



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org



D02485



Distr.
LIMITED
ID/WG.9/1
27 March 1968
ENGLISH ONLY

United Nations Industrial Development Organization

Interregional Seminar on Industrial Location
and Regional Development
Minsk, August 1968

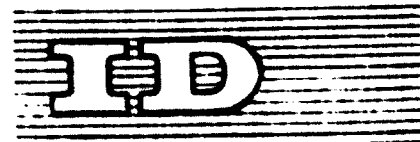
14 10 26

EVALUATION OF AN INDUSTRIAL PROJECT FROM THE POINT OF VIEW
OF RATIONAL LOCATION OF PRODUCTIVE FORCES ^{1/}

by

E. Aisov
Council for Study of the Productive Forces, USSR

^{1/} The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO.



United Nations Industrial Development Organization

Distribution
LIMITED

ID/WG.9/1 SUMMARY*
27 March 1968

ORIGINAL: ENGLISH

Interregional Seminar on Industrial Location
and Regional Development
Minsk, August 1968

14 626

EVALUATION OF AN INDUSTRIAL PROJECT FROM THE POINT OF VIEW
OF RATIONAL LOCATION OF PRODUCTIVE FORCES ^{1/}

SUMMARY

by

E. Alaev
Chief of Section, Council for Study of the Productive Forces

* This is a summary of a paper issued under the same title as ID/WG.9/1

1/The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO.

id. 68-172

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

1. Evaluation of the efficiency of an industrial project should be made from the point of view of its relationship to the existing and projected over-all location pattern of a nation, and not from the point of view of the profitability of a particular project.
2. Every new enterprise that is established in response to the needs of the economy gives rise, in turn, to new industrial, service and utility needs. It is necessary, therefore, to take into account demands for goods and services in order to assure optimum utilization of an enterprise's facilities. Similarly, the impact of a new enterprise on the labour market must also be taken into account when approaching the location problem. The social costs of a new enterprise in terms of its demands upon services such as sewage, its disturbance to community welfare and its effect on air pollution must also be considered.
3. Such an approach to location is used in the Union of Soviet Socialist Republics and it seeks to take into account, when constructing a new industrial plant, such requirements as the economic exploitation of natural resources, rational use of manpower, the need to develop effective relationships between economic regions and enterprises, specialization and complex development of the economy of these regions, balancing their development, as well as the need to prevent excessive concentration in big cities. It is believed that the most efficient industrial location is one which minimizes the total social costs of labour for industry and transportation and which permits the establishment of an industry in the shortest period of time.
4. Determining the best location of an industrial enterprise is facilitated when the general scheme of location of productive forces in a country is drawn up beforehand. The general scheme is a document which combines economic analysis of the existing location and regional development pattern with a determination of the most economic variant of location of industries, agriculture, and transportation and optimum industrial development in each region. For rational location of the productive forces it is necessary to take into account the specific features of individual industries and regional industrial development, based upon the achievement of regional development and specialization.
5. Locating a new enterprise requires study of the following factors:
 - (a) The relationship of an industry to the economic structure of the region - ancillary industries, construction base and transportation facilities;
 - (b) Raw material needs and their availability;
 - (c) Manpower needs and the effect of the new plant on the manpower situation of the region;
 - (d) Needs of sources and utilities, including housing, medical services, schools, and cultural establishments;
 - (e) Conformity of the industry to the spatial structure of the region including site requirements, impact upon the system of commodity flow, and conditions of settlement of employees of the new enterprise.
6. In general, the complex method of evaluation of an industrial enterprise project from the point of view of national location of productive forces is reduced to taking into account comprehensively and simultaneously the most important location factors such as raw materials, fuel, power, transportation, water, and manpower, and the economic evaluation of all inevitable changes in the social life of the population and the terrain.

