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## **Academic Views on the Economics of Construction: French Variations (1920-1970)**

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**ABSTRACT:** Depending on whether they date from the 1920s or the 1940s and later, doctoral theses using the compared economics of construction projects as a central argument are characterised by a considerable difference in tone and content. During the 1920s, single family homes were recommended whereas during the 1940s and later, it was housing blocks that were advocated. Although not at all based on concrete observations, the interpretation that prevailed as from the 1940s has nevertheless continued to reign and contributed to justifying the policy then chosen by the public authorities in terms of new buildings. However, this interpretation has also contributed to maintaining a gap between the consensus of the elites and the popular perception of the problem.

### **INTRODUCTION**

The first half of the 20<sup>th</sup> century in France saw few doctorate theses written concerning the issue of housing, and even fewer placing emphasis on the role played by the compared economics of construction projects. While the rental crisis and financing problems were subject to in-depth developments, any approach examining the respective costs of different types of housing generally remained ignored. A detailed study of sources reveals that only two theses defended in Paris have made the economics of projects a fundamental aspect of their argument. The first dates back to 1921 and was written by Henri Sellier (1883-1943), who had graduated from a major business school, was an experienced socialist politician and an administrator in the Office Public d'Habitations à Bon Marché du Département de la Seine (Seine department affordable housing service) created in 1916 to manage the construction of social housing in the Paris suburbs. The second was in 1945 by Claude Olchanski, an engineer having graduated from the Ecole Centrale in 1935 and who fairly rapidly extended his education by a doctoral curriculum.

The common points of these two theses are that they were focused in the problems of social housing, written in the critical moments following two world wars and published – a fairly rare occurrence. Those points aside, they were completely dissimilar, whether in terms of the education and personality of the authors, the style and contents of the presented economic argument or, finally, the resulting conclusions as to the type of project that should be pursued. Concerning the scientific canons of applied economics, the approach taken by C. Olchanski, essentially based on affirmations of principle without any real concrete observations, is clearly far less convincing than that taken by H. Sellier. However, we shall show that the former literally annihilated the position held by his predecessor and that its characterising methods continued to be accepted by university juries over the following 20 years. The argument conforms to an *a priori* conception of town planning and the architecture of housing. Its function is more illustrative than demonstrative and this raises the question of economics as a scientific discipline applied to town planning and construction.

### **THE THESIS BY HENRI SELLIER (1921)**

H. Sellier's thesis is developed over nearly a thousand pages, without counting the 250 pages of appended documents. Rather than being exclusively concerned by the Paris region, the text proposes a global reading

of the "housing crisis" in France as well as an approach to housing and town planning policies in 18 countries, essentially European but also including the United States, Canada and Australia. Apart from its analytical side, the thesis also aims to support a concrete project concerning the urbanisation of the city's suburbs and the role to be held by the then fledgling social housing sector in France.

From this point of view, one of the decisive aspects corresponds to the economic equation of the works being promoted. The policy position is dryly laid out in just a few pages hidden away in the heart of the text and then illustrated at great length towards the end of the thesis by the presentation of 15 projects concerning new social housing complexes. H. Sellier begins by dealing with the issue of the cost of land. Citing *Greater London* and *Greater New-York* as examples, he simply discards the vision of the dense pedestrian city and the inevitable overcrowding that this would generate. He bases himself on the reorganisation of transport systems to justify the spatial spread of large cities: "Today [...] the reorganisation of transport systems makes it possible to imagine the creation of worker agglomerations in suburban regions as yet not reached by industrial appreciation" (Sellier 1921, p. 251). In these areas undergoing urbanisation, sites are negotiated at between "four and 20 Francs a metre". H. Sellier specifically mentions an average price of 10 Francs in the town where he is mayor: Suresnes, adjoining Paris on the west bank of the river Seine and facing the Bois de Boulogne. These price conditions authorise very well spaced urban layouts in which single family homes play a fundamental role, even in the context of social housing.

