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USSR Report

ECONOMIC AFFAIRS

(FOUO 2/81)

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ECONOMIC POLICY, ORGANIZATION, AND MANAGEMENT

KIPERMAN DISCUSSES INDUSTRIAL INDICATORS

Moscow VOPROSY EKONOMIKI in Russian No 11, Nov 80 pp 49-59

/Article by G. Kiperman: "The Improvement of Physical Indicators in Industry"/

/Text/ In the improvement of the economic mechanism, which is called for by the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," the bringing of the system of plan and accounting indicators in line with present requirements occupies an important place. This pertains equally to value and physical indicators, which in dialectic interrelationship make it possible to characterize the results of production according to the amount of socially necessary labor expenditures which are contained in them and are expressed in monetary form and as the amount of use values of various purposes. The efficiency of the entire system of indicators, especially those which characterize the level and dynamics of the production volume and labor productivity, depends in many ways on the composition of the physical indicators, their functions in the planning and evaluation of the activity of production units and and measurements used. This is explained by a number of circumstances.

First, physical indicators are the base, primary indicators for the formation of the entire system of indicators. It is possible to determine the volume of output in other indices -- value and labor--only on the basis of physical indicators. The price, the production cost, the labor-output ratio and other characteristics of items which are connected with the conditions of their production are determined in terms of one physical unit of output or another.

Second, the main goal of socialist production is the satisfaction of social needs. But these are first of all needs for certain types of material wealth, which have certain properties. All other needs, no matter how important in themselves, are secondary with respect to the needs for material wealth. The price, the production cost and the labor-output ratio of the production of items influence the possibility of meeting the needs, increasing or limiting them. But the needs for material wealth are themselves met by consumer properties, which are reflected in physical indicators.

The physical proportions of social production along with the labor proportions in the end determine all the main ratios in the development of the national economy: the ratio of the two subdivisions of social production, groups A and B in industry and so on.

A number of measures on increasing the role of physical indicators in planning as well as in the evaluation of the activity of production units have been implemented in recent times. In order to increase the role of physical indicators it is necessary to expand the products list and the list of assignments which are approved in the national economic plan in physical terms. With reference to machine building this measure is stipulated by the decree of the CPSU Central Committee and the USSR Council of Ministers on the improvement of the economic mechanism. The increase of the number of approved items should be accomplished first of all by the subdivision of the extremely aggregated and therefore compositionally dissimilar groups which enable suppliers to "manipulate" the composition of the output to the detriment of the consumers. With the fulfillment of the plan for the group as a whole the plans on items more easy to produce are often exceeded, while the clients need more complicated items which are notable for better consumer properties. If for the large, aggregated groups all the items belonging to them are measured according to the planned standards of the labor-output ratio, the actual average labor-output ratio for the group as a whole is considerably less than the planned labor-output ratio. This is explained not by the decrease of the labor-output ratio of items (with this method it is not taken into account), but by the increase of the proportion of relatively simple items in the total output. The expansion of the approved products list will make easier for consumers the opportunity to order the items they need, including more complicated ones.

The expansion of the products list should also proceed in the direction of the inclusion in it of items of new equipment, as well as those produced in accordance with licenses purchased abroad. In the annual plans it is also possible to approve assignments on temporarily critical items. But the opportunities to expand the approved products list are limited by two circumstances. First, each additional item of the products list complicates planning and makes the plan more unwieldy. Of course, when drafting the plan computers must be used more extensively, but even here the number of items should be the optimum. The inclusion in the plan of new items should as far as possible be accompanied by the exclusion of items, for which the need of confirmation has disappeared. Second, the development and strengthening of the direct ties of producers with clients must not and need not be replaced by the expansion of the products list, the requirements of democratic centralism in the formulation of the plan must not and need not be violated. The assignments approved in the plan should facilitate for the client ministries the establishment of efficient production ties with the supply ministries. The excessive detailing of the products list of the national economic plan is just as harmful as its excessive consolidation.

In conformity with the decree on the improvement of the economic mechanism, as was already noted, the products list of the plan for machine building is being expanded. However, in our opinion, it is expedient also to extend this practice to the planning of the production of some consumer items, especially scarce items and items produced from inexpensive materials. As is known, in light industry the specific assortment of the production program of enterprises is formulated in accordance with the orders of trade organizations. In principle such a procedure is correct, since precisely the workers of trade organizations, by meeting daily with consumers, have an opportunity to identify in good time changes in demand and to react accordingly to them. But the orders of trade far from always become the basis of the formulation of production plans. There are often instances when it is not trade that dictates to supply enterprises what must be produced, but, on the contrary, the latter

dictate to trade what must be purchased and ordered. As a result the least expensive or relatively labor-intensive items are "washed away" first of all from the production plans to the detriment of the interests of the population. Therefore it would be advisable, without changing the established system as a whole, to approve centrally and in light industry assignments on the production of individual types of goods in physical terms, primarily the scarcest items.

Contrary to the widespread opinion of its simplicity, the problem of formulating and applying physical indicators is among the most complicated in economic practice. Its complexity is dictated by the objective and therefore unavoidable contradiction between the features inherent in physical indicators and the nature of the demands made on them. Let us examine in what this contradiction is manifested concretely.

The planning and accounting of output in physical terms are carried out in units of measurement which reflect the physical properties and consumer purpose of products. But any physical unit—meter, unit, ton and so forth--makes it possible to measure only one of the many consumer properties of a product; here it is necessary to divert attention from the rest. Of course, one must try to reflect the main, key property of the item, which determines to the greatest extent its conformity to the need for the meeting of which it is intended. For example, the planning and accounting of the production of fabrics in square meters make it possible to reflect their most important property--the area on which the possibility of producing (sewing) certain items or others depends. But other properties of fabrics: the close weave, the shrinkage, the color, the wrinkle, the texture and so on are no less important for the consumer. Each property separately, but not all of them together, can be reflected by physical measurers.

Unfortunately, the underestimation in the past of the physical indices themselves and the complexity of their practical application had the result that many of them do not conform to the task of orienting producers toward the achievement of the end result--the better satisfaction of a specific social need with the minimum expenditures of living and embodied labor. However, by using this criterion alone, it is possible to determine objectively the conformity to it of each physical measurer. If the measurer is intended for reflecting one of the properties of an item, it is impossible to consider as a shortcoming the fact that it does not reflect other properties. It is a matter here not of shortcomings of the indices, but of the nature of the very object of measurement—the output, which has complex and diverse properties. Therefore the task is, having recognized the impossibility of measuring the different properties of items by means of the same unit of measurement, to seek, first, the reflection of the main, most important property for the consumer--to use those units of measurement, which characterize this property most completely; second, where this is expedient (for example, when there are two main properties or two properties approximately equivalent for the consumer), to use simultaneously two units of measurement.

Such an approach has been implemented for a long time in practice. A classical example is the measurement of the motors of turbines in items and units of power (kW). Roughly speaking, it is a matter of the use of two measurers according to the scheme: items/key technical and economic parameter (power, productivity, lifting capacity and others). At present the list of items, which are being planned and taken into account in two physical units of measurement, is being expanded

considerably. This moderates the contradiction between the quantitative and qualitative characteristics of the production of items by means of physical measurers and the limitation of these measurers themselves, but does not eliminate it; many items have not two, but more equivalent main properties; some properties for the present do not yet yield to quantitative measurement or the process of measuring them is extremely complicated and so forth. The planning and accounting of the production of the majority of types of output henceforth will be carried out by means of one physical measurer.

By characterizing some one property of the output and diverting attention from all others, the physical indicators accordingly direct the attention of enterprises to the satisfaction of a specific social need. But it is impossible to divert attention from other needs. Therefore the problem of the better and comprehensive satisfaction of social needs can be solved by means of a system of indicators and the appropriate measures. Thus, when planning and calculating the production of window glass a shift was made from tons to square meters. The correctness of this does not arouse doubts: the consumer needs precisely the area of glass and not its weight for the end result of the use of the glass is the number of glass-enclosed window frames, stairways and doorways with allowance made for their area. Planning and accounting in square meters are conducive to the reduction of the thickness of the glass and to the more efficient use of raw materials. This is good. But consumers also need thick glass. However, many of them are not receiving enough of this glass, in spite of the availability of capital allocated to them. This is easily explained: if at the end of the quarter or year the production plan in square meters is not fulfilled for some reason, the enterprises quickly reduce the output of thick glass in order to obtain more square meters of thin glass from the same amount of raw materials. As a result some of the orders for thick glass are not filled.

One measurer cannot simultaneously stimulate the output of both thick and thin glass. It was necessary to choose. The choice was correctly made. But so that the consumers of thick glass would not suffer, the responsibility of enterprises for the fulfillment of the plan according to the entire products list and the observance of obligations in accordance with contracts and orders must simultaneously be increased. Although the accounting of the fulfillment of assignments on deliveries is carried out in value form, with respect to content it is a means of monitoring the conformity of the actual composition of the output in physical terms to the composition stipulated in the plan and in the contracts concluded on its basis.

