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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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PLANNING FOR AND PROMOTION OF THE USE OF STEEL : COMMENTS ON THE BRAZILIAN EXPERIENCE 1/

by

Fabiano J.H. Peguriar
Empresa de Desenvolvimento de Recursos Minerais - CODEMIN S.A.
Brazil

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SUMMARY

Before commenting on the experience gained in Brazil on this subject since 1964, the paper sums up the historical background, as well as the basic premises that conditioned the planning of the Brazilian steel industry in the last few years.

The situation in 1964 was characterized by the need to discipline the expansion of the steel sector, so as to reduce investment to its most efficient minimum. Also, based on past experience, the Brazilian steel planners based the new program on detailed market forecasts and on the development of a roster of projects sufficient to cover the country's needs for at least five years.

In carrying out the program, a first important aspect is the State's guidance and intervention, in order to ensure the adequate allocation and flow of financial resources to the steel enterprises. Another vital aspect, according to the paper, is the priority given to a review and correction process, as preferable to sophisticated mathematical treatment of market forecasting.

Under this system, a new market appraisal and forecast is done every two years. Each time, a new ten-year goal is set up and the necessary corrections introduced in the program.

After a brief discussion of the need for developing countries, to export steel, the paper describes the methodology adopted for market forecasting in Brazil, which is defined as a simplified input-output model. The importance of the review and correction process is stressed by the fact that, in a period of very high rate of economic growth, such as Brazil has experienced in the last few years, forecasts have become outdated within three years.

Finally, the paper touches the question of promotion of the use of steel in developing countries and concludes that the best promotion lies not in the hands of the steel industry itself but in the Government's policies designed to create or introduce steel-using industries in the country. However, in housing and construction, a country may reach the point where, for certain types of structures, the use of steel, although more economical, is retarded by technological inertia.

The paper points out the various reasons for resistance to steel structures and suggests programs that help to overcome it and speed up their introduction.

It has been my privilege to participate in the Brazilian effort to diagnose and program the development of the country's iron and steel industry, from 1965 to the present. At the request of UNIDO, I am glad to furnish the following comments on the experience gained in these years, with the hope that they might be useful to people in other countries who may find themselves with similar responsibilities, under similar circumstances.

Before we go into the experience that shall be analysed in this monograph, it will be useful to show very briefly the historical background, as well as the basic premises, which conditioned it.

The first systematic survey of the iron and steel industry in Brazil revealed the existence, in 1905, of two blast furnaces - of which only one in operation, with an yearly production of 2,000 t of pig iron - and some 100 forges, which added another 2,000 t a year of iron bars. Many previous attempts to establish an iron and steel industry in the country, dating as early as the late 16th century, had failed for various reasons, most of all due to lack of independent sources of technology and capital, needed in order to compete with European imports.

Under the prodding of the internal market and pressed by import difficulties first arisen during the First World War, three steel plants were erected, based on charcoal blast furnaces, which subsist until today. After that, consumption rose steadily up to more than

51[illegible],000 t in 1929, only to fall back in 1931, under the effect of the world-wide depression, to 184,000 t, which resulted in a meager 4.2 kg/cap. However, local production accounted for only 5.9 % of the 1929 consumption.

In the thirties, local production showed new vigour, growing from 19,000 t in 1931 to 150,000 t in 1939. This was the year in which the Executive Commitee of the first National Steel Plan proposed the foundation of Cia. Siderúrgica Nacional and the erection of our first coke-based, integrated, large-scale steel plant.

The effect of this initiative can never be overrated. In 1946, as the company's Volta Redonda plant were into operation, local production already represented 34.6 % of consumption, although imports were back at the level of 1929. However, between 1946 and 1951, under the impulse provided by the new plant, production rose at a yearly rate of 26 % and, in this last year, already represented 63.8 % of the total consumed in the country.

In this same period, and helped by various US missions, Brazil began to learn the techniques for planning and guiding its economic development. At this stage, the greatest emphasis was placed on energy and transportation, as well as health and food production.