Moving on to the economics of construction, H. Sellier contrasts housing blocks that need to be built from heavy masonry, such as the programmes that were then being planned for construction on Paris' old fortifications, with single family homes that could by then be built using lighter reinforced concrete or breeze block structures able to guarantee satisfactory sustainability and comfort. In these conditions, he stated that for a three-room house corresponding to the canonical social housing volume, it was possible to obtain a single family home at a cost of 28 000 Francs as opposed to 40 000 Francs for a unit in a social housing block. This obviously left a considerable margin to absorb the added cost of single family homes resulting from the installation of networks: roads and services, sewers, water and gas pipework. Although he believed that these costs should, much like public highways, be assumed by local authorities, H. Sellier finally decided to incorporate them at an added cost estimated at "4 000 to 5 000 Francs" per house. Finally, by integrating the cost of the land on the basis of 300 square metres at 10 Francs a metre for an individual plot, he arrived at an all-in price for a single family home of around 35,000 Francs as against over 40 000 Francs for an equivalent apartment in a housing block.

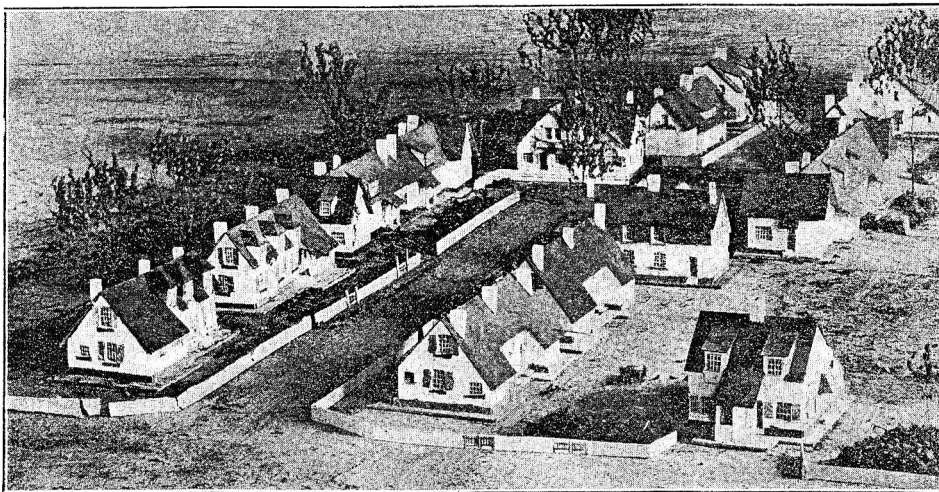


Figure 1: Garden city projects for the Paris region: feasibility study by architects André Arfvidson, Joseph Basmompierre and Paul de Rutté; (Sellier 1921, p. 256)

The spatial organisation proposed for these housing estates was largely inspired by the experience of the English *garden cities* and the German *Gartenstädte*. H. Sellier makes particular reference to the "remarkable book by R. Unwin, *Town Planning in Practice*" (Sellier 1921, p. 258), from which he quotes extensively (particularly, pp. 273-284) and includes ten drawings. This partial translation represents an original and is quite different from the language adopted for the same passages in the French version of the book which was only published in 1923. The very insistent reference to R. Unwin's text specifically aims to justify certain composition principles. For reasons concerning the economics of the project and urban aesthetics, the spatial organisation is based on groups of adjoining houses. There was then the question of architectural style. While the construction methods, local facilities and comfort of the housing were intended to be "modern", the author nevertheless based himself, for these projects initially developed by the "housing service architects", on a historicising approach referring back to the past: "the (housing) models should be inspired by the classical styles of the old buildings to be found in the Ile-de-France region [as] the local styles, because of secular traditions, were determined by climatic conditions" (Sellier 1921, p. 285).

The analyses made by H. Sellier and his chosen options find their concrete expression in the evocation of 15 garden city projects being designed or which were already beginning to be built on land owned by the Seine

department or its housing service (Sellier 1921, pp. 596-880). One of the operations which had already started was a project located in the Lilas commune, "just 1 200 metres" from the walls of Paris (pp. 765-792). Given their proximity to the Paris gateways, the land areas remaining available for construction were not very big. The acquired surface was just a little larger than six hectares and the resulting project was one of the smallest programmed by the housing service: just 212 houses, while on other sites up to a thousand houses were to be built. The programme includes:

- 119 houses with three main rooms plus "kitchen and W.C.", with surface areas varying from 47 to 59 m<sup>2</sup> depending on the layout,
- 67 houses with four main rooms plus "kitchen and W.C.", with a surface area of around 60 m<sup>2</sup>,
- 23 houses with five main rooms plus "kitchen and W.C.", whose surface areas are not specified.

