of the production process that are considered particularly polluting are the mineral parks (storage areas for minerals used in steel production), the coke ovens,blast furnaces, and the agglomeration (sintering) plant.

3 CURRENT SITUATION AT ILVA

3.1 Economic situation

In 2011, Riva Group produced 16 Mt of raw steel, of which, 7.6 Mt of black coils, 4.1 Mt of wire rod, 2.0 Mt of concrete reinforcing steel (rebar), 1.0 Mt of rolled bars and billets, and 0.8 Mt of quarto plates. This equated to a turnover of about 10B€, with a reported net profit of 327.3 M€. This represented a return to profitability after poor performance in 2009 with turnover of 5.822B€(with a reported loss of 547.7 M€), and 2010 with 7.788B€(and a loss of 66.3 M€)[6]. The ILVA Taranto plant produces 8 Mt of steel annually, and distributes value of 865 M€ into the Taranto region; this represented about 75% of Taranto's GDP based on the Bank of Italy reports in 2008.

In the last 15 years the Riva Group has reportedly invested about 4.4B€ in the steel making plant. ILVA report that 25% of thishas been for environmental and safety enhancement, although it is not possible to clearly delineate between these investments and other forms of plant investment. About half of the investment on environmental and safety enhancements(447.3 M€) were reportedly for improvements to the coke oven, but it seems littlewas invested in the mineral parks coverage or more effective dust reduction measures; only recentlyhas ILVA begun to invest in the coverage of the conveyors.ILVA claim that higher rates of investment on environmental performance were not financially feasible. However, despite the reported losses at ILVA Taranto, the Riva Group had positive profits as discussed above, and the net asset equity of Riva Group is on an upward trend (currently around 4 B€), so financing of plant improvements appears possible, albeit perhaps not desirable to the owners and investors.

In July 2012, the Taranto judiciary ordered the shutdown of the plant's smelters in an attempt to force the Riva group to initiate the necessary investments. Facing inaction from ILVA, in November 2012 the Taranto judiciary took the extreme action of seizing 800 M€ of finished product in an attempt to force change. This action was overturned by a government decree to allow the plant to continue operating to protect jobs, but the dispute is still on-going.

3.2 Environmental issues

In 2010, ILVA emitted over 4,000t of dust, 11,000t of nitrogen dioxide, 11,300t of sulphur dioxide, 7.0t of hydrochloric acid, 1.3t of benzene, 150kg of Polycyclic Aromatic Hydrocarbons (PAH), 52.5g of benzo(a)pyrene, 14.9gof organic compounds, polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F) and dioxin PCBdl. Levels of PCDD/F and PCBdl may be traced to specific sintering activities (agglomeration area) carried out within the plant.

To reduce emissions it is necessary to take measures forcontainment giving priority to the reduction of emissions of hazardous substances and metals. At present, ILVAhas largedeposits of coal,coke and other mineralsadjacent to the production plantin 30m high stockpiles. These are exposed tothe weather andparticularly duringdry south-easterly wind conditions dispersefine dust particles across the city creating values of PM10 beyond acceptable levels. The only method currently used for retaining this dust is to humidify the deposits using trucks that spray water over the stockpiles. Even though ILVA's certifications say they respected national laws and regional values (as measured in 2010), experts have pointed out that to achieve the emissions targets introduced in 1999 the humidification system would have requiredcontinuous automatic control to activate when conditions demanded. There was no such control, and without this the emissions cannot be considered compliant.

Emissions from other parts of the production process are similarly problematic. In accordance with European Community rules on the environmental performance ofsteel plant experts have found that: **"**in most of the production areas and/or process steps, the amount of the pollutants emitted are considerably higher than those that would be emitted in the case of adoption by ILVA of BATs with the performance as determined by BRefs". Furthermore, experts have concluded that if BATs were adopted for all phases of production, and not only discrete parts of the process, this would be more efficient in reducing pollutants and thus reduce emission loads from the entire plant. The difference found between the measured values and those expected from the application of BAT and those reported in BRef, shows that there is still a gap between the techniques used in ILVA and their effectiveness.