Due, to some extent, to the novel coordination brought about by these first planning efforts, the fifties brought a new acceleration of the Brazilian industrial development, which in part was made possible by the ability of the Volta Redonda plant to keep pace with the rapid growth of steel consumption associated with

this process. Facing a new picture, the Government launched two new large-scale integrated steel enterprises - Cosipa and Usiminas - and approved the Mannesmann project. These and others formed a part of a first governmental attempt to promote the birth and development of whole new industries, such as the automotive, ship-building, and heavy mechanical industries, while continuing to expand the energy and transportation infrastructure. Under this new plan, one of the Government's goals was to reach an ingot production of 2,279,000 t in 1960 and 3,496,000 t in 1964. The actual figures attained were 2,448,000 t in 1960 and 3,015,700 in 1964.

After 1961, inflation became increasingly acute and put the best of any large investment projects such as the new steel plants under construction, which saw their start-up retarded and their cost hopelessly overrun. As the economy was brought practically to a standstill, a new need arose in 1964 to export steel in order to use the excess capacity suddenly available.

This was, then, the situation in 1964. The Brazilian planners felt, on one side, the need to discipline the expension of the steel sector, so as to reduce investments to their most efficient minimum. On the other hand, they felt a new awareness of the possibilities and limitations of the planning methods and instruments of action learned in the last twenty years. As President Castello Branco emphasized when he launched the work on his new Ten Year Plan, we already knew that planning is not to be confused with the mere projection of the past, nor to be derided because of the inherent imprecision of the basic data available, nor yet to be feared as a means of excessive

control by the state. Nevertheless, as a basis for meaningful governmental action, planning must involve the setting of reasonable and compatible objectives, as well as the selection of adequate instruments of action.

We also realized that any quantification of economic phenomena presents its own inherent risks and the only way to minimize these risks is through a periodical appraisal of results, followed by judicious manipulation of the instruments of action at the Government's disposal, so as to correct, at reasonable intervals, the errors contained in the original decision.

In terms of the steel industry, this means that we must start with a good knowledge of the present-day market. This must be sufficiently detailed to serve as a solid basis for the choice of equipment to be made by the project designers. We must also develop a roster of good projects which, as a whole, must represent more capacity than what is needed in the period under consideration by the plan. Considering the long maturity of steel projects, this period should never be less than five years and, ideally, should approach a whole decade.

Then we must establish a time schedule for each and all of the projects, in such a way that, superimposed on one another, they cover the part of the country's consumption that is previously decided, according to cost and resource considerations.

This last affirmation merits a closer scrutiny.

Each country presents a different situation, with respect to the availability and costs of raw materials, energy, transportation, manpower and money, as well as to market scale and foreign exchange generation. In each case, it will have to be decided how much of the country's steel consumption can or should be covered by internal production or by imports. This decision may even vary from one product type to another. It will certainly depend on the precision of the original market forecast.

Basically, we face only two alternatives: either we can afford an appreciable amount of importation, or we must commit ourselves to an active and constant exportation of steel. A middle way does not really exist, for, with internal markets that frequently amount to the capacity of only one plant, it is so difficult to maintain an equilibrium between the demand and supply of steel, except for very short periods, that we will certainly fall into one or the other of the alternatives defined.

In the case of Brazil, the decision was easy. With abundant reserves of iron ore, comparatively cheap manpower and a respectable, as well as rapidly expanding market, the comparative advantages of internal production are very evident, in spite of a lack of good-quality coal or appreciable amounts of natural gas. Brazilian steel, by any analysis, is competitive, cost or quality-wise, in the international market. Therefore, Brazil can and should export steel.

On the other hand, the country's scarcest resource is capital and the maintenance of a high capacity to import, basically through export of manufactured products, is an essential condition for sustaining the high rate of economic growth that is desired. Such being the case, Brazil should not invest heavily in steel excess capacity in preference to nobler products of higher product/capital ratio; unless, of course, the investment is financed from abroad, in such a way that does not affect negatively its ability to receive foreign capital needed elsewhere.

Taking all this into account, a compromise was reached. Brazil should invest in only such excess capacity as is needed to avoid start-stop exports - and thus maintain a continuous posture as an exporter in the international market for steel. It was estimated that, maintaining a programmed capacity always 25% above the estimated demand, the country's steel industry could export between 5% and 10% of its overall production, with no strain on the equipment.