In 1920, the largest of the work contracts was signed, and this made it possible to check the assertions of the author concerning the economics of the project. For the construction as such and the development of private plots ranging in size from 150 to 250 m<sup>2</sup>, 17 contractors were invited to tender and this resulted in prices for the three room houses varying from 22 000 to 27 000 Francs depending on the types. For the entire programme, the construction contract and the development of the plots represented 6 025 000 Francs, being around 28 400 Francs per house. The expenses linked to the construction of roadways, infrastructure networks and fencing came to 3 300 Francs per house. Finally, the land was bought at 19 Francs a square metre, resulting in a cost of 5 700 Francs per house. This gave a total of 37 400 Francs, excluding fees and contingencies. As can be seen, the level of the land cost explains why the 35 000 Francs threshold was exceeded, with the cost structure essentially complying with the fundamental equation presented above. It is also probable that this operation, which was underway at the time the thesis was being written, represented one of the bases for the formulation of a general approach to prices.

#### THE THESIS BY CLAUDE OLCANSKI (1945)

In the thesis he wrote between 1942 and 1945, C. Olchanski took a completely different approach and arrived at opposite conclusions concerning the issue of the cost of construction. Following a particularly well documented study on social housing in France, which underlined its limits, and an in-depth analysis of the methods to be adopted in terms of housing assistance, the author arrived at the issue of the most desirable form of housing in a final chapter entitled "Construction techniques" (Olchanski 1946, p. 188-198). While accepting that the single family home might be preferred by *certain* workers, "especially those working in the mines", he then gave a detailed critique of the idea of the garden city, resulting in a succinct appreciation that was no less than a denunciation: "From an economic point of view, garden cities are particularly expensive given the extensions of roadways, pipework, the large number of foundations, structural walls and roofs" (Olchanski 1946, p. 190). The exorbitant cost of single family homes led him to turn his attention to the charms of housing blocks:

However, one can take advantage of the considerably reduced cost of housing blocks to improve comfort. Central heating and refuse chutes can be envisaged, making life easier for households while reducing expenses and handling. [...] The cost of creating roadways for garden cities could be partially reduced and the saving specifically used for facilities such as lifts, garages and better materials (Olchanski 1946, pp. 190-191).

Basing himself on these expectations, it was only natural that C. Olchanski would declare that he was "fundamentally in favour of the construction of tall buildings", an option whose dimensional characteristics were detailed a little further: "Six or seven storey rental buildings [...] need to make way to taller 15 to 20 storey high rise buildings" (Olchanski 1946, p. 191). This would obviously result in having to absorb a number of constraints, such as the rationalisation of vertical ducts which, in itself would call for the organisation of housing unit layouts around a sanitary core incorporating the kitchen, bathroom and W.C. It would also call for the correction of certain inconveniences noted following the construction of the first tall buildings in France. These included disruptions affecting heat distribution in the buildings, and called for the abandoning of district heating networks given their "very high cost" resulting in unprofitable management, as witnessed in Villeurbanne (in the suburbs of Lyon) and Paris itself (Olchanski 1946, p. 195-196). The general lines resulting from this approach and the mentioned subjects of concern generally heralded the development of building systems in France during the 1950s and 1960s. This impression is further reinforced by the decision taken to opt for in-situ concrete as the main method used to construct the loadbearing structures of buildings.

The comments made by C. Olchanski concerning collective heating systems are clearly based on an understanding of operational audits. But can the same be said concerning the rest, being his fundamental economic views? An initial observation able to throw a shadow of doubt lies in the fact that housing buildings, whether social or private, subsequently rarely reached a height of "15 to 20 storeys". In 1974, throughout France, there were only 174 housing blocks exceeded a height of 50 metres, of which 55 were located in Paris itself (Tilmont; Croizé 1978, p. 269), and hardly any others have been built since then. This is easy to see in French town and, in particular, in large social housing complexes. A characteristic example is provided by the housing complex in Sarcelles (north of Paris), built between 1955 and 1975, where the clients privileged four to five storey constructions that corresponded to the limit above which post-war regulations imposed the incorporation of a lift. This result, clearly visible throughout France, immediately leads one to believe that the ad-

vantage that an abstract vision promised to draw from the stacking of floor levels was not as considerable as expected. Even if one admits that the benefit of high buildings really existed, the general result leads one to cast a critical eye on the peremptory affirmations made by C. Olchanski.