The physical unit which is used in the planning and evaluation of the activity of enterprises substantially influences the structure of production and the products list. The planning of the production of reinforced concrete pipe, for example, is carried out in cubic meters. Therefore it is unprofitable for plants to produce small-diameter pipe: the labor expenditures are relatively greater, while fewer cubic meters are obtained. According to the estimates of Giprostroymaterialy, if the need for pipe is taken to be 100 percent, pipe with a diameter of 500 mm accounts for 25 percent of the need, while pipe with a diameter of 1,200 mm accounts for 12.5 percent of the need. Only 10 percent of the total output is small-diameter pipe, while 36 percent is large-diameter pipe. The output of pipe with a diameter of 1,000 mm is 1.5-fold greater than the need, and the output of pipe with a diameter of 1,200 mm is threefold greater, while the output of pipe with a diameter of 500-700 mm is two-fifths of the need.

The output of many products of the chemical industry is planned in tons, although in a number of instances this does not direct attention to the better satisfaction of the needs. For example, polyisobutylene sheet, from which liners which are impermeable to acid and alkali agents are manufactured, is being produced for builders. The USSR Ministry of Installation and Special Construction Work has repeatedly proposed to decrease the thickness of the sheet from 2.5 to 1.5 mm, but its planning in tons is preventing this.

Frequently the replacement of some physical indicator or other by another, more correct one is drawn out for a number of years. In part this is explained by the complexity of replacing one indicator by another. Suffice it to note that in this case it is necessary to make changes in planning, standard, planning and design and statistical documents. For if items or square meters are introduced in place of a ton it is necessary, as a rule, to recalculate the rates of consumption of material resources, fuel and power (instead of the rates of consumption per ton it is necessary to establish them in terms of an item or square meter). The production capacities of enterprises should be recalculated, since without this the substantiation of the plan is impossible. The appropriate measurer should be introduced in the technical characteristics of items, for example, in the certificates of machines and equipment. The balances of production capacities should accordingly be recalculated. In many instances it will be necessary to change the cost unit as well as the unit of pricing. Moreover, changes of the units of measurement in the production plans, as a rule, give rise to the need for analogous changes in the physical balances and plans of distribution. Statistical reporting will change, although two measurers--the former one and the new one—will have to be used for a minimum of one year in order to preserve the dynamic series. Several months may be required to solve these questions. If in practice they have been worked on at times for years, this can be explained only by the inadequate persistence or lack of interest of individual ministries.

With a change in the unit of measurement the technical problems arising here should also be solved in good time. If measurement in meters is introduced in place of a unit of weight, along with the weighing service, which remains necessary, new equipment for measuring the length, thickness, area and so on should be developed and introduced, as a rule, on the production line.

Another aspect of this problem is even more complicated. The change of the unit of measurement is not an end itself, but a means of solving a specific technical and economic problem. For the measurers themselves have no influence on the development of production. Their role lies in something else: they are called upon to direct the attention of economic managers to the implementation of a system of technical and technological measures, which will ensure the solution of the posed problem.

Let us take, for example, newsprint. The weight of 1 m^2 of a sheet of newsprint in our country on the average is 51.5 g, its decrease by only 0.1 g would provide such an additional amount of paper (in area) from the same amount of wood pulp that there would be enough of it with room to spare for the annual printing of any of our central newspapers. But in countries with a high level of development of the pulp and paper industry the weight of a sheet of newsprint is only 44-46 g (per 1 m^2). The excessive thickness of the paper produced in our country is explained by a number of

causes, one of which is the planning of its production in tons. The changeover to planning in square meters would promote the reduction of the thickness and accordingly the weight of paper. However, this would be the result of changes not in the physical measurer, but in the equipment and production technology. A change of the measurer would be only a "catalyst" of the implementation of a number of technical and technological measures. The main thing is the increase of the strength of the pulp, since with a decrease of the thickness of the paper the standard of strength does not change.

The situation with cardboard, the production of which is also planned in tons, is approximately the same. The Arkhangel'sk Pulp and Paper Combine previously produced packaging cardboard, 1 m^2 of which weighed 252 g. Owing to the steps taken it was possible to decrease it to 173 g without detriment to the quality. For this it was necessary to modernize the machinery and improve the processing method. The national economy obtained an enormous impact: 800,000 tons of pulp, or 3.5 million m^3 of wood were saved, but the combine pays fines for the nonfulfillment of the plan of deliveries in tons. A change in the physical measurer being used would stimulate the improvement of the equipment and technology, without which the end result--the output of thinner, but not less strong types of paper and cardboard--would not be achieved.

However, in a number of sectors there are no technical difficulties for the introduction of new, more correct measurers which better reflect the consumer properties and technical and economic parameters of items. But even in those instances when difficulties do exist, they can on no account serve as justification for the use of indicators which do not meet present requirements.

Many of the physical indicators were introduced in practice during a period when a subordinate role belonged to the qualitative factor of the development of production. Any unit of measurement which reflects the amount of produced output regardless of its qualitative parameters conformed to its own purpose. Now the situation in the national economy has changed, but many types of products are planned and taken into account as before in measurers which are at variance with the task of the better satisfaction of needs and the increase of production efficiency.

It is possible to speak of the shortcomings of measurers only conditionally, for it is a matter of physical units which in themselves do not have shortcomings. The shortcomings lie not in the measurers themselves, but in the practice of their use. Thus, for the planning of the purchases of wood the cubic meter is a good measurer, while for reinforced concrete components it is a bad measurer, for the planning of the production of sugar the ton is a good measurer, while for machinery and equipment it is a bad one and so forth. The planning of the output of rolled products in tons is a serious shortcoming. Metallurgical plants are not interested in the production of light-weight sections, thin sheet and narrow strip, in the manufacture and deliveries to machine builders of blanks which approximate in form and weight the finished items, for the production of which they are intended. The ton, of course, reflects one of the physical properties of rolled products--the weight, but does not reflect at all its consumer properties. Practically no consumer of rolled products needs their weight as such. Completely different properties--the thickness, width, length, strength, hardness, thermal shock resistance, ductility and so on--are important for him. Therefore the customary and seemingly obvious

measurement of the output of rolled products in tons does not conform to the task of directing attention to the better satisfaction of needs.

The total output of rolled products under present conditions can be specified only in tons. But many types of them can and need to be planned in other units. For example, it is unquestionably more suitable to plan wire in running meters and not in tons. Due to the fact that the majority of types of wire are planned in tons (and only some of them are planned in meters), suppliers try to produce wire of the greater possible gauge which does not always conform to the interests of clients and the national economy and much metal is consumed in vain. Meanwhile, there are no technical obstacles to changing over to the planning of the production of all types of wire in meters. At some enterprises this has been done, but still not everywhere.

Thus, it is first of all necessary to "clear away" the assortment of rolled products which is planned in tons, having eliminated from it all the items which it is feasible to plan and take into account in other units of measurement--in running or square meters, in a number of instances in items. Unfortunately, the Ministry of Ferrous Metallurgy is not working on this problem vigorously enough.

Another possible, but still inadequately elaborated means of solving the problem is the use of conventional physical measurers. They cannot be used everywhere, but in a number of instances yield favorable results. This is confirmed by many years of experience in using such measurers as the conventional ton, the conventional (standard) tractor and others.

In the precast reinforced concrete industry the total production volume in physical terms is specified in physical cubic meters. Here an item which is complex in form and labor-consuming in production is equated to a simple item, if their volume is the same. Enterprises are interested in increasing the output of items which are the simplest to produce, but large in dimensions ("cubical"): foundation blocks, panels. As a result the physical measurer used is at variance with the requirement of the fulfillment of the plan according to the entire products list, the task of the complete supply of construction projects with all the necessary components. The production of advanced components, which are capable of performing the same functions with a smaller volume, is unprofitable, since the labor productivity (in cubic meters per worker) decreases.

The experience of the Main Administration of the Construction Materials and Structural Parts Industry attached to the Moscow City Soviet Executive Committee showed that these shortcomings can be eliminated when measuring the production of reinforced concrete components in conventional cubic meters. A panel of floors, the standard labor-output ratio of the production of which is 5.5 hours (per cubic meter), was taken as the conventional unit. Coefficients of conversion into conventional units are being established for all items depending on their standard labor-output ratio (and not the actual ratio). The more complex an item is, the higher the coefficient of conversion is. As a result the production of all items is becoming equally profitable (with respect to its influence on the total volume of output in conventional units and the indicators derived from it), labor productivity is being measured more correctly, the activity of enterprises is being characterized more objectively, the fulfillment of the plan according to the entire

products list is being facilitated, the assimilation of the production of new components, which are difficult to produce, but necessary to construction workers, is being stimulated.