This moderate excess capacity is sufficient to give an adequate reserve to face either sharp, unforeseen short term peaks of consumption, or trend variations due to an eventual increase in the income-elasticity of steel that may be associated with the present stage of Brazil's industrial development. It also serves to maintain a relaxed relation between internal supply and demand and thus avoid excessive, undesirable price fluctuations.

In order to carry out the projects defined and scheduled according to plan, state guidance and intervention is unavoidable, in order to ensure the adequate allocation and flow of financial resources to the steel enterprises. This intervention may assume various forms, such as direct application of governmental funds; compulsory investment by steel users; or incentives, such as tax exemption or subsidized financing, to private investors. Without it, private capital, be it national or foreign, will probably seek other fields where return on investment is shorter and rentability higher.

To close the loop and feed back the information that is necessary for timely corrections of the program, projects should be closely followed up and the market forecast reviewed every two years. Each time, a new ten-year goal should be established, and short-term as well as long-term corrections introduced in the program.

At this point, I should think that the importance of good market surveying and forecasting for the success of any steel program is very clear. In this respect, I should say, though, that a periodical reviewing process is more important than sophisticated mathematical forecasting methods.

With the exception of an input-output table, unavailable until now, all other mathematical methods of demand forecasting - from extrapolation of time series to correlation with macro-economic variables and international cross-sections - have been

used in Brazil and shown to be, all, very imprecise. They have helped to bracket a range of what we may consider high-probability forecasts. This, however, is so wide as to render these methods unreliable for actual programming.

The best results have been achieved with what we could call a simplified input-output model, which I believe, may be successfully applied in any country with a comparatively small but fast-growing steel market, a low or medium per capita consumption, a high degree of industrial concentration, and a high percentage of Government-controlled investment. According to this method, we have developed reliable market forecasts in the following steps.

First, we survey the main enterprises in the various steel-using industrial sectors. These have been defined as:

- Transportation equipment (*)
- Parts and components of transportation equipment
- Farm and road machinery
- Mechanical machinery and equipment
- Electrical machinery and equipment
- Domestic and commercial utilities
- Cutlery, tools, plastics and toys
- Containers
- Housing and construction
- Wire products
- Miscellaneous

(*) This includes the manufacture of road vehicles, as well as the railroad equipment, ship building and aerospace industries.

These 11 industrial sectors were further broken up into 75 branches. Also, rolled-steel products, according to chemical composition, form and size, were classified in 318 types, grouped together under three broad categories: flats, non-flats and semi-finished.

In each of the 75 industrial branches, enterprises are inquired as to their production targets for the next two, five and ten years. They are also asked to detail their steel needs, according to the 318 types of rolled products, in relation to their actual and future production levels. The surveyed enterprises represent between 60% and 100% of production in their respective industrial sector and overall constitute roughly 80% of the country's use of steel. Based on their answers, we are then able to extrapolate the steel needs of each sector. We then check these results against the goals and directives stated in the latest Government plan and, whenever necessary, correct them.

This is more easily done in those sectors related to capital formation, such as housing and construction, ship-building, metallurgical and engineering industries, where output is directly related to Government investment, which has represented practically two-thirds of all gross capital formation in Brazil. Difficulties arise - and results are consequently less precise - in consumer goods, such as automobiles, domestic utilities, etc. However, since two-thirds of Brazilian steel is directed to

capital formation and only one-third to consumer goods, this does not invalidate the global results obtained.

These results are then compared with the extrapolation of time series developed for the main groupings of rolled products, as well as with projections based on correlation with per capita GNP and industrial production. We also check the income-elasticity associated with the forecast consumption against the past and present Brazilian values, as well as with those for other countries when in similar stages of industrial development.

This enables us to classify our forecast as optimistic, pessimistic or, hopefully, realistic. In other words, this allows us to define, in broad terms, the range within which we can expect variations from the forecast.

All this sounds fine. But let me be quick to add that reality has a way of contradicting the most careful analysis. For instance, our 1969 forecasts for 1972, 1975 and 1980, which at the time were considered by many to be too optimistic, were shown to be more than 20% below real consumption measured in 1972. In short, they were completely outdated in a period of only three years of steady, high-rate economic growth.