Contents

	<u>Page</u>
I. <u>An Enterprise and the Productive Forces Location System</u>	3
II. <u>An Enterprise and the Region</u>	6
Industry	8
Manpower	9
Non-productive sphere	10
Natural resources	10
Territory	12
III. <u>Complex Calculations of the Optimum Point of Enterprise Location</u>	13

I. AN ENTERPRISE AND THE PRODUCTIVE FORCES LOCATION SYSTEM

1. Evaluation of the efficiency of a projected enterprise, as a rule, should be made from the point of view of already existing enterprises and their length of endurance as productive forces in a country (complex evaluation method). Evaluation should not be done from the point of view of one particular enterprise alone (individual method of evaluation). Advantages that may seem to be profitable for a single enterprise may turn out to be unprofitable from the point of view of the whole economy.
2. Each new enterprise whether large or small, whether located in a town or small settlement, irrespective of the organization or agency of which it is a subordinate, becomes from the beginning of its operation an integral part of a country's national economy and maintains certain relations with other enterprises. These relations are diversified and although some may seem to be of negligible importance when applying the individual method of evaluation, they may prove to be essential from the point of view of national economy and should be taken into account when dealing with the complex method of evaluation.
3. Each new enterprise that is established because of certain needs of a country's economy, gives rise in turn to new needs and requirements and sometimes brings into being other enterprises, not only in its own field but also in other fields as well as in the realm of services and utilities. The volume of output of these other enterprises which are optimum from an economic point of view, as a rule, exceeds the product demand of the projected enterprise. Only at the regional or national economy level is it possible to make full use of the facilities of accompanying enterprises.
4. Each new enterprise with its manpower demand causes changes not only in economics but also in the social life of a country. These changes are often favourable, such as higher employment, increased income in the region of the new enterprise and in general improved living standards. If an unwise selection has been made, undesirable consequences may result. For instance, a new enterprise that needs either a predominantly male or female labour force may break the balance between male and female labour in a particular region. In cases where local manpower is insufficient, it is necessary to transfer labour from other regions. This action is not always justifiable, either economically or for other considerations. All these changes should be taken into account when approaching the location problem in the complex method.

5. Each new enterprise influences not only the economics of a country but also brings about other changes, not always favourable ones. For example, sewage waters, toxic gases and dust, accumulated ashes and other wastes, if not properly taken care of, can greatly impair sanitation and hygienic conditions in residential areas. Such conditions can cause an increase in disease which can result in economic loss. In the Union of Soviet Socialist Republics such a result is contrary to the policy of the State which is to improve people's living standards. The problem of natural landscape, recreation zone preservation and nature conservation should also be given much consideration. Care should be taken not to use excessively raw materials and resources that could become depleted. Also care should be taken not to impede natural processes of geographical environment restoration of forests and water resources.
6. Many changes do not become fully apparent at the start of an enterprise, but only after several years of operation. If these changes are undesirable ones, it becomes more and more difficult to rectify the mistakes the longer they have accumulated. With a complex approach that permits long-term forecasting, there is less risk of making undesirable miscalculations.
7. Priority should be given, therefore, to the complex method of industrial enterprise project evaluation, especially for a big enterprise, because latent sources of efficiency may be released by manoeuvring industrial capacities and resources.
8. According to a regulation in force in the Union of Soviet Socialist Republics, the choice of a region or area for construction of a new industrial enterprise is made with the interests of the whole State in mind. This conformity with Socialist principles of productive forces location considers the specific techno-economic peculiarities of each branch of industry and aims to create the best living and labour conditions for all the population. Consideration should be given to the priority of exploitation of natural resources that are advantageous from an economic point of view, rational use of manpower, the need to develop efficient industrial relations between economic regions and enterprises, specialization and complex development of the economy of these regions, levelling of their development standards, as well as the need to prevent excessive industry concentration in large towns.

9. It is believed that the most efficient variant of an industrial enterprise location is the variant that involves the minimum cost for labour and transportation, and which provides the establishment of an industry in the shortest period of time.
10. Calculations made to determine the best place for an industrial enterprise location are greatly facilitated if the general scheme of the location of productive forces in the country is drawn up beforehand. The general scheme of the location of productive forces is a document that is worked up before the project or plan commences. It combines in its analytic part an economic analysis of existing territorial proportions in industrial location and conditions of industrial development in each economic region of the country. In its synthetic part the determination of the most economic variant of location of industries, agriculture, transportation and other factors are set forth together with the optimum of industrial development in each region.
11. For rational location of productive forces it is necessary to take into account the specific features of individual industries, the regional analysis of natural and economic conditions of industrial development, and the possibility to achieve the best results for the whole society on the basis of the complex development of regional economics and their efficient specialization.
12. It is impossible to make large-scale calculations aimed to discover the optimum variant of location without working out standards and without improving methods of calculations.
13. Unified techno-economic standards are functioning in the Union of Soviet Socialist Republics as well as the standard projects and designs of various enterprises, drawn up by scientific research establishments, tested in practice and adopted by state organs. For instance, the comparative technical and economic indices on fuel production and its transportation over the Union of Soviet Socialist Republics regions have been prepared for making calculations for the five year period 1966-1970 of the standards of specific capital investments into transport and transportation costs of various cargoes by rail to important regions and areas, standards of labour costs and others. The ministries and state committees related to various industries, elaborated methodical regulations for long-term calculations of the variants of adequate industry location.