3.3 Social issues

Evidencesuggests that the environmental contamination has in turn created serious health problemsfor the employees and the wider Taranto community over the past decade[7]. The current enquiry into the site was launched after a 30% overall spike in local cancer rates was reported, with liver cancer up by 75% and upper uterine cancer up by 80%. Analysis of specific disease data provided by the Ministry of Health shows that while the cancer ratesfor the average Italian population are decreasing and the same phenomenon can be observed in the Puglia region, in Taranto cancer related deaths have been increasing.For example, in the period 2001-2008 lung cancer deaths in Taranto have increased by 5%, while the Italian average has decreased by

10%[8].Incidences of respiratory problems such as asthma are also reportedly higher in the area, with 90% of all babies affected.

Pollution also impactson quality of life in the Taranto community in other ways through contamination of land and water sourcesand the consequent risk of affecting the food chain. Residents are advised not to grow crops or raise livestock in the area (In 2008 roughly 2,000 sheep were slaughtered after their milk and meat were found to contain dangerous levels of dioxins). Furthermore,the city mayor has issued an instruction that children should not play in unpaved lotsto avoid contact with the omnipresent red and black dust particles that regularly blanket the city.

Countering the health concerns are the social benefits of long-term employment. ILVA Taranto employs more than 12,000 direct workers and 7,000 indirect workers, and is responsible for 75% of the 50Btof traffic handled by the Taranto port. Moreover the plant feeds ILVA'sGenova plant (1,760 workers), Novi plant (just under 1,000 workers), Racconigi's plant (200 workers) and other small plants. Due to the consequences of legal actions on the 26th of November 2012, the cold area production of the plant was stopped with an immediate potential layoff for 5,000 employees. Furthermore, the Puglia regionthat includes Taranto already suffers from unemployment levels of 25%, andILVA is relied upon as one of the main opportunities for stable employment.

So Taranto is facing a complex double problem –the population is worried about serious disease and other health issues caused by pollution, while at the same time employees and their dependents, and local suppliers and businesses are afraid to lose their jobs. Large strikes were organised in the latter half of 2012 in Taranto and in other cities where ILVA undertakes secondary processing, and the position of the workers (supported by the Unions) is to defend their jobs.

4 BEST AVAILABLE TECHNIQUES (BATS)

The technological performance of the ILVA's plant process has been analysed in the light of known BATs&BRefs[4], in order to identify available technologies to tackle each aspect of the firm's production processes and emissions.Particular attention is paid to the following areas: mineral parks (Table 2), coke oven (Table 3), sintering (Table 4), and blast furnace (Table 5). For each area the tables providethe current situation and technology employed by ILVA along with suggested BATs.

Table 2: Mineral parks BATs analysis

ILVA	ILVA PLANNED INVESTMENTS	GOVERNMENT REQUEST
Humidification of the deposits through the use of water cannon trucks	Construction of 2.2 km, 21 m high, barrier in High Density Polyethylene (HDPE); 20% reduction of the average inventory; Increase humidification of road and materials with fog cannons; Implementation of a monitoring system for humidification.	To cover all the mineral parks (Potential solution as used only by Hyundai in South Korea)

Table 3: Coke oven BATs analysis

PROCESS PHASE	ILVA (in progress)	BAT EU
Coal preparation	Secondary de-dusting	Techniques for minimising emissions
Oven charging	"Smokeless" charging machine	Preventingoven charging emissions
Coking	Coke ovens refractory partial revamping	Stabilise operation; Coke ovens maintenance; Sealing of emissions points; NO_x reduction; Pressure regulation of ovens; Improvement and cleaning of oven doors
Pushing of the coke	Fume capturing at coke discharging	Techniques for minimising emissions
Coke quenching	Conventional wet quenching	Improvement of coke wet quenching; Coke dry quenching
Treatment of coke oven gas	Desulphurisation	Reducing the number of flanges; Usinggas-tight pumps; Avoiding emissions from pressure valves; Desulphurisation
Coke handling	Secondary de-dusting	Using enclosures; Efficient extraction and de-dusting

Table 4: Sintering BATs analysis

PROCESS PHASE	ILVA (in progress)	BAT EU
Raw materials preparation	Secondary de-dusting; Control of oil in sinter feed	Abatement of dust emissions; Control of residues characteristics used in sinter feed; Reduction of VOC emissions
Sintering	MEEP (Moving Electrode Electrostatic Precipitator); Active carbon & urea injection; NO_x and SO_2 monitoring	Process optimisation; Advanced electrostatic precipitator; Bag filter with injection of active carbon and other additives; Reduction of NO_x and SO_2
Cooling and processing sinter	Secondary de-dusting	Abatement of dust emissions from secondary sources