In the absence of any reference whatsoever to observations made on site, the point of view proposed by C. Olchanski is fundamentally only based on arithmetic "evidences" that are supposed to govern development and construction economics, but which are all questionable. *It is obvious that* the quantities of foundations, when expressed in terms of square metre of floor level are lower for housing blocks than for single family homes, but can these foundations be compared? Another, even more questionable *obvious point* concerns the "structural walls". Apart from the fact that, once again, the nature of the object changes over the height of the building, it is the arithmetic logic that is at fault in this situation. Certainly, a housing block supported by transversal cross-walls, alternating three and six metre spans and corresponding to an average of four metres, determines a ratio of "structural walls" equal to 0.25 linear metres per square metre of gross plan area, while a square-shaped family home covering a surface area of 100 m<sup>2</sup> and whose loadbearing peripheral structure is completed by secondary bearings on partitions would have a ratio of 0.40. But, in the case of a single family home, the ratio of "structural walls" includes the construction of elevations that, even if these are not load-bearing, are no less expensive to build in housing blocks given that the same materials are generally used. To compare what is comparable, it is therefore necessary to add an elevations ratio to the transversal "structural walls" ratio which, in the case of social housing blocks, is generally between 0.20 and 0.25. If this is done, then the performance of the housing block is less favourable than that of the single family home and this divergence is increased if one takes into consideration the attic rooms made possible by traditional roofs. When everything is taken into consideration for the construction as such, the only point among the affirmations made by C. Olchanski that is able to resist criticism is the one concerning the roofs and, more specifically, flat roofs, which can hardly be called a determining factor. The argument is even less convincing when one notes that the approach exclusively concerns the production of floor slabs and completely ignores habitable floor space and the considerable amount of common space, known in the past as "serving spaces", whose indispensable presence has the effect of reducing the proportion of truly habitable floor space in a standard housing block level to around 75%.

For the rest, the only illustration given by the author to support his vision of the economics of construction corresponds to a statistic concerning the cost per habitable room provided by employers in the iron and steel industry and based on the experience of workers' estates. The difference in favour of housing blocks is not particularly expressive: "10 000 to 30 000 Francs at 1938 prices" per room in a single family home as against "14 000 to 24 000 Francs at 1938 prices" in a housing block. It should be added that in these employers' estates, single family homes could be vast villas occupied by senior executives, while accommodation in housing blocks was reserved for poorer workers. Within this context where the configuration of buildings and the characteristics of the habitable rooms (both in terms of size and finishes) faithfully copied the social hierarchy, the only meaningful element concerns the *minimum* costs respectfully recorded concerning single family homes and housing blocks. The concerned statistic thus provides proof to the opposite as there is a 30% divergence in favour of the single family home as presented by H. Sellier. Were these ideas considered by C. Olchanski? He does not make reference to them, although it is possible to note a clear reining-in of his point of view in the last few lines of his thesis. Circumventing the issue of construction as such, he concludes by professing that "the value of high rise housing blocks lies above all in the reduced level of costs required for the construction of roadways, sewers and water, gas and electricity supplies" (Olchanski 1946, p. 198).

## AN UNSUBSTANTIATED ARGUMENT THAT NEVERTHELESS CONTINUES TO HOLD SWAY

This leads us from the apparent arithmetic of building to that of infrastructures and development which represent the strongest and most durable point of the argument stating that the small family house is an expensive product. A collection of services that do not seem in any way to worry H. Sellier is now presented as a determining factor despite the fact that its substance has hardly changed. The evidence is presented without nuance and nothing that might question the basis of the affirmation is provided. The fact that the cost of laying out a single family home is counterbalanced by the considerable advantage of the cost of the building is naturally lost from sight. No mention is made of the fact that the layout expenditure represents a very secondary element whose importance in the total cost is hardly any greater than the loss of efficiency linked to common spaces in housing blocks. No mention is made of the fact that the public works system had undergone increases in productivity at least equivalent to that to be found in the housing sector, a factor that, above all, profits urbanisation methods requiring the most roadways and networks. Finally, much like the approach taken to the construction cost as such, the allegation of an exorbitant cost is not based on any real observations.