14. Considerable difficulties may be encountered when making calculations because of the complexity of industrial relations of projected enterprise and the great number of objects being built and extended, with varying capacities, and the points and areas of possible location. For such estimations specially worked out mathematical techniques and electronic computers are applied. Such calculations are made in the Union of Soviet Socialist Republics to determine optimum location of enterprises such as cement, tires and certain engineering industries. The implementation of the results of the calculations is facilitated by the fact that the absolute majority of the industrial components, available in the calculations, are owned by the State.

15. The quality of calculations and the conformity of projected enterprise location variants with the economic tasks of the State are checked and controlled by experts commissions set up for the examination of these calculations. The basic problems of industrial location are submitted for consideration to the State Experts Commission under the Union of Soviet Socialist Republics State Planning Committee.

II. AN ENTERPRISE AND THE REGION

16. The conceptions of specialization and complex development of economic regions are the biggest achievements of science on productive forces location. Specialization of the economic region shows its place in the territorial division of labour over the country. It is based on the fact that in this region due to the effect of specific features of natural and economic conditions, of manpower supply, of geographical situation and other factors, certain kinds of produce are manufactured with least costs involved and on a scale exceeding the needs of the region itself. In other words, specialization is a function of the whole economy of the region, predetermined by its natural, economic, labour factors and its geographical situation.

17. The interregional exchange with specialized products, that is products, manufactured with least cost, ensures within the framework of the whole national economy most efficient production and distribution of material wealth. The approach from the point of view of the national economy in estimating the efficiency of specialization of the region in a particular industry requires also taking into account expenses for the accompanying branches of industry, transportation facilities, housing construction and other factors. In other words, economic efficiency of the specialization of the region in particular industries is not only a function of these industries, but also a function of the whole economic complex of the region. If the analysis of the regional specialization shows to what extent it participates in territorial division of labour, then the analysis of the complex nature of the regional economics reveals deep reasons for the efficiency of regional specialization, and points out ways to further increase this efficiency. It is impossible to make a decision to locate a new enterprise in a region without examining the following questions:

- (1) To what extent does the industry correspond to the economic structure of the region and to what extent is it ensured by adequate development of ancillary industries, such as a construction base and transportation facilities?
- (2) To what extent does the industry correspond to local natural resources and conditions and with what kinds of raw materials can it be supplied?
- (3) To what extent is the industry ensured of manpower supply and what will be the effect on the total manpower balance in the region?
- (4) How high are the standards of services, utilities and supply to the population of the region (these have an indirect impact upon the stability of the labour force and its productivity)?
- (5) How does the industry conform with the spatial structure of the region and to what extent does it correspond to territorial opportunities of the region?

All these interrelationships and proportions between individual industries and the new industry and natural resources and manpower, form the basis of the complex development of the economic region.

18. If a decision is being made to locate a new enterprise (industry) in an economic region, before evaluating this or that location variant, it is necessary to analyse all of the main interrelationships of the regional complex, giving an economic estimate to each. The most important relationships that are subjected to economic analysis are listed below.

Industry

19. Provision of a new enterprise with fuel and electric power and the impact of the enterprise on the fuel and power budget of the region are important.

20. In every economic region, as a rule, various kinds of fuel with different cost price indices and specific capital investments are utilized. When designing a new industrial enterprise, the indices of the so-called 'enclosing' fuel, that is the fuel upon which one must depend in this region, should always be present. For many regions, especially those that are short of power, this 'enclosing' fuel is often more expensive (the increase of power consumption is connected with investments in power production, with shifting to less economic fuel resources, with extension of fuel transportation and other factors) but reserves of cheaper fuel may be limited.