In the planning of the production of rolled products the repeated attempts to use the measurer "conventional ton" did not yield favorable results. The main reason, in our opinion, is that the change of the consumer properties of the items is out of proportion with the change of their labor-output ratio. With the increase of the level of the mechanization and automation of production the labor expenditures are becoming a less and less reliable basis for the formation of conventional measurers. Obviously, a search for new approaches to the solution of the problem is necessary.

Every item has a specific functional purpose and meets some need. The more precisely the physical measurers reflect the consumer properties of the items, the better they are. This also pertains to conventional physical measurers: they should be based on the comparison of the consumer properties of items, and not their labor-output ratio. For example, the production of white pigments is planned and taken into account in conventional physical units which reflect the content of active substance--zinc oxide. Its content in many ways determines the main consumer property of white pigments. But the content of zinc in white pigments, of course, is not proportionate to the labor-output ratio of their production.

Only in those instances when it is impossible to select a measurer which directly reflects the consumer properties of items is it necessary to compare them according to labor expenditures. But this is permissible only in those instances when there are grounds to assert that a more complicated and therefore more labor-consuming item better meets a specific need. The use of conventional physical measurers which are based on the consideration of the key technical and economic parameters of items is the most effective. Such parametric measurers are being used more and more extensively in machine building: the output of machines, technological sets and lines is planned according to their productivity, that is, the amount of output which can be produced in conformity with the technical characteristics of the machinery per unit of time. The extension of the practice of using parametric measurers conforms to the task of orienting the activity of machine building ministries, associations and enterprises toward the achievement of better end results.

But the conventional physical and parametric measurers do not completely replace the physical measurers but are used along with them, supplementing and enriching the characteristic of the output being produced. The determination of the total productivity of automatic lines according to the plating of sheet steel is their main characteristic, but it does not replace the data on the number of lines, without which the coordination of production with the needs, the compilation of the plans of distribution and so forth are impossible.

Experience has shown that in a number of instances it is difficult to reject a measurer, the inexpedience of the use of which is obvious (for example, the same tons or items in individual machine building sectors). For such instances the specialists of individual ministries suggest, as they say, a no-lose version: to reject entirely the physical measurer, using instead of it (for the same products list items) the value measurer. Such a practice exists: for many types of technological equipment

the value in comparable prices is indicated in the production plan in physical terms instead of the number of units. The comparable wholesale price (and in the Ministry of Machine Building for Light and Food Industry and Household Appliances, as an experiment, the standard of the net production) conditionally performs here the role of the physical measurer. The extension of this practice suits the producing ministries, but hardly conforms to the interests of the national economy. It is easier to fulfill the plan in rubles, since the impression is created of the improvement of the fulfillment of the plan according to the products list which in reality might not be the case. With reference to the planning of the production of equipment in the July (1979) decree of the CPSU Central Committee and the USSR Council of Ministers the question of the impermissibility of the establishment of assignments in tons, of the need to change over to the planning of production in units of measurement which reflect its productivity and other economic properties, was unequivocally resolved. Indicators in tons can be used in necessary instances only as estimate indicators.

Much work on the improvement of the measurers of the output of machine building has been done by planning organs and ministries since the promulgation of the indicated decree. In many instances the changeover to the planning of production in two units of measurement according to the principle: an item or unit/key technical and economic parameter, will be a definite step forward. Where it is difficult to distinguish the key parameter (for example, machine tools, wood working and many other machine tools have several approximately equivalent parameters), the use of two units of measurement according to the principle of an item (unit)/ ruble (here the aggregate of the consumer properties should be reflected in the monetary valuation) might be advisable. Whereas until now in the national economic plan the production of wood working machine tools or casting machines was planned only in items, now it will be planned in items and by value (in millions of rubles). The output of spinning machines so far has been planned in items, which do not reflect its main parameter--the power. It is reflected in the number of spindles (or spinning places): the more spindles a machine has, the greater its power or productivity is. Therefore the decision has now been made to change over to the planning of the production of spinning machines not only in items, but also according to the total number of spindles. The new measurer better reflects the consumer properties of the machines.

But the number of spindles is still not the end result. The product obtained on the spinning machines--thread--is that. Therefore, the Ministry of Machine Building for Light and Food Industry and Household Appliances correctly considers that the number of kilograms of thread which should be obtained per hour of operation of the machine is a more accurate measurer of the productivity of a spinning machine. But it is impossible to introduce now such a unit of measurement (items/kg of thread an hour), since in the technical characteristics of the machines (in the certificates) the productivity in kilograms is missing. only the number of spindles is entered. In such instances it would be expedient to set the deadline for the introduction of the new measurer (for example, 1982 or 1983), which will direct attention toward the completion by this deadline of the necessary technical preparation. Precisely such a decision was made in a similar situation with respect to a number of types of products of the electrical equipment industry, in which much work has been done on improving the physical indicators. For example, mobile electric power stations, crane motors, AC generators, the output of which was planned in items (in spite of

the substantial differences in power), now will be planned in items and thousands of kW; insulating materials were planned in running meters, but now will be planned in square meters; zinc batteries, the output of which until now was planned according to the weight of the zinc, now will also be planned in millions of ampere-hours. The new unit of measurement reflects the consumer properties of the batteries.

Work is also being done in this direction in other sectors. In the chemical industry, for example, the production of mineral fertilizers was planned in conventional units, that is, in terms of the content of nutrients: for nitrogen fertilizers--20.5 percent nitrogen, for potassium fertilizers—41.6 percent potassium oxide and so on. Starting in 1981 the assignments will be set in terms of 100 percent content of nutrients. At the same time the growth rate may be less, but it will reflect the real situation more accurately. Thus, the production of mineral fertilizers in the USSR in 1977-1978 was characterized by the following data (in millions of tons):

	1977	1978	Growth rate (percent)
In conventional units.	96752	97976	101.2
In terms of 100 percent nutrients.	23493	23653	100.6

The production of chemical fibers and filaments until recently was planned in tons. This adversely affected the production of thin fibers and filaments, which are more complicated and labor-consuming to produce, but meet the requirements of textile workers. Now the situation has changed: the production of chemical fibers and filaments will be planned in ton-counts (the thinner the filament is, the higher the count is).

The introduction in the practice of planning of production not of individual machines, but of sets and systems of them, of complete production lines, installations and units, which include equipment and devices which make it possible to obtain the final product of the given technological processes, is expedient for many sectors of machine building. This fully accords with the task of orienting the activity of machine building ministries and industrial associations toward the end results, that is, toward the better satisfaction of the needs of clients, who need not incomplete machines, but sets of them which ensure the complete mechanization or automation of the corresponding technological process. Here the dissemination of the practice of deliveries in complete sets according to the experience of the Ministry of Chemical and Petroleum Machine Building was supplemented by the organization of planning, which was appropriate in content. Some experience of planning the production of machines and sets of technological equipment has been gained in the Ministry of Tractor and Agricultural Machine Building and the Ministry of Machine Building for Animal Husbandry and Fodder Production. In the procedural instructions for the drafting of state plans of economic and social development it is established that the creation of technically improved systems of machines, sets and lines, which make it possible to mechanize completely a specific technological cycle and production process, should be stipulated in the plans on the development of the sectors of machine building.

However, the planning of systems of machines and sets so far has not become widespread. It is expedient to establish centrally a list of systems of machines and sets for which assignments on planning production and customer deliveries should be established in the national economic plan. At the same time it is necessary to determine or revise the composition of the sets: at present means of the mechanization and automation of the processes of loading the production lines, of "unloading" and packing the final product, monitoring, measuring and control instruments and so forth are often not included in them. Indeed, the composition of complete production lines as the need arises can be refined upon agreement between the manufacturers and the customers, but in practice the producers determine it. As a result the fulfillment of the plan of deliveries in complete sets is facilitated, but the operation of the sets becomes complicated for the customers. Apparently, the composition of each system of machines or set should be determined by USSR Gosplan or USSR Gossnab on the suggestion of the customer. The price of the set should not be formed mechanically from the prices of the machines and instruments belonging to it, but should take into account the parameters and efficiency of the set as a whole; as in all similar cases, priority should belong to the whole, and not to its parts. The price should change with a change in the parameters of the set as a whole and not of its individual components.

The discrepancy between the ability of the physical measurer to reflect only one of the properties of an item and the true multiplicity of them is irresolvable. Apparently, in spite of the steps now being taken, it will not be possible to reject entirely the use of measurers which are far from the optimum, but it is possible and necessary to reduce to a minimum the negative consequences connected with this. It is necessary to establish that when the enterprise fills all the orders of customers according to contracts and orders, the plan is considered fulfilled both in physical and monetary terms, regardless of the actual volume of output in one physical measurement or another.