This instance is cited as corroboration to my earlier statement, that the highest priority should be given to a review and correction process, as preferable to sophisticated market forecasting methodology.

Before finishing, I would like to add a few words about that very controversial subject: the need for promotion of the use of steel in developing countries. The word "promotion" implies a need for advertising, for stealing a certain share of the market from a competitive product. This is nowhere the case of steel in a developing country. On the contrary, the opposite situation is the rule, with Governments and enterprises straining their human, technical, and financial resources to keep the steel industry abreast of the growing needs of the country.

To anyone familiar with this problem, the conclusion is inescapable that the best promotion of the uses of steel lies not in the hands of the steel industry itself but in the creation or introduction of steel-using enterprises in the country.

This, however, is a job for Governments, through their own investments or their policies designed to encourage investments in industrial production. With very few exceptions, a country's industrial development in its first stages is highly dependent on steel as a basic input. The promotion of steel is an intrinsic effect of any industrial development program.

There is one area, though, which constitutes an exception to this rule, and this is housing and construction. In this area, the low cost and quality of labor, typical of any country in its first stages of industrial development, lead to a preference for wood and cement structures against steel.

This is very natural and practically unavoidable. However, as the country progresses, it reaches very rapidly the point where, for certain types of structures such as bridges, urban viaducts, and high-rise buildings, the use of steel, although more economical, is retarded by the technological inertia of the country's civil engineers and construction industry.

Of course, this inertia is eventually overcome and steel assumes its rightful place as a building material. But this transition may take a long time, and can be considerably shortened through adequate promotional measures.

The resistance to steel structure is usually based on the following reasons:

1) Unavailability of the necessary steel shapes and qualities.
   In many instances, this is very logically due to the simple fact that the local market is not large enough to justify this production, and the vagaries of currencies and protective regulations discourage a continuous dependance on imported steel. However, sometimes these reasons have ceased to apply but the inertia of the steel industry leads it to concentrate capacity on other, more easily marketable products and leave this share of the market unattended.

2) No local [illegible] structure design.
This is very easily [illegible] engineering curricula, developed according to the needs of the [illegible] phase, where concrete reigned as absolute king.

3) Aesthetic prejudice against the use of steel.
This is also an effect of outdated curricula of architects and students of architecture.

4) Lack of skilled manpower.
There is nothing in common between the mostly simple labor involved with orthodox concrete structures and the highly skilled work of welders, riveters, and other specialists in the assembly of steel structures. Engineers familiar only with concrete and low-quality labor are reluctant to entrust such responsibility to workers that they are not able to keep under their direct supervision.
This is perhaps the most serious resistance and the most difficult to overcome, because it is associated with the whole educational and social structure of the country.

5) Unpreparedness of the building industry.
In order to shift to steel structures, a higher investment in fixed assets and manpower is demanded of the building contractors, as well as more solid financial basis of the builders and real estate developers.

6) Fiscal regulations which favor concrete against steel.
A concrete structure represents less valuable inputs bought and more value added to the final product at the building site. A steel structure involves buying more previously manufactured material that is only assembled at the building site. According to the system of taxation of the building industry, a heavier tax burden may fall on the steel structure than on a concrete one.

In order to overcome all these resistance factors, a coordinated program must be launched, with such a broad scope as to demand a high degree of coordination between industry and Government. Such a program must encompass:

- elaboration of new, adequate technical standards for the manufacture and use of rolled and welded steel shapes.

- investments in new rolling and fabricating facilities, for the manufacture of the needed steel products.

- intriduction of new, revised curricula in civil engineering and architecture courses, including extensive contact with steel structures.

- formation of necessary specialists, such as welders, riveters and others that are essential to the erection of steel structures.

- enactment of [illegible] legislation that provides for a balanced treatment of concrete and steel structures.

- continuous distribution of extensive information on the characteristics and relative advantages of steel structures, directed to building contractors, civil engineers, architects, governmental agencies and other prospective users of these structures.

A special entity is needed for this task. Ideally, it should result from the association of steel makers, fabricators of steel structures and contractors, but not controlled by any of these vested interests. It should emphasize the formation of a new, steel-minded generation of civil engineers, architects and skilled workers, through short-term courses and publication of high-quality literature adapted to their various needs and levels.

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