Table 5: Blast furnace BATs analysis

PROCESS PHASE	ILVA (in progress)	BAT EU
Loading material	Stock-house de-dusting	Minimising stock-house emissions
Reduction and smelting	Venturi scrubbers blast furnace gas	Techniques for reducing dust emissions of blast furnace gas
Casting iron and slag	Cast-house de-dusting; Tar-free runner linings	Minimising cast-house emissions; Fume suppression during hot metal charging (with N_2); Using tar-free runner linings
Slag treatment	Condensation of fume from slag processing (partial)	Condensation of fume from slag processing

5 DISCUSSION

While finalizing this paper interventions will start in order to cover the mineral parks (36 months foreseen) as well as other plant improvements. Extraordinary government funded job protection measures will be activated for 6,417 workers of Taranto's plant until 2015. The job protection measures will mitigate the social impact to implement the Integrated Environmental Authorisation (AIA) even if they will be charged on collectivist base in an already challengingeconomic situation for Italy. Solidarity agreements could also be added in this case impacting on workers salary. Notwithstanding these measures, the situation within the Taranto plant is still critical and one head of department has recently been threatened with death.

The ILVA activity is under examination by technicians sent by the Minister in the area of environmental protection and concerning the law 231 of 2012 (see www.ispraambiente.it). The goal is to enableopen consultation of given prescriptionsto verify the implementation of the AIA plan. To this concern, the last report (28th of February 2013) proposed about 12 months of work to coverthe mineral parks according to technologiesidentified in the BATs analysis – new fog cannons and a monitoring system will include safety flares and six new sensors along the external perimeter of the plant. Within June 2013, 25 new measurement systems for emissions will be installed monitoring the following areas: agglomerate (sintering), coke oven, blast furnace and steelmaking milling. Concerning the continuous sampling of dioxin a system has already been installed andmonitoring protocolare being defined by the environmental agencies.

The coke areas (860 M€ of interventions of the nearly 2B€ estimated), will be improved starting from coke oven batterynumber 9,and completed within the second half of 2013, while batteries 3, 4, 5 and 6, have already been shut down and will be rebuilt together with battery 11. For the agglomerate, purchase orders have been placed for textile filters (see the BATs). Also, the blast furnace area will be improved within 18-24 months. In steel makingfacility 1 the roof floor will be closed and connected to fumes and dust aspiration systems, works have already been undertaken for 2 of 3 converters, and completion is expected for June 2013. Further, ILVA has launched the purchase order for a new textile filter (3.2 million cubic meters per hour). Finally, the raw material conveyor belts will be covered (385 belts for 200 km), 90%of which will be covered within 2014.

But what is the cost of so many interventions as requested by the AIA plan released the 26th of October 2012? The initial estimation was around 3B€to 4B€. This is a significant amount but still far from the original estimation made in the September judicial review that put the cost close to 10 B€for upgrade of the hot plant area. Surprisingly, the most recent estimateundertaken (Siderweb Study Centre) suggests of cost of approximately 1.5 B€. If confirmed it will remove any doubt about the economic feasibility of the plan and so remove the threat of such investments undermining the future survival of the enterprise. However, immediately after this statement, ILVA presented a plan costing 2.25 B€.

Thus the lesson learned is that combining environmental, social, economic, and technical problems together results in the most disparate estimations and that the estimation process is strongly opaque, especially in this specific case. But this apparent unclearness has, in our opinion, other possible reasons. The AIA released by the Minister defines and prescribes the company to reduce pollution by applying the BATs. However, the company, by law, takes the final decision on what to apply in the light of economic feasibility. Particularly, the assessment included in the AIA (article 8, law decree 59/2005), considers the best technologies in an absolute way and not with respect to a cost-benefit criteria. The cost reduction proposed by ILVA, against the first ministerial estimation, is justified by the fact in September the estimation process was done only in an approximate way. Now feasibility and design quantification are in the operative phase and only 20% variability is acceptable before closing all the contracts for consequent activities.

Another important issue concerns the reliability and reality of the interventions undertaken previously. On 23rd January 2013 ILVA stated that 65% of AIA prescriptions were already in place; that is in contrast with the level of remaining intervention costs and the related uncertainty arising. A further unclear aspect relates to the individual investment for each plant and sub-plant. For instance, for the coke areas, 860 M€ is the cost estimated to refurbish and rebuild, even though in a document dated 2012 entitled "Investments for Environment"[9], the Company stated to have already invested since 1995 up to 2011, 480 M€. Surprisingly, after an investment of 30 M€ per year in a single area, the area now apparently needs to be completely rebuilt.Other estimations are opaque and difficult to practically correlate to effective investments in industrial sustainability; the most probable value could be around 689 M€ in a period spanning from 1995 to 2006.