When increasing the role of physical indicators and expanding the area of their application, not only the advantages, but also the shortcomings which are connected with this must be taken into account. Thus, the dynamics of physical indicators do not always correspond to the dynamics of the labor expenditures, especially in machine building. A correspondence is observed here only when production cooperation is absent or stable. Only on this condition is it possible on the basis of the dynamics of the physical indicators to characterize correctly the results of the activity of enterprises. In other cases which are encountered quite often in practice, the physical indicators, contrary to the generally accepted opinion of their unconditional "objectivity," are just as unsuitable for the comparison of the results of the activity of one enterprise in adjacent periods or of similar enterprises during different periods as the gross or commodity production. If, for example, one plant produces refrigerators which are fitted with compressors of its own production, while another receives them from outside, with the equal output of refrigerators of the same type the amounts of work performed by the enterprises will be different. In such cases the contribution of the collective of each plant to the production of an equal number of refrigerators can be measured by means of a value indicator--the net production.

It is necessary to emphasize with all certainty that the increase of the role of physical indicators on no account should be achieved by the decrease of the role of

value indicators. It is impossible to consider the interrelationship of physical and value indicators to be like connecting vessels when an increase of the level in one of them is accompanied by its decrease in the other. It is a matter of a system of indicators, in which an unjustified decrease of the role of any indicator adversely affects the effectiveness of the use of the entire system of them. Increasing the role of physical indicators and bringing them into line with the objective requirements of the development of production and consumption is aimed at increasing the effectiveness of the entire system of indicators, including value indicators. Having rid some value indicators, such as the gross, commodity and sold production, of the "performance" of individual functions not characteristic of them, we thereby eliminate the shortcomings connected with this and increase the positive influence of the use of the indicated indices on the development and improvement of production.

Many measures on the improvement of physical indicators are aimed at the increase of production efficiency, first of all the reduction of the materials-output ratio. The effectiveness of these measures would be greater if the influence of wholesale prices shows up in the same direction. Our plants for example, produce a black mastic (by adding graphite) which is used in laying parquet. Builders have been demanding for many years now the organization of the production of light mastic, but then in place of graphite it would be necessary to add ground natural quartz, which is several times less expensive. The manufacturing enterprises are afraid of a decrease of the cost of mastic. It is possible to cite many such examples. The decree on the improvement of the economic mechanism solves this problem--the former amount of profit will be retained in the new prices, until the end of the five-year plan the former wholesale prices will be used for determining the production volumes and labor productivity. It is necessary to utilize more actively and promote more extensively the opportunities afforded by the decree to stimulate a decrease of the materials-output ratio.

It is impossible not to raise another question relating to the problem being examined. It is a matter of introducing the international system of SI units in the practice of using physical measurers. It was prepared and recommended for use 20 years ago (in 1961). However, so far such obsolete units of measurement as quintals (instead of tons), calories (instead of joules), horsepower (instead of kW) and so forth are used extensively in economic practice, in economic and even educational literature. It is necessary to establish that in economic literature, especially reference publications and textbooks, only those units which are contained in the international system should be used.

The first, but very important steps have been taken in the matter of improving the physical indicators. The main thing now is for this work to be performed systematically. The dynamics of social production, the change in the conditions of its development and the expansion of the products list and the product assortment require the constant improvement of the physical indicators and the assurance of their conformity to the tasks of increasing production efficiency and work quality.

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PLANNING AND PLAN IMPLEMENTATION

PLAN INDICATORS, END NATIONAL ECONOMIC RESULTS

Moscow VOPROSY EKONOMIKI in Russian No 11, Nov 80 pp 138-140

/Review by L. Abalkin of the book "Konechnyye narodnokhozyaystvennyye rezul'taty i planovyye pokazateli proizvodstva" (The End National Economic Results and the Plan Indicators of Production) by Yu. S. Muntyan and G. Ya. Kiperman, Izdatel'stvo "Ekonomika", 1979, 136 pages/

/Text/ The further intensification of the process of reproduction and the practical implementation of measures which are aimed at the improvement of the economic mechanism and the strenghtening of its influence on production efficiency naturally increase the interest in the problem of the end national economic results.

The book being reviewed does not aspire to a political economic analysis of the problem. The authors define their goal more narrowly and specifically--on the basis of the generalization of the experience of planning work to examine the ways of improving the system of indicators of planning with allowance made for its orientation toward the end national economy results.

The goals of the development of production and its socio-economic features, it is stated in the monograph, find expression in the end results. With reference to production activity the orientation toward the end results means the best satisfaction of social needs with the minimum expenditures, while with reference to the nonproductive sphere it means the best satisfaction of the needs of society for all types of services with the most efficient use of resources (p 90).

In light of the decisions of the 25th party congress Yu. Muntyan and G. Kiperman examine the main directions of the improvement of planning at the present stage and the means of combining the physical and value indicators of production. Special attention is devoted to the analysis of the content and composition of the final national product, as well as the final product of ministries, industrial associations and enterprises.

When examining the practice of planning the authors identify a number of unsolved problems and difficulties which check the use of effective tools of the management of social production. The great potentials which the drafting of an intersectorial balance offers are well known. But, as is noted in the book, the ministries in their practical activity are not guided by the recommendations which ensue from such elaborations. The intersectorial balance is compiled with a breakdown by so-called

pure sectors, which does not correspond to the organizational structure of industry. Therefore its indicators are unaddressed (p 24).

An unusual, but quite typical situation arises: science developed a very effective tool of economic analysis and management (in this case the intersectorial balance), but it is being put to negligible use. The reason consists, apparently, in the following. The path from theory to practice includes a large number of intermediate links, which correspond to the general movement from the abstract to the specific. The inattention to these links and the absence of a kind of bridge, which unites theoretical assumptions with the practice of planned management, significantly restrain the process of improving the economic mechanism.

The negative results of the practice, in the case of which the assignments on the output of products are set by some organs, while the balance and the plan of distribution are set by others, are shown in the book (p 51). Other factors, which cause disturbances of the balance of the plan and disproportions in the national economy, are also identified (pp 22-23, 77 and elsewhere).

Among the assumptions stated in the book we would like to direct the attention of the readers to several fundamentally important assumptions which are aimed at improving the methodology and organization of planning.

The authors consistently show the role and merits of the standard method in planning. They see its main advantage in the fact that it makes it possible to establish the dependence between the amount of resources, in the increase of which enterprises, associations and ministries are interested, and the indicators which characterize the end results of production, in the improvement of which the national economy as a whole is interested (p 29). The planning calculations of the quantitative and qualitative indicators of production at all levels when using norms and standards are significantly simplified and, what is the main thing, here the making of technically and economically sound decisions is ensured (p 40). The question of using the standard method in economic stimulation is examined in detail.

The assurance of the stability of the plans is one of the main directions of the further improvement of planning and the increase of its mobilizing force. The negative consequences of its frequent and not always sound adjustments are well known. The solution of this problem requires an entire system of measures, among which the creation of a planned reserve, which is optimal in composition and amounts, first of all reserves of material resources and production capacities, plays an important role.

In this connection the need to improve the methods of calculating the material reserves is substantiated. As to the reserves of production capacities, their lack complicates the satisfaction of the needs which arise during the planning period, and to a certain extent hinders the work on the development of new items, the introduction of advanced technology and the organization of new works (p 15).

Much space in the book of Yu. Muntyan and G. Kiperman is devoted to the analysis of the indicators of planning and the means of improving them. The merits of the indicator of the standard net production and the experience of its practical application in industry are examined in detail. However, the authors are not inclined to

absolutize the importance of this indicator. Their fundamental position on this question is both scientifically and practically sound. The real opportunities of influence of any indicator on the development of production, it is stated in the monograph, are limited, since the indicators act not in isolation, but in a system of approved indicators of the plan, in which each of them complements the others and itself experiences their influence. Therefore the effect of any indicator should be examined in interrelationship with the assignments of the state plan (p 73).

We have the right to expect from the authors, who have made it their goal to analyze the expression of the end national economic results in the plan indicators, an exhaustive answer to this question. However, unfortunately, this expectation is not fully justified. The main attention in the work is directed to the measurement and evaluation of the final product of the corresponding links--from the national economy to the enterprise. This is an important question, but it forms only one of the aspects of the multilevel problem of end results.

The correct underlying thesis that the end results characterize the degree of satisfaction of needs with the minimum expenditures, is not developed consistently enough in the book. This finds expression in the fact that the problem of efficiency was relegated to the background in the book. It is correctly emphasized in it that the plans of the output of products in physical terms do not lend themselves to optimization (p 35), that the efficiency of social production can be evaluated only by means of value indicators (p 37). The maintenance of progressive dynamic proportions and stable high rates, and not the achievement of great efficiency, is declared to be the most important task of the plan of the output of products in value terms (pp 54-55). From the standpoint of the end results high rates in themselves, especially with respect to the gross volume indicators, still do not attest to an increase of production efficiency.