21. If the economic efficiency of power consumption of a new enterprise is estimated according to the cheapest fuel in a region and reserves of this fuel are limited, then a distorted picture is given, even if a new enterprise actually consumes this kind of fuel. In this case some of the power users in the region would have to turn to the more expensive 'enclosing' fuel and the benefits derived from one enterprise would be eliminated by the losses of the other.

22. The correct choice of the 'enclosing' fuel for any region is facilitated by a preliminary estimation of the power and economic characteristics of the region, an integral part of the general scheme of productive forces location.

23. Provision of a new enterprise with the produce of ancillary industries and supplying it with raw materials and semi-processed products must be evaluated. (For example, the rate of providing an engineering enterprise with rolled metal; the rate of providing a textile enterprise with fibre, dyes and chemical and technological aids). If the ancillary industries are not available in the region, and if the region is orientated towards consuming the imported produce, this must be taken into account in relation to the cost price for the consumer, including transportation costs.

24. A new enterprise must be provided with ancillary industries of general application such as construction and transportation, and equipment maintenance. Of special importance when taking a decision on location is a local construction base (construction agency, industry of building materials) or conditions for its establishment. It is also necessary to take into account the possibility of further use of the building agency after the projected enterprise has been started.

25. The possibility of utilizing in situ the by-products and industrial wastes of the projected enterprise should be studied. For instance, when designing a coke plant, opportunities for using coke gas should be analysed; or when designing a textile enterprise opportunities for utilizing wastes should be examined.

26. The zone of sale of the new enterprise products and transportation conditions must be evaluated. Cost of the finished product for its consumer, but not for the manufacturer, should be taken into account, including transportation costs.

Manpower

27. Provision of the new enterprise with a labour force, including skilled labour force is important and possible expenses to attract labour from the outside must be considered.

28. It is estimated that the creation of the complex of housing, municipal and cultural conditions for each man who migrates from the European part of the Union of Soviet Socialist Republics to the Eastern regions costs ten thousand roubles or on the average per year (the term of depreciation of the basic funds equals 50 years) 200 roubles for each person migrated.

29. The influence of the new enterprise upon the regional balance of manpower including correlations between the spheres of application of male and female labour, seasonal differences in labour intensification over the region must be taken into consideration.

30. In the Union of Soviet Socialist Republics, for instance, the construction of enterprises of light and food industries (enterprises orientated preferably towards female labour) are promoted in regions of heavy industry concentration - the Donbass, Kuzbass, the Urals, where men are mainly employed at the main industries and where female labour is available. Determination to establish correct proportions between male and female labour brings about fuller involvement of manpower in social production, increases families' incomes and reduces labour turnover.

31. Consideration must be given to the conditions for providing employees and their families at a new enterprise with foodstuffs and other goods. This factor is particularly important when evaluating regions with confined local food supply such as the regions of the Union of Soviet Socialist Republics extreme north.

Non-productive sphere

32. The condition of services and utilities in a region is important. Costs needed for extensions, housing and municipal construction, medical service, schools, and cultural and educational establishments must be considered.

33. Specific conditions of an area that demand additional costs for medical service and for measures to stabilize the labour force should be evaluated. For instance, costs to set up artificial solariums and basins for children's institutions and construction of air conditioning installations should be known.

Natural resources

34. The amount of supplies and economic efficiency of local raw materials on the basis of which a new enterprise could start operations, and the availability of local construction materials should be known.

35. In the Union of Soviet Socialist Republics elaboration of projects and allocation of capital investments for construction and extension of mining enterprises is based on the approved mineral reserves balance which are referred to as categories A, B and C₁ and which ensure operation of an enterprise for a whole forecasted period of basic funds depreciation.

36. The condition of the water supply for the new enterprise and the effect of the new enterprise upon the water balance of the region is important. For instance, the effect of the construction of mines upon the ground water level, upon forest zones reduction during forests exploitation upon the regional water regime and other effects; the conditions for removal of industrial and sewage waters, their purification and utilization must all be evaluated.