As from the 1940s, learned opinion rested on its laurels and satisfied itself for many years by simply reiterating the same types of assertions as those made by C. Olchanski, assertions that still continue to make themselves heard. But when it comes down to the reality of the situation and as far as we know, there is only one analysis concerning the cost of roadways and networks that draws a comparison between housing estates and housing block complexes, and its conclusions are completely different. This study was carried out some time later around 1970 under the direction of P. Merlin, Ponts et Chaussées engineer general and professor at the Ecole Nationale des Ponts et Chaussées. The operational data used for this study resulted in a representation of the variation of development costs per housing unit in the form of "U" curves, with the low point corresponding to

a density of 25 houses per hectare for single family homes and a density of 60 housing units per hectare for housing blocks. While it is clear that the optimum level for housing blocks (7 500 Francs at 1967 prices per housing unit) is more favourable than that for houses (9 000 Francs at 1967 prices per house), the divergence is not so great, and the cost of housing block units exceeds that of the single family home optimum as soon as a density of 80 housing units per hectare is attained. In other words, a documented approach to costs immediately questions the evidence of an arithmetic simply based on ideas.

Although easier to demonstrate – there has been no moment throughout the 20<sup>th</sup> century when, at comparable finishes and volumes, the construction of a single family home has proven more expensive than that of a unit in a housing block – the thesis concerning the construction as such also continued to durably profit from academic uncton. This can be seen in the doctoral work carried out by J.E. Havel, crowned at the Paris Faculty of Arts in 1956, which immediately saw the publishing of a compendium called *Habitat et Logement* as a paperback by Presses Universitaires de France for use by students as a reference for issues concerning housing. In this work, reprinted four times up to 1985 without its contents undergoing any significant revisions, the author predicts a progressive cessation of the production of single family homes. He gives two reasons for this taking place (although completely belied by what subsequently took place in France): a “town planning reason” corresponding to the conditions governing the development of metropolises, and an “economic reason” based on the nature of construction. This second aspect, being the only one of concern to us here, is reduced to its simplest expression: “On condition that the buildings are not too tall, it is cheaper per housing unit to locate several housing units rather than a single home under one roof” (Havel 1974, p. 19). It is clear that this manner of treating the economics of a building reveals a remarkable prudence given that the author restricts himself to the only good reason available to him, or proof of an extraordinary irresponsibility. In any case, it is clear that the insufficiently based thesis written in the 1940s was transformed into a generally accepted popularised ideology and this leads to questions being asked as to the nature of the processes that have successfully transformed a falsehood into a scientific assumption.

In contrast with the thesis written by H. Sellier, one of the salient features of the works that received approval from university juries as from the 1940s was the lack of a real basis on which to make concrete observations. This same characteristic is also to be found in the thesis defended by J.C. Kourganoff in 1963, *Une solution au problème du logement: l'industrialisation du bâtiment* (A housing solution or problem: the industrialisation of construction). Having given a detailed presentation of the various concrete-based prefabrication methods, the author professes that in terms of structural works “all the advantages [of large panel precasting] permit a cost reduction of around 10% to 25% when compared with the traditional sector” (Kourganoff 1963, p. 132). But he then goes on to admit that he had not been able to obtain any “accounting documents” able to prove this point because “each company [considers] that these are secret documents” (Kourganoff 1963, p. 139). In other words and once again, this is an unverified affirmation and it is surprising that a jury where two of the three members were very well-known professors of economics at the University of Paris – J. Marchal and A. Piettre – was able to crown a doctoral work where the central argument of the thesis lacked any real basis. The probable reason was that the approach taken, simply based on the handling of ideas, was familiar and thus acceptable to professors of political economics highly interested in conceptual constructions. However, this approach is nevertheless inappropriate within the context of a problem of applied economics, where the observation and measurement of realities should represent fundamental conditions underlying the validity of the analysis.