In a number of instances the authors approach uncritically the evaluation of the role of volume indicators. They consider it necessary, for example, to use the indicator of commodity production for characterizing the results of the aggregate labor in sectors, as well as in the entire sphere of physical production (p 65). As to enterprises (production associations), the commodity and sold production are ostensibly their final product (p 133). At the same time Yu. Muntyan and G. Kiperman write that the evaluation of the work of enterprises according to the sold production and of ministries according to the commodity production does not lead to the violation of the unity of the system of indicators (p 126).

In our opinion, it is impossible to agree with these conclusions. The magnitude of the value of the consumed means of production which is included in the commodity and sold production can in no way be considered the result, especially the end result, of the work of enterprises, associations and ministries. This magnitude, like the volume of the output of commodity (sold) production as a whole, is directly dependent on the consumed material resources and inversely proportional to the efficiency of their use. If the efficiency is included in the evaluation of the end results of economic activity, the mentioned indicators are not suitable for this purpose.

In the work it is correctly claimed that "frequently the most effective solution of production problems can be achieved not only with fewer expenditures, but also with smaller volumes of commodity and sold production" (p 116). It is difficult to argue against this. But if this is so, how is it possible to consider the mentioned indicators to be an expression of the end results?

It should be noted that the question of the end results of the activity of the primary unit of the national economy (enterprises, the production association) was the most poorly elaborated in the book. Only two and a half pages are devoted to this fundamental question. Here the problems of the profit, the means of its "clearing," the profitability and others are not even mentioned. In many respects this is connected with the fact that the question of the end results was replaced by the question of the final product.

At the same time on a number of questions of the final product the authors state very interesting opinions. It is possible to agree with the main methodological principle, in conformity with which for each production unit the product intended for consumption outside the sphere of its production activity is the final product (p 114). This principle is successfully applied to the choice of indicators for ministries and industrial associations. The authors proceed on the basis that the ministry is not a simple sum of the enterprises which are united only by a common management, but an economic system which gradually develops into a sectorial economic production complex (p 116). A similar characterization is given in the work to industrial associations.

In conformity with this the indicators applied in planning, the use of which is based on the notion of the ministry and the industrial association as a simple sum of enterprises, are critically analyzed (pp 123, 128). A number of indicators which reflect the end results of the activity of large economic production complexes are proposed in the work. Special attention is devoted here to the assignments on deliveries of products to consumers. The interests of consumers, the authors indicate, in most instances coincide with the interests of the national economy (p 74).

The suggestions of the authors on the sharp increase of the role of deliveries and the tightening up of contractual discipline merit attention. In the work, in particular, it is proposed to conclude contracts between the consumers and producers of products on the basis of the draft of the plan prior to its approval (p 86), which will make it possible to eliminate a number of conflicts which occur at present. The need to assign to ministries the monitoring of the fulfillment of the plan of deliveries of products according to contracts and orders and to make them responsible for the fulfillment of obligations by subordinate enterprises is substantiated (p 21).

In spite of the questionability of a number of assumptions contained in the work, the book does stimulate a search for more effective planning decisions. This is especially important in connection with the need to complete in the next few years the adoption in practice of the measures outlined by the party on the improvement of the economic mechanism. Acqutaintance with the book will be useful to both scientists and experienced workers.

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INDUSTRIAL DEVELOPMENT AND PERFORMANCE

IMPROVED EFFICIENCY OF EXPERIMENTAL PRODUCTION ADVOCATED

Moscow VOPROSY EKONOMIKI in Russian No 11, Nov 80 pp 69-75

/Article by E. Torf (Leningrad): "The Increase of the Economic Efficiency of Pilot Works"/

/Text/ The increase of the need of social production for efficient innovations is creating the need for the accelerated development of the experimental base of scientific and technical organizations and industrial enterprises for the purpose of expediting the changeover from the information results of scientific research to their use in production in the shortest time. Here the role of pilot works both as the performers of experimental operations, without which the updating of production on the basis of the achievements of science and technology cannot take place, and as the producers of small series of products, the experimental check of which has been completed but the series production of which has not begun, is increasing. Both functions of pilot production are equally important, therefore, when designing and planning the latter, it is necessary to substantiate economically the possibility of their performance with allowance made for the reflection of its specific nature both in the methods and indicators and in the standard base of planning.

Pilot production is distinguished from series production first of all by the nature of the output. The output of pilot production is the information on a possible innovation in production, which is materialized as test models. In addition to the technical and economic documents the test model (batch) of output is a development ready for use, that is, the "output" from the sphere of preproduction and at the same time the "input" in the production sphere as such. The specific nature of the output of pilot production and its dual nature govern a number of features of its functioning as compared with series-producing enterprises: the considerable degree of uncertainty of the production process and its result, the accelerated updating of both the output and the production equipment itself.

The efficiency of any works, including a pilot works, to a considerable extent depends on the extent to which the goals facing the works and effective means of their quickest possible achievement are reflected in the system of planning and its standard base. The analysis of the state and utilization of pilot works for identifying the reserves for increasing their economic efficiency and creating a standard base of planning is complicated by the fact that the proper accounting and statistical reporting are lacking. Moreover, the features of the economics of this type of production have been inadequately studied.

In the existing system of planning of pilot works, including those sectors in which planning according to supply orders is in effect, the goal orientation of the pilot works toward the preparation of the introduction of innovations in production is inadequately taken into account. Moreover, the supply orders do not always contain precise information on the period and amounts of experimental operations, which complicates the long-range planning of pilot works, while their managers, by not having a clear idea about the possible change of the products list, are in no hurry to transfer the output of small series of a new product to industrial enterprises.

The weakness of the standard base for the determination of rational amounts of experimental operations, their correlations with the amounts of the corresponding research and development, as well as with the volumes of small-series output in essence leads to the disregard of the specific nature of pilot works. Standards of the profit, the profitability and the expenditures per ruble of commodity production are used for them.[1] The system of the evaluation and stimulation of pilot enterprises, which is based on these standards, interests them in series production, but not the output of experimental models with the corresponding tests.

The tendency for the proportion of the output of small series of new products to increase has emerged at pilot works as a whole. Thus, the load ratio of the pilot enterprises of the sectorial scientific research institutes and design bureaus of machine building and instrument making with operations not related to the nature of their activity is 30-40 percent, the series output is 14-17 percent.[2] According to our calculations, the proportion of small series in the total amount of operations of pilot enterprises in the chemical industry increases on the average by 7 percent a year, while the proportion of experimental operations according to the themes of scientific institutions decreases on the average by 4 percent a year.

The expenditures on experimental operations are planned at the levels of the individual development, the scientific and technical organization with an experimental base and the sector (subsector). The tasks facing the pilot works at these levels are different. At the level of the development the pilot works provides the innovation being assimilated in industrial production with the necessary and adequate information, which is obtained during the experimental operations. At the level of the organization the task is to make an experimental check of all the scientific research or design themes as the need arises with allowance made for the demands made on the experimental check of the individual development. At the level of the sector the pilot works should ensure the process of the effective updating of production, having performed the required amount of experimental operations with allowance made for the time lag between the latter and the stage of the assimilation of innovations.

The difference in the tasks facing pilot works at the different levels of management should be reflected in the system of their planning, particularly the system of planning standards, the use of which will make it possible to increase the economic effectiveness of the expenditures on pilot works. At the level of the sector we made an attempt to determine the standard of the planning of such expenditures.

The coefficients of correlation between the expenditures on pilot works and the volume of new output, which was assimilated in the sector, were calculated for two data arrays: for 9 machine building ministries of the USSR and for 16 enterprises

of the Estonian SSR Ministry of Light Industry, in order to establish the relationship between the expenditures on pilot works and the volume of the new output being assimilated in the sector. The choice of the research objects was dictated by the availability of statistical reporting on the volume of output of new products. Due to the lack of the corresponding cumulative statistical information the expenditures on pilot works were determined by estimate. The coefficients of correlation in both instances were greater than 0.6, which attests to the existence of a relation between the expenditures on pilot works and the updating of the output. The highest coefficients of correlation in machine building were noted during the second and third year after the investments in pilot works, in light industry they were noted during the first year. The assumption that there is a lag between the expenditures on pilot works and the updating of the output, which is equal to two to three years for machine building and one to two years for light industry, was drawn on this basis. This is also confirmed by the data available in the literature.[3]

The adequately high coefficients of correlation and the existence of a steady lag made it possible to use a regression equation for calculating the expenditures on pilot works (y) with a given volume of updated output (x). The following equation with a lag of three years, which provides an accuracy equal to 30 percent, was obtained for machine building: $y = 0.03x + 14.6$. The use of such an equation would enable sectorial ministries and all-union industrial associations to plan the expenditures on pilot works subject to the need of the sector for innovations, which will be the most important prerequisite of the increase of the effectiveness of these expenditures. Unfortunately, the performance of a similar study for other sectors of industry, in which updating mainly concerns the processing method, at present is impossible, since the appropriate statistical information is lacking.