Considering the investments from the Government and tax payers'perspective, it appears that assuring job protection of more than 5,000 workers up to 2015 will result in a collective cost of more than 800 M€ to the public purse. Surely it would be better to oblige privately owned companies to respect regulations adopting the required investments (even if this means partially supporting them from public sources) before reaching this critical disequilibrium point, instead of imposing almost entirely, the huge social, economic, and environmental (and hence serious health issues) on the country and citizens, and finally claiming for the evident "unsustainability" of these industrial practices/facilities.

6 CONCLUSION

The hard choice to risk dying of cancer rather than face the ignominy and hardship of unemployment for workers, the institutional obligations to prohibit environmental pollutionto guarantee health and wellbeing for the citizens of the territory, and the conflictingmyopic profit-oriented management strategy of Riva Group, pose an unquestionable industrial sustainability challenge. The Riva group has claimed that compliance costs were prohibitive. However, looking at the economic and financial performance of Riva Group, it is hard to acceptthey couldn't support the right investments to renovate the plant since 1995, and yet harder to believe they are now demanding the government to pay.

Some commentators have suggested that inappropriate ownership of the company, prolonged State inaction, and corruption are the cause of the problems. There is almost certainly some truth in this as evidenced by the fact that polluting activities have continuedsince the 1990's despite environmental concerns raised by government, and award of full environmental certifications ISO14001 and ISO18001 right up to the current date. However, ultimately it appears that the Riva family and the management of ILVA have simply followed a contemporary shareholder-centric approach to business of profit maximisation, with an expectation that government will continue to support by taking responsibility forthe external social and environmental costs[10].

The ILVA Taranto case isan extreme example of environmental pollution and social harm due the size of the plant, its national and regional importance, and the duration of the problems, but the problematic business approach underlying the issues is not uncommon. Recent, highly public examples demonstrate similar compromises in pursuit of profitsacross a broad range of sectors. For example, British Petroleum's environmental disaster in the Gulf of Mexico in 2010; suicides and labour disputes over pay and working conditions at iphone supplier Foxconn in China 2010-2012, and the collapse of an apparel factory building in Bangladesh in 2013 killing many hundreds of workers.Similar scenarios are likely to occur repeatedlyparticularly in regions where regulations and governance to protect the environment and society are weakuntil business models focused on short-term profit maximisation are addressed. This is perhaps particularly pertinent to large nationally strategic industry sectors.

In the past these enterprises may have benefited from implicit guarantees of the State, enabling them to maximise short-term profits for management and owners while acting in areckless manner towards their broader stakeholders including the environment, workers and society. The judicial challenge in this particular case of ILVA demonstrates that the changing dynamics of a recessionary and debt-laden Europe makes such an expectation of government and taxpayer largesse look increasingly unsustainable.Furthermore, pressure on firms to adopt a more holistic approach to business sustainability seems likely to increase under changing public awareness and attitudes towards the role of corporations in the wake of the recent examples of corporate neglect of suppliers and the environment in pursuit of profits.

Applying a scientific and rigorous industrial sustainability approach will be the only way to resolve paradoxes like the one presented in this case; production (even of steel) is possible in a way that guarantees workers and community health and wellbeing. Technology can provide effective solutions as defined in BRefs and demonstrated by leading producers in Germany, South Korea and Japan who have pioneered and championed best available techniques for the sector. Such firms, far from being weakened by the investment costs are now enjoying strong competitive advantages in a global market place, supporting, rather than damaging their local environment and communities. Such innovation is more than just technological though – it requires a fundamental shift in perception of the value proposition of the firm to embrace the needs of broader stakeholder groups, reducethe dependency on government support and fully reconsider how the firm does business, whichare at the core of the firm's business model.

In conclusion, appropriate consideration of social and environmental sustainability within the business model as suggested by Stubbs and Cocklin[1]will therefore increasingly become core to ensuring economic sustainability and hence long-term survivability of the firm and protection of national strategic capabilities and jobs. Firms and government policy will need to shift to a more holistic perspective of value creation, based on the TBL and BATs.

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