37. The coefficients of construction cost increase by zones, of increase of operational costs and the wage level caused by the specific features of natural conditions in the region should be evaluated. In 1963 in the Union of Soviet Socialist Republics the following coefficients of the cost increase of wages were active:

Regions of the extreme north	- 1.40 to 2.0
Regions treated as regions of the extreme north	- 1.30 to 1.60
Regions of the European north and southern regions of Siberia and the Far East	- 1.20 to 1.30
Ural mountains and southern regions of western Siberia	- 1.10 to 1.15
High mountainous regions	- up to 1.40

38. The regional coefficients of the wage level determine to a considerable extent the regional coefficients of construction costs.

39. The conformity of the climatic and other natural conditions of the region with the specific needs of the new industry is important, such as moisture and air temperature, seismic characteristics of the area and river regimes.

40. Economic losses as a result of changes in the geographical environment should be considered. (Flooding due to building of reservoirs, transfer of installations and roads, due to underground mining and so on.)

41. An idea was proposed to build a large hydropower station in the low reaches of the Ob river with a capacity equal to 6-7.5 mln. kw. With it it would be possible to have the cheapest electric power in the country. However complex calculations showed that the damage that would have to be done by flooding the area (about ten thousand millions of roubles) would bring to naught the efficiency of the Nizhno-Obsk hydropower station (rich fields of gas, oil, peat and big forests happened to be in the area to be flooded).

42. The influence of a new enterprise upon the sanitary and hygienic living conditions is important, such as expenses required for purification of industrial sewage waters, and gas exhausts and for maintaining these conditions at a proper level.

Territory

43. The size of existing industrial centres and units in the region and their specific peculiarities that facilitate or complicate the location of a new enterprise in these centres should be considered. Availability of suitable construction sites and possible sources of reduction of capital and operational costs of the projected enterprise should also be considered. (Locating buildings on sites with already existing enterprises, connecting into centralized heat, power and water supply systems and other economy measures.)

44. The influence of the new enterprise upon industry within the region and upon the system of commodities flow is important. Priority is given to locations that have empty transport routes for loading (the cost of cargo transportation on an empty route is two or three times lower than in heavily travelled routes).

45. Conditions for rational resettlement of employees of the new enterprise and expenses required for creation of protective sanitary zones and extension of municipal transportation must be considered.

46. These are the main factors taken into account in the complex method of enterprise location.

47. Each factor has its own economic merit. The problem of the complex method of choosing a location lies in giving combined evaluation to all factors mentioned.

III. COMPLEX CALCULATIONS OF THE OPTIMUM POINT OF ENTERPRISE LOCATION

48. Location of a big cotton mill that manufactures fabrics for clothes, linen and underwear can be used as an example. The main parameters necessary for estimation are: (figures are approximate) production capacities equal to 63 million metres of fabric per year; projected capital investments equal to 62 million roubles; 7,100 employees, including 4,600 women. Requirements for operation of the mill are given in the following table:

Table 1

Mill operation

<u>Raw materials and power</u>	<u>Units of measurement</u>	<u>Per 1,000 m. of fabrics</u>	<u>Annual output</u>
Cotton fibre	tons	0.11	6,930
Dyes	tons	0.02	1,260
Other materials	roubles	1.00	63,000
Electric power	kw/hr.	630.00	39,700,000
Fuel	tons of convent. fuel	0.70	44,100
Water	cu. m.	150.00	9,450,000
Water purification and water diversion	cu. m.	110.00	6,930,000

49. Such is "the visiting card" of the big cotton mill on the basis of which we evaluate the features of its location. However, for complex calculations of the optimum place of location these are not sufficient. It will also be necessary to build a settlement for employees with all kinds of municipal services as the 7,100 mill employees represent approximately 21,300 inhabitants. Housing construction costs for them would be estimated at 38,340 roubles. These figures however, do not complete the calculation of needs and requirements. For every 100 persons employed in the main industry there are on the average, 70 persons, employed in services and utilities such as trade, municipal economy, transportation and medical service. The total number of employed in the settlement would be about 12,000 (7,100 employed at the mill, plus 4,900 employed at other industries), among them 7,800 women. The total number of the population working

at the mill or in catering services comes to 36 thousand people. The needs of the whole complex will increase as indicated in the following table:

Table 2

Increase of needs

<u>Expenses</u>	<u>Unit of measurement</u>	<u>The Mill</u>	<u>Other Users</u>	<u>Total</u>
Electric power	mln.kw/hr.	39.7	36.0	75.7
Fuel	thousand tons of convent. fuel	44.1	28.8	72.9
Water	thousand cu.m.	9,450.0	5,256.0	14,706.0
Water purification and water diversion	thousand cu.m.	6,930.0	4,680.0.	11,610.0
Foodstuffs and goods	ton		54,000.0.	54,000.0

Requirements of cotton, dyes and other kinds of specific products for the mill remain unchanged.