In the future, in our opinion, it is advisable to analyze the relation between the expenditures on pilot works and the level of the updating of the output in two directions. First, it is necessary to continue the study of the dependence of the expenditures on pilot works both on the volume of new output and on the indicators which characterize the updating of the processing method and the equipment. The improvement of accounting and statistical reporting is important here. Second, the criteria of rationality of the found equation should be determined, which is a necessary condition of its use as a standard equation. When performing the first stage of the study it was presumed that the actual updating of the output is efficient. However, this does not always correspond to reality. Therefore, at the subsequent stages of the study it is necessary to establish the dependence of the expenditures on pilot works not simply on the updating of production, but also on its economically feasible volume, which provides an increase of the efficiency of social production. This can serve as the standard base for the planning of pilot works at the level of the sector.

The standard base for the planning of pilot works at lower levels requires greater elaboration and accordingly more complicated calculations. The proposals on this question which exist in the literature pertain primarily to the elaboration of empirical-statistical weighted average standards of the labor-output ratio and the monetary expenditures on experimental operations in individual sectors of industry.[4] However, the weighted average standards are based on past experience and do not stimulate the development of a new, improved production process, that is, they cannot in principle reflect the specific nature of pilot production. This

shortcoming of weighted average standards can be eliminated by means of limit standards, that is, those values of standardized indicators, above or below which the performance of a specific operation becomes economically inadvisable. Therefore, the limit standard of the expenditures on experimental operations can be established, having set the impact from the use of their results in production equal to zero.

The expenditures on experimental operations are economically effective until they are repaid by means of the acceleration and the reduction of the cost of the process of assimilating scientific and technical achievements in production. Here research or development cannot replace experimental work, which is aimed at giving scientific results the form of physical components of production. The impact of the acceleration of the assimilation of innovations to a considerable extent depends on the thorough experimental check of the results of research and development. The acceleration of the assimilation of innovations makes it possible to obtain the economic impact by reducing its losses with the "freezing" of capital investments during the period of assimilation. The amount of this impact can be calculated by the method previously proposed by us.[5]

The economic effectiveness of experimental operations largely depends on the technical level of the equipment for the production, testing and adjustment of the experimental models (batches) of products, for the recording of the parameters of the experimental equipment and the technological processes. This is conducive to the receipt of more complete and reliable information on an innovation and, consequently, the increase of its quality and the acceleration of its assimilation in production.

The great effectiveness of experimental operations is also governed by a number of economic and organizational factors. The changeover from research and development to experimental operations, and then to the assimilation of the innovation in series production should be uninterrupted. Here at each stage a sufficient amount of work should be done to obtain reliable information on the product or processing method being developed.

The necessary amount of experimental operations makes it possible to obtain the minimum information which ensures the assimilation of an innovation in production. That amount of experimental operations, the increase of which does not make it possible to improve significantly the technical and economic indicators of an innovation, is the adequate amount. Thus, the necessary amount of experimental operations is determined by the technical and technological demands on an innovation, while the adequate amount is determined by the economic limitations. The output of small series of products at pilot works can be efficient only on the condition of the provision of the necessary and adequate amount and the reliability of the results of experimental operations.

In connection with the fact that pilot production performs two functions which differ in economic nature, planning should be carried out in both directions separately. One should begin with the planning of the experimental operations, then the plan of the output of small series of products is compiled. Such a procedure of planning conforms to the specific nature of pilot works, which are intended first of all for the performance of experimental operations, the planning of which begins

with the determination of their theme. The assignment of the scientific and technical organization serving the pilot works is the basis of this part of the plan. Further the equipment workload with respect to time, the labor-output ratio, the material and monetary expenditures on the assigned themes are calculated. The obtained amount of expenditures should not be more than the maximum amount, which depends on the economic effectiveness of the operations. For the pilot works as a whole it is necessary to ensure the continuity of the changeover from research and development to experimental operations, so that a "line" of themes, which were completed at the preceding stage, but have not been accepted for experimental checking, would not form.

The planning of the output of small series of products begins with the determination of the capacities of the pilot works which are free from the performance of experimental operations. In practice this comes down to the establishment of a fund of operating time of the equipment, which without detriment to the experimental operations can be used for the output of small series of products. With the observance of the indicated conditions the output of small series of new products at pilot works makes it possible to assimilate new production more successfully, to study better the "behavior" of a new product at the user's, to attract new users, to work out the production technology and to expedite the satisfaction, if only in part, of a new social need.

The pilot works is kept busy with the output of small series of previously assimilated products in connection with the fact that industry is not always ready to accept a completed development for immediate assimilation (the appropriate production capacities are lacking, the designing, construction and assimilation of new works are being delayed and so on). At times the need for a new product is limited, which makes it possible to satisfy it completely by means of the production capacities of the experimental base and makes series production inadvisable. The equalization of the workload of the equipment and personnel of pilot works in time as a result of the irregularity of the arrival at the pilot works of completed research or development is often required. All these factors should be taken into account when planning the output of small series of products at pilot works.

The choice of an economically effective assortment of small series of products which are produced at pilot works, like the determination of the limit of the expenditures on experimental operations, is made at the level of the planning of individual types of products. In those instances when the assimilation of an innovation involves the construction of a new works, the date of the start of the output of the new product is postponed at least by the standard duration of the designing, construction and assimilation of this works. Therefore, the output of small series of new products at a pilot works makes it possible to obtain at the user's a lump-sum economic impact.

The output of small series of products in pilot production requires greater expenditures than in series production in connection with its small capacity and the imperfection of the processing method. If the increase of the cost of the products in the case of production at a pilot works is greater than the lump-sum economic impact for the user, for the national economy this product is economically inefficient. The limit of the increase of the cost of the output of small series of products in pilot production as compared with series production is the equality

of this increase of cost to the lump-sum economic impact from the use of this product in the national economy, which was obtained during the period from the completion of the experimental operations to the assimilation of its series output.

The output of a product with a narrow purpose, the need for which can be met completely by means of the idle capacity of the pilot works without detriment to the quality of the experimental operations, is a special case of the production of small series of products at a pilot works. Here the production capacity of the pilot works should be equal to the capacity of the industrial works which it would be necessary to build in the absence of the pilot works. The greater efficiency of series production as compared with pilot production, as a rule, is connected with the increase of the production capacity and the stability of the production process. However, in the special case in question the capacity does not increase, the production process has already been worked out and stabilized. Consequently, there are no grounds to assume that the cost of producing the new product at a newly built small-series works will be less than at a pilot works. Moreover, the building of a new industrial works requires additional capital investments, but the pilot works was built previously and a portion of the capital investments in it have already been amortized during the experimental operations. These arguments lead to the conclusion that in the special case of the equality of the capacities series and pilot production in the output of small series of products can be equally efficient. Works of precisely this type form the production portion of scientific production associations.

The analysis of the effectiveness of the output of small series of products at one of the pilot plants showed that a narrowly specialized product, the need for which is completely met, is basically effective, while the partial meeting of the need up to the assimilation of series production in most instances is economically inadvisable. Consequently, the main condition of the effectiveness of the output of small series of products at a pilot works is the timely transfer of ready developments to series production, as well as the maintenance of a rational ratio of the amounts of experimental operations and the output of small series of products, in case of which a reserve of time is retained for the performance of rush and unforeseen experimental operations.

A method of determining the value of this ratio is suggested in economic literature. According to the calculations of some authors,[6] the indicators of a pilot works differ substantially from the indicators of a similar series-producing enterprise when the proportion of experimental operations is at the level of 45-50 percent of the total production volume. On this basis it is possible to recommend the value 1 : 1 as the lower limit of the ratio of the amounts of experimental operations and the output of small series of products. This means that if the amount of experimental operations is less than 50 percent of the production volume, this enterprise cannot be called a pilot enterprise. Of course, depending on the specific nature of the sectors of industry this value can vary quite significantly. However, this approach to its determination, in our opinion, reflects the specific nature of the pilot works and can be used for practical purposes.

When determining the expenditures on experimental operations at the level of the scientific and technical organization on the whole it is necessary to take into account that the stages of the "research--production" cycle are irreplaceable. The

irreplaceability of the stages is responsible for the fixed amount of operations on each of them, the performance of which is a condition of the further continuation of the process. The premature transfer of a development to series production means only that the experimental operations will be performed during the industrial assimilation of the innovation.

The expenditures on experimental operations at the level of the scientific and technical organization to a considerable extent depend on the amount, complexity and novelty of the research and development which are being performed by this organization and require experimental checking. Therefore the standard of the expenditures on experimental operations at the level of the organization can be specified as the ratio of the amounts of research or development, which require experimental checking, and the amounts of experimental operations. The criterion of the rationality of this ratio is the minimization of the interval between the completion of the research or development and the beginning of the experimental operations, which will make it possible to minimize the "line" of completed themes awaiting experimental checking. The ratio of the expenditures on research or development and experimental operations, in case of which the interval has been completely eliminated, is the upper limit of the expenditures on experimental operations at the level of the scientific and technical organization.