In the presence of a consensus on theoretical ideas that *ought* to conclude by practical verification, and without this consensus being based on concrete observations, it cannot be assumed that its source could be found in the sphere of economic thinking itself. C. Olchanski provides a key to interpret this prejudice imported from other sources. In the passage where he discusses the glorious future of “15 to 20 storey” buildings (Olchanski 1946, p. 191), he refers twice to the writings of Le Corbusier, particularly citing *La Maison des Hommes*, published in Paris in 1942. It was therefore under the influence of an understanding of modernity propagated by “modern movement” architects and town planners that the economic approach came to neglect the facts and simply based itself on a profession of faith. It should be added that this new religion also reflected the professional interests of those involved in architectural and urban design, first among these being engineers and architects. C. Olchanski seeks to assert the new role given to engineers by large construction operations (pp. 194-196). This same type of insistence is apparent in the increasing importance of intellectual investment in the preliminary studies and organisation that can be seen in the works by J.E. Havel (pp. 21 and 118) and J.C. Kourganoff (p. 171). While assistance from conceptual intellectuals can justly seem indispensable in heavy construction, the same cannot be said for small houses, a field where they could even experience certain failures. This is exemplified by the stinging letdown suffered by Le Corbusier and his developer H. Frugès between 1924 and 1926 with the abandoning of their working class houses designed for the Pessac site in the outskirts of Bordeaux.

The loop on which the economic analysis of the “moderns” is based closes in on itself as soon as one realises that, in its general form, the idea according to which building production activity is linked to the number of floor levels derives specifically and exclusively from the experience of heavy construction. On large building sites, the productivity of the structural works is mediocre on ground level and below, where the most non-repetitive operations take place, and gradually improves with the standard upper floor levels up to an optimum level and then deteriorates again for the taller buildings. In this mechanical progress, the salient point is that there is a break in work processes every time the production teams have to return once again to dig around at the bottom of the excavations and that, consequently, productivity can never be good for single

family houses. However, this appreciation, inspired by the rhythms of heavy construction, is contradicted by observations made in the field. The relative simplicity of a house allows production agents to easily memorise the structure and consequently capitalise a horizontal productivity that literally steps over the excavations and foundations. Single family home builders state that, like those workers erecting standard floor levels, a production team having built the same model two or three times is perfectly able to control difficulties, anticipate supply requirements, etc., simply working from the memory of previous identical houses, to an extent that any changes need to be clearly and insistently explained to avoid the risk of seeing an exact copy of the initial model. The effects to be expected from this horizontal productivity are at least comparable to those obtained from vertical blocks, and it should be noted that the benefits are obtained without having to use an unwieldy organisation and inspection system.

The relative symmetry that exists between the productivity respectively provided by horizontal and vertical repetitiveness was lost from sight in analyses made during the 1940s and subsequently. As soon as this is seen in perspective, at least conceptually, the economic reasoning accompanying the aesthetic/urban popularised ideology of the "moderns" becomes no more than pure tautology. Fundamentally, housing blocks provide productive advantages because this type of construction corresponds to the only option under consideration. Providentially, this option also coincides with the professional interests of the highly vocal architectural corporations. The consensus of players then gave the unfounded assertion all its backing and dispensed with any checking procedures, even in scientific environments.

## CONCLUSION

The understanding of the economics of construction represents a fundamental point in the option taken in favour of a particular mode of urbanisation. In the period from 1920 to 1970, doctoral theses crowned by the University of Paris were read and understood in two successive ways. The first dates to the beginning of the 1920s and favours the *city of houses* project. The second, which reigned from the 1940s to the 1960s, backed a development project that took the form of *housing blocks*. Unlike the first, the second presented itself as a simple affirmation of principle and, in the terms used to express this affirmation, it would have been very difficult to give it documented concrete substance by field observations concerning prices. This did not prevent the affirmation from contributing to the production of real effects. These corresponded to the period of just a few years during which, in around 1960, apartments in housing blocks represented up to three-quarters of new dwellings built in France. This second understanding, which had the consensus of the elites, rather than finding its source in an independent economic contribution to construction expertise, was to be found in an *a priori* conception of modernity that inspired postulates concerning economic views as well as aspects of aesthetics and construction techniques. Inasmuch as, from an economic point of view, these were constantly belied by facts, an ever-wider gap grew between the construction culture sought by the elites and the popular perception which was convinced that, by keeping a close control over prices, the single family house continued to be an affordable product, at least in the very large number of urbanisation sectors where the cost of land did not represent an insurmountable obstacle. The more general lesson that can be drawn from this episode is undoubtedly the idea that we would expose ourselves to similar types of risks if, for whatsoever reason, we once again cultivated a vision of project economics subject to a doctrine and which did not take the observation of the real situation into consideration.

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