50. In order to choose the best location, it is necessary to choose several possible spots. In practice, all possible locations are not examined because the most favourable regions and points of location are already roughly defined in the general scheme of location. For comparison, the characteristics of three hypothetical location points, A, B, and C are given in the following table. (Location point A is taken as 100)

Table 3

Characteristics of three location points

<u>Expenses</u>	<u>Location Points</u>		
	<u>A</u>	<u>B</u>	<u>C</u>
Cost price of 1 kw/hr. of electric power	100	33	33
Specific capital investments into 1 kw. of power	100	140	80
Cost price of 1 ton of conventional fuel for the user	100	66	26
Specific capital investments into transport	100	102	114
Cost price of 1 ton of cotton for the user	100	98	100
Cost price of 1 ton of dyes for the user	100	140	124
Cost price of 1 cu.m. of water	100	214	86
Specific capital investments into water supply per 1 cu.m. of water	100	1,000	100
Cost price of purification of 1 cu.m. of water	100	333	80
Specific capital investments into purification per 1 cu.m. of water	100	499	80
Expenses on foods and goods supplies per inhabitant	100	110	333
Delivery of fabrics to the user	100	300	389

51. In general it can be said that location A shows the best indices from the point of view of the proximity to the consumer; proximity to ancillary industries (dyes production); more perfect transportation system and better opportunities for supplying the population with foodstuffs and goods. Point B is situated in the raw materials zone, with cheap electric power (higher specific capital investments due to the rate of consumption of hydropower) but with very limited water resources. Location B is characterized by better indices of electric power, water supply, water diversion, but it is located far from the consumption centres and in the zone with higher costs of construction and higher wage levels.

52. Let us assume that according to territorial and engineering conditions each point chosen is suitable for mill construction. Calculations of the forecasted cost price of produce are set forth in the following table:

Table 4
Comparative cost price structure (in thousand roubles)

<u>Articles of expense</u>	<u>Location Points</u>		
	<u>A</u>	<u>B</u>	<u>C</u>
Cotton fibre	7,034	6,932	7,034
Fuel	441	291	115
Electric power	119	40	40
Dyes	95	132	117
Other kinds of raw materis	63	63	63
Water supply	87	211	72
Wages	9,940	9,940	9,940
Increase of wages by zones	-	-	994
Depreciation	1,360	1,360	1,980 ^{a/}
TOTAL	19,639	19,469	20,361
Cost price of 1 m. fabric for the manufacturer - in kopecks	31.1	30.9	32.3
Transportation costs for delivery to the users	63.0	189.0	245.0
Full cost price for the user (total in thousand roubles)	19,702.0	19,658.0	20,600.0
1 m. of fabric in kopecks	31.3	31.2	32.7

^{a/} In connexion with the increase of the construction costs

53. Thus the variant of the cotton mill location in point B gives annual savings equal to 44 thousand roubles in comparison with variant A and 948 thousand roubles in comparison with variant C.

54. About 300 tons of wastes are released in manufacturing fabrics that may be used in special textile enterprises, so-called wastes utilizing factories. Let us assume that such a factory is available in point A while there is no factory of this type in points B and C. In connexion with this the annual costs for delivery of wastes to the consumer will make a thousand roubles for point A, 15 thousand roubles for point B and 21 thousand roubles for point C. Total values of the current operational costs will increase up to 19,703 roubles for point A, up to 19,673 roubles for point B and up to 20,621 roubles for point C.

55. We must also compare the annual costs of services and utilities over the whole region, which are not included in the cost price, but in any case are involved, and should be taken into account when making complex calculations.