Thus, the system of planning of pilot works, which is aimed at increasing their economic efficiency, should first of all be based on the use of specific standards. The elaboration of such standards should be carried out with allowance made for the tasks facing the corresponding organs of management. A possible classification of the standards is cited in the following table /see the following page/.

The acceleration of scientific and technical progress is the most important condition of the increase of the efficiency of social production. The need when drafting the plans of USSR economic and social development to ensure the acceleration of the implementation of scientific and technical discoveries and developments, which are aimed at increasing the growth rate of the productivity of national labor and product quality, is indicated in the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality." For this the ultimate goals, the technical and economic results, the periods and stages of the performance of operations--from scientific research to practical implementation, including the organization of the series production of new products and the introduction of advanced technology--will be stipulated in the programs on solving the most important scientific and technical problems.

The proposed procedure of planning of pilot works is aimed at the shortening of the intervals in the process of the scientific and technical preparation of the assimilation of innovations in production, the acceleration of the performance of experimental operations, the increase of the level of economic analysis at pilot works and the elaboration of the appropriate standard base. In our opinion, this will promote an increase of the efficiency of pilot works.

Management organ	Level of management	Indicator being planned	Standard base for planning
Sectorial ministry	Sector (subsector)	Expenditures on pilot works	Standard equation, which links the economically efficient amount of the updating of production with the expenditures on experimental operations
Scientific and technical organization	Scientific and technical organization with experimental base	Expenditures on experimental operations	Limit amount of expenditures on experimental operations with the continuous changeover from research or development to experimental operations
		Expenditures on output of small series of products	Limit ratio of the amount of experimental operations and the output of small series of products, which equals 1 : 1
Scientific and technical organization	Individual developments or types of products	Expenditures on experimental operations	Limit of expenditures on experimental operations depending on the economic effectiveness
		Expenditures on output of small series of products	Limit of the increase of the cost of small series of products depending on the lump-sum impact obtained at a works

FOOTNOTES

1. See "Sovershenstvovaniye planirovaniya i ekonomicheskogo stimulirovaniya nauchno-tekhnicheskogo progressa" /Improvement of the Planning and Economic Stimulation of Scientific and Technical Progress/, Izdatel'stvo Moskovskogo universiteta, 1977, p 66.

2. See M. L. Bashin, "Novaya tekhnika i opytnyye predpriyatiya" /New Equipment and Pilot Enterprises/, Izdatel'stvo "Mashinostroyeniye", 1979, p 34.

3. See L. Rozhneva, "Pricing for the Products of Applied Research and Development" (VOPROSY EKONOMIKI, No 3, 1977, p 120).

4. See, for example, V. K. Bekleshov, P. N. Zavlin, "Normirovaniye truda v NII i KB" /The Norm Setting of Labor at Scientific Research Institutes and Design Bureaus/, Izdatel'stvo "Ekonomika", 1973; A. A. Zvyagin, "Normirovaniye inzhenernykh rabot" /The Norm Setting of Engineering Operations/, Izdatel'stvo "Ekonomika", 1975.

5. See E. M. Torf, "Ekonomika i organizatsiya opytnykh proizvodstv" /The Economics and Organization of Pilot Works/, Izdatel'stvo "Ekonomika", 1975, pp 72-76.

6. See V. A. Shakin, G. P. Grishina, "Features of the Economics of Pilot Plants" ("Upravleniye, ekonomika i organizatsiya opytnogo proizvodstva" /The Management, Economics and Organization of a Pilot Works/, seminar materials, Moscow, 1977, pp 108-114).

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REGIONAL DEVELOPMENT

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REPUBLIC ACADEMIES, REGIONAL PLANNERS COORDINATE WORK

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/Report by Academician N. N. Nekrasov at the 37th Session of the Coordinating Council of the USSR Academy of Sciences: "The Elaboration of the Scientific Problems of Combining the Sectorial and Territorial Planning of the National Economy and the Tasks of the Academies of Sciences of the Union Republics"/

/Text/ The great efficiency of the economy of the country depends not only on the increase and improvement of production, but also on its efficient territorial organization. Enormous reserves for the further economic development of the Soviet Union and each union republic individually are incorporated in the correct, scientifically sound combination of the sectorial and territorial approaches to the solution of major national economic problems. In the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" much attention is devoted to the improvement of sectorial and territorial planning and to their fundamental unity.

The scientific problems which are directly connected with the solution of practical tasks in this area are very diverse and embrace many sections of science. At present it is possible to distinguish here the five most important problems, the elaboration of which is of fundamental importance for the further development of the sectors of physical production, and especially regional economic complexes. We have in mind the regional problems of scientific and technical progress, the problems of the comprehensive use of natural resources for the country as a whole and by individual regions, the problems of the efficient distribution of productive forces in the union republics and economic regions, the creation of a scientifically sound system of territorial production complexes and regional problems of nature conservation.

The elaboration of these problems also determines the urgent tasks of the republic academies of sciences for the immediate and distant future. It should be stressed that it is a matter, in particular, of the further intensive transformation of the productive forces of the entire territory of our country, in each union republic. And the pioneering role of the Academy of Sciences in the solution of new problems of the development of the productive forces and scientific preparation for the economic development of new regions is well known.

/Regional Problems of Scientific and Technical Progress/ /in italics/. Their elaboration is a component of the development of the Comprehensive Program of scientific and technical progress for the distant future, which determines the main directions of the future development of the productive forces of the country and its individual regions. This program is now becoming the scientific basis in the drafting of state long-range plans of the economic and social development of the country. It is the first stage of sorts of the long-range scientific planning of the national economy with specific assignments for each five-year period.

As is known, the General Meeting of the USSR Academy of Sciences charged the academies of sciences of the union republics to take a direct part in the elaboration of the comprehensive program and especially its regional aspects. Favorable experience in developing programs of scientific and technical progress up to the year 2000 has been gained at the republic academies of sciences. However, these programs have not been properly coordinated with the general concept of scientific and technical progress in the country and among the republics. Now the demands on the comprehensive program are increasing and a large regional section is being specially singled out in it. The Commission for the Study of Productive Forces and Natural Resources attached to the Presidium of the Academy of Sciences will be the chief scientific organization on regional problems of scientific and technical progress, ad hoc commissions as well as a consolidated commission are also being organized at the academies of sciences of the union republics. A uniform work plan and uniform procedural approaches to the indicated problems have to be drawn up in the immediate future.

These problems are integrally connected with the factors of the economic development of the microzones and are inseparable from the scientific and technical policy of the country for the future. The regional programs of scientific and technical progress should be aimed at the fundamental coordination of sectorial programs within one region or another with allowance made for its natural and resource features and potentials. The planning tasks of the optimum combination of sectorial and territorial economic development will also be solved on this basis.

New types of raw materials and energy and new technological processes as applied to the conditions of the comprehensive development of the productive forces of one region or another are being studied at the academies of sciences of the union republics, the scientific centers and branches of the Academy of Sciences. The results obtained during this basic and applied research should be the basis for the elaboration of the set of regional problems of scientific and technical progress. The ramified network of sectorial scientific research institutes and planning and design organizations, which are located on the territory of each republic, have great potentials for the performance of the appropriate work; the exchange of scientific and technical ideas among the academies of sciences of the union republics, especially those located in the same economic macrozone (the republics of Central Asia and Kazakhstan, the Baltic republics and Transcaucasia), should also play a useful role here.

There are also some regional scientific and technical problems which are common to the country. For example, the development of a system of machines, equipment, materials and technological processes in the so-called northern and tropical design. These problems are becoming more and more urgent in light of the general strategy of the economic development of our territories with extreme natural conditions and rich natural resources.

/The Comprehensive Use of Natural Resources for the Country as a Whole and by Individual Regions/ /in italics/. This group of problems is also included in the comprehensive program as a special section. The structure of natural resources, their quantity, quality and degree of study and the directions of their economic development have a direct influence on the economic potential of the country and especially on the territorial organization of the economy.

The availability of abundant and efficient natural resources affords wide scope for economic development and in many ways determines the scientific soundness of national economic forecasts and long-range plans. The study of natural resources and the ascertainment of the economic efficiency of their territorial combination and comprehensive use are one of the main problems of regional economics. The work here is proceeding in two main directions: the study of individual types (elements) of natural resources (minerals, land, forests, water) and the investigation of the entire natural complex of natural resources within a certain region.