Table 5

Regional costs of services and utilities
(in thousand roubles)

<u>Expenses</u>	<u>Location Points</u>		
	<u>A</u>	<u>B</u>	<u>C</u>
Electric power	108	36	36
Fuel	288	190	75
Water supply	51	126	46
Delivery of goods and foodstuffs	49	81	162
	<u> </u>	<u> </u>	<u> </u>
TOTAL	496	433	319
Total current expenses (the cost price, Transportation of the produce to users, as well as wastes, population and catering expenses)	20,199	20,106	20,940

56. According to the total sum of the calculations (current prices) point B takes "the lead", saving 93 thousand roubles compared with variant A and 834 thousand roubles compared with variant C. But the optimization criterion is not minimizing the cost price only or current expenses in general, but it is minimizing the total costs, both current, operational and capital costs. The following table shows capital investments according to the three variants.

Table C

Capital investments (in thousand roubles)

<u>Location points</u>	<u>A</u>			<u>B</u>			<u>C</u>		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
The mill (in addition to construction cost increase)	62,000	-	62,000	62,000	-	62,000	62,000	-	62,000
Power production	596	540	1,136	1,090	1,060	2,150	776	432	908
Water supply	23	15	38	164	99	263	20	13	33
Transportation	491	237	728	280	120	400	460	195	655
Housing	38,340	26,460	64,800	38,340	26,460	64,800	38,340	26,460	64,800
Construction cost increase	-	-	-	-	-	-	5,112	3,528	8,640
TOTAL	101,450	27,252	128,702	101,874	27,739	129,613	106,708	30,628	137,336

Legend: (1) Capital investments in the mill and housing for employed
(2) Capital investments in services and utilities
(3) Total investments

57. According to the comparison variant A saves 911 thousand roubles from capital investments compared to variant B and 8,634 roubles compared to variant C, or in reduced costs (when depreciation term is equal to 50 years) it saves 18 thousand roubles per year compared to variant B and 172 thousand roubles compared to variant C. However, in this case the total annual savings are the biggest in variant B (69 thousand roubles compared to variant A and 1,183 thousand roubles compared to variant C.)

58. The last calculations that should be done are calculations related to the provision of the labour force for the mill. The following table show migration costs for manpower to the hypothetical location points.

Table 7.

Provision of labour force

<u>Location Points:</u>	<u>A</u>			<u>B</u>			<u>C</u>		
	<u>TOTALS</u>	<u>men</u>	<u>women</u>	<u>TOTALS</u>	<u>men</u>	<u>women</u>	<u>TOTALS</u>	<u>men</u>	<u>women</u>
Labour resources (persons)	8,000	2,200	5,800	8,000	4,000	4,000	7,000	1,000	6,000
Need to shift people from the other regions	4,000	2,000	2,000	4,000	200	3,800	5,000	3 200	1,800
Expenses for transfer of the population per person (in roubles)	100			150			200		
TOTAL (in thousand roubles)	400			600			1,000		

59. There should be a correlation between the male and female population shifted from one region to another. It would be necessary to transfer 3,600 people to point B and 1,400 women to point C to maintain a balance between male and female labour in those areas. This would create a need for additional jobs: 3,600 jobs for men in point B and 1,400 jobs for women in point C.

Additional capital investments needed would be:

for point B - 5,400 roubles; for point C - 1,400 roubles.

Expenses for mill construction are given in the following table.

Table 8

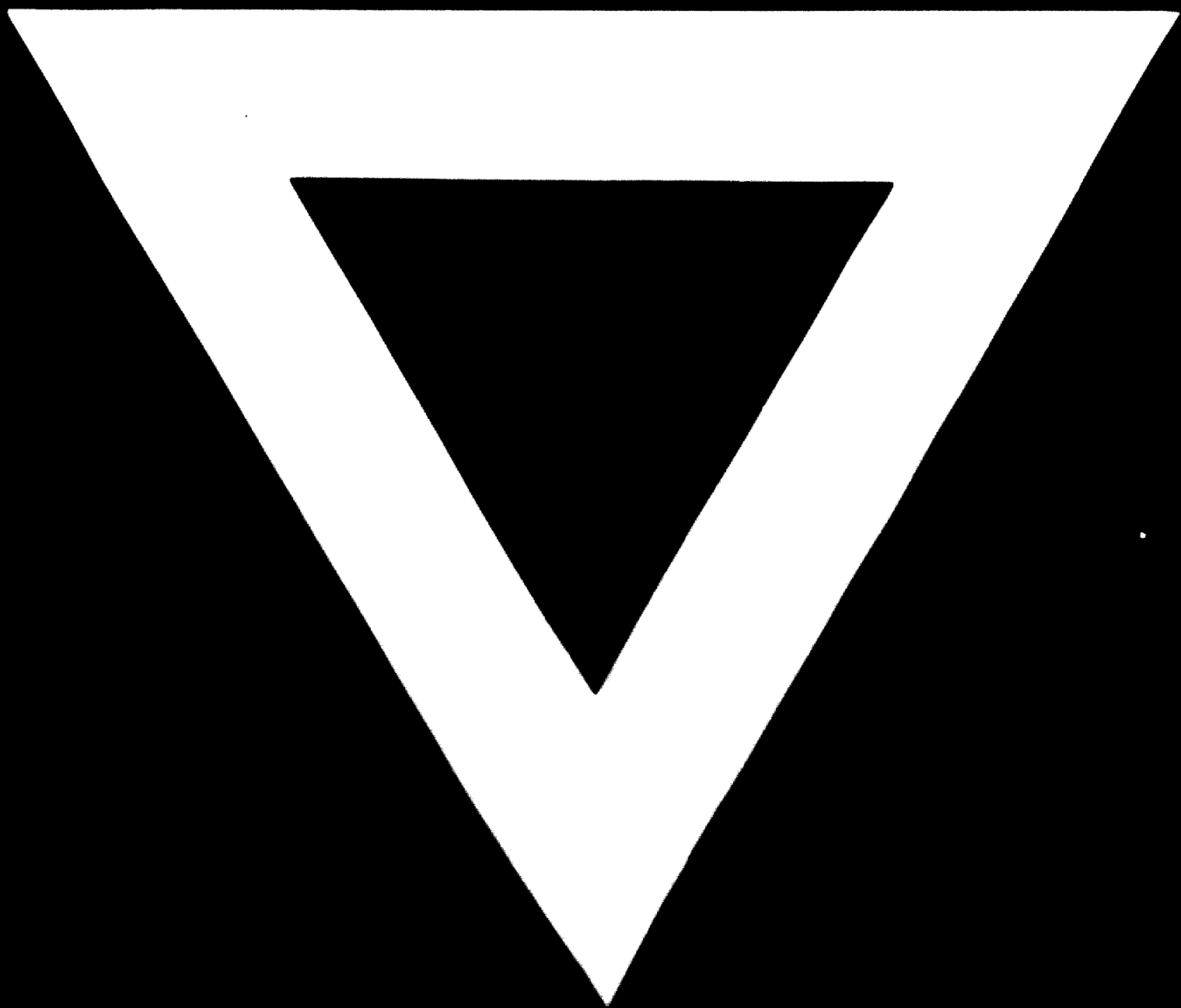
Mill construction expenses
(in thousand roubles)

	<u>Running expenses</u>	<u>Capital and initial costs</u>	<u>Reduced expenses</u>
Point A	20,199	129,102	22,781
Point B	20,106	135,613	22,818
Point C	20,940	139,736	23,735

Thus, by reduced costs in the national economy, savings in Point A would be: in comparison with point B - 37 thousand roubles; in comparison with point C - 954 thousand roubles.

60. In calculations conventional figures and hypothetical points are used. In practice the calculation process is complicated by a number of circumstances. For instance, availability in one point of reserve capacities of construction or catering industries, availability of houses or free resources could greatly reduce the capital investment needed. However, complication of the conditions of construction would affect the capital investments. Great savings are achieved if the enterprise is not isolated but is a part of an industrial centre.

61. In general, the complex method of evaluation of the industrial enterprise project from the point of view of location of productive forces is accomplished by taking into account factors affecting raw materials, fuel, power, transportation, water, manpower and services and making an economic evaluation of all changes that are inevitable in the social life of the population and the environment. The main difference from the individual method of evaluation is that extensive calculations are made both over the projected enterprise and the accompanying industries in the non-productive sphere. The need to make such an approach towards industrial location has long been recognized in all countries. For many location factors modern computer techniques are used.



29. 6. 72