The individual types of natural resources for the entire territory of the country and by individual regions are usually studied in our practice. The natural sciences reveal the regularity of the formation of metallogenetic series and provinces, detect the zones of occurrence of various types of minerals, determine the conditions of the formation of the soil and plant cover, the river discharge, ground waters and so on. The thorough and concrete study of each element of the natural complex is necessary for the development of the extractive sectors, agriculture and forestry and for the forecasting evaluation of the economic prospects as a whole. However, under present conditions, when the search for the most efficient versions of the development of the national economy is under way, such an element-by-element, to a certain extent sectorial study of the natural complex of one territory or another is clearly inadequate. The new scale of the development of the productive forces of the USSR, the rapidly increasing need for all the main types of natural resources, the increase of the efficiency of the economy of each region--all this requires the considerable broadening and new statement of the problem. Along with the intensification and extension of the present methods of studying each type of natural resources, the complicated and broad task of studying the territorial combinations of all types of natural resources and the prospects of their comprehensive development, as well as of identifying the most efficient technological processes of their use is being advanced.

The Academy of Sciences has always devoted special attention to the study of natural resources: many industrial regions of the country were formed as a result of implementing the proposals of scientists of the USSR Academy of Sciences and the academies of sciences of the union republics, who discovered new natural resources and developed effective means of their extensive use. The comprehensive approach to the study of the interrelated natural resources of a specific region is not new. A classical example of this approach is the organization of the study of Khibiny, which was conducted in the 1930's under the direction of Academician A. Ye. Fersman.

At that time the biological and water resources, the climate, the soils and their interrelationship were studied at the same time as the mineral resources. Since the apatite-nepheline ores were a new type of raw material, which was unknown in Soviet and world practice, particular attention was devoted to the technological processes of converting apatites into superphosphate and to the extraction of

nepheline as a source of alumina, as well as rare metals and minerals. The earnest scientific preparation carried out at Khibiny by the Kola Branch of the Academy of Sciences made it possible in a short time under the difficult natural conditions of the North to create a mighty mining center with a developed production and social infrastructure, which is of the greatest importance in the economy of the country. It should be noted, however, that national economic practice has utilized only a small portion of the suggestions of scientists. Value components of the Kola ores to this day go to the dumps and are polluting, in particular, such a rare body of water as Lake Imandra.

Unfortuntely, in our country there are still very few examples of an integral approach to the study of the natural resources on individual territories. Meanwhile the study and use of all the elements of the natural complex afford great opportunities for the increase of production efficiency, for the scientifically sound building of the economy in each economic region and union republic, each territorial production complex. (The solution of the scientific and technical problems of the protection of natural resources and natural conditions is also directly connected with this.)

The problem of the comprehensive use of mineral raw material resources has now become a major problem in its scale and importance for the further economic development of the country. In our country up to 6-7 billion tons of minerals are mined annually (according to expert estimates, the annual extraction of minerals by the end of the century will increase significantly), and at the same time many valuable components so far are not being extracted during the processing of mineral raw materials and are being irrevocably lost. There are concrete scientific and technical recommendations on solving this problem, but they are not always implemented. For the extraction of the most extensive group of useful components as possible, for the maximum decrease of losses when processing mined mineral raw materials and the reduction of production wastes it is absolutely necessary to continue the improvement of the existing flow charts and methods of extracting, concentrating and processing mineral raw materials and the development and introduction of new ones.

/The efficient distribution of productive forces and the development of the regional economy/ /in italics/ are extremely important for both the present and the future structure of the economy of each union republic and economic region. The present period in the development of the productive forces of the country is characterized by profound changes in the territorial distribution of production: by fundamental shifts in the location of the fuel and power and the mineral raw material bases to the eastern and northern parts of the Soviet Union; by the sharp expansion of the economic development of new regions with a high concentration of valuable natural resources; by the development of new regions with a high concentration of valuable natural resources, the extensive renovation and retooling of production at established industrial centers. Large-scale programs of the development of the productive forces of the country have a direct influence on the entire economic system of the economic regions and actively influence the structure of the economy and interregional production ties.

A decisive shift of industry to the east is characteristic of the present and especially the future period. Whereas in 1940 more than 90 percent of the industrial output was produced in the European regions of the USSR and less than 10 percent

was produced in the eastern regions, by 1975 the proportion of the eastern regions had already increased twofold and was 19 percent. In 1980 the eastern regions will produce 25 percent of the total industrial output of the country. As a result interregional relations will change radically, which will also directly affect our entire transportation system.

Each five-year plan of USSR economic development paves new ways to the involvement of different regions of the country in the economic turnover. The scale and period of such a comprehensive economic use of new territories have no analogs in the world history of economic development. Suffice it to recall the development of the virgin and fallow lands in Kazakhstan, the creation of the mighty petroleum and gas complex on the Western Siberian plain, which in area surpasses by fivefold the territory of France, or the solution of the task on the radical transformation of the agriculture of the Nonchernozem Zone of the RSFSR, as well as the development of the deserts and semideserts in Central Asia. Now a territory of 1 million km^2, stretching toward the Baykal-Amur Main Rail Line, has to be developed. Important scientific, technical and economic tasks have been posed by the elaboration of the strategy of the economic development of the zone of the North with its unique natural resources. The scientific, technical and design preparation of the territorial redistribution of water resources is being carried out--the transfer of some of the discharge of Siberian rivers to Kazakhstan and Central Asia and of the rivers of the European North to the Volga basin.

The scientific elaboration of the most important regional problems is embodied in the General Plan of the Distribution of the Productive Forces of the Soviet Union. Scientific research on the efficient distribution of productive forces is being conducted at almost all the academies of sciences of the union republics, and plans of the distribution of production and the comprehensive development of the economy of the union republics are being drawn up on this basis. The General Plan of the Distribution of the Productive Forces of the USSR up to 1990 was drafted with the active participation of the institutes of the academies of sciences of the union republics.

An important duty of the republic academies of sciences in the coming period is to elaborate the scientific concept of the development and distribution of the productive forces of each union republic for the distant future up to 2000-2005, to pose the fundamental socio-economic tasks of further regional development and to outline ways to solve them. This is necessary for the comprehensive program of scientific and technical progress of the country and for the better combination of the sectorial and the territorial plans.

/The creation of a scientifically sound integral system of territorial production complexes/ /in italics/ is in essence a new scientific, planning and economic problem. The elaboration on the basis of the generalization of gained experience and the achievements of science and technology of a general scientific theory of the creation and development of territorial production complexes as the main form of the territorial organization of the economy and the efficient distribution of the productive forces of the country is necessary. In this connection theoretical and practical questions are arising which concern the efficient territorial scale of such complexes, their types and structure, the effective relationship between the scale and structure of specialized works and the corresponding infrastructure

(production and social), the scientific soundness of the systems of the complexes, the interaction of these systems and their individual components on the basis of economic -mathematical models. The scientific soundness of the forms of the organization and management of the complexes is of fundamental importance. So far not one operating complex, and especially not one complex being formed has a clearly established system of management, and their organization in practice is determined by the sectorial affiliation. In this case the national economy is losing much in production efficiency.

Large-scale territorial production complexes are typical of the vast regions of new economic development. The Western Siberian Petroleum and Gas Complex and the Angara-Yenisey Complex are being formed intensively. The organization of complexes in the zone of influence of the Baykal-Amur Main Rail Line: the Southern Yakutsk, the Lena and others, has begun. The Timano-Pechora Complex is being created in the northern section of the European part of the USSR; the possibility of forming the Kola Complex is being studied. In the central regions the Complex of the Kursk Magnetic Anomaly and the Orenburg Complex are being successfully developed. In Kazakhstan the development of the Pavlodar-Ekibastuz, Karatau-Dzhambul and Mangyshlak territorial production complexes is continuing; the institutes of the republic are studying the possibility of organizing another six complexes: the Rudno-Altaysk, Aktyubinsk and others. The Almalyk-Angren, Navoi and other complexes have been created in Uzbekistan. In Kirghizia they have begun the study of the Issyk-Kul'sko-Chu Territorial Production Complex. The formation of the Southern Tajik Complex is being completed. The need is arising for comprehensive research for the formation of a number of interrepublic territorial production complexes: the Eastern Caspian, the Poles'ye and so on.

Recently USSR Gosplan approved procedural instructions on the drafting of comprehensive goal programs for the solution of regional problems of the formation and development of territorial production complexes. It was established that the preprogram materials—the plans of the formation of the complexes--are drawn up by scientific research and design organizations. In this respect at some academies of sciences of the union republics something has already been done (in the Ukraine, Kazakhstan, Uzbekistan, Tajikistan), but in others it has not yet begun. Apparently, at the republic academies of sciences along with the general formulation of questions of the general theory of the creation and development of territorial production complexes it is expedient to conduct work on the practical scientific substantiation of the formation of the latter. The results of this research should be reflected in the general scientific concept of the development of the productive forces of the republic.

At all the republic academies of sciences the study of /ecological problems/ /in italics/ is being carried out to one extent or another, but it is necessary to give this research an even greater practical orientation. Scientifically sound proposals of an ecological nature should be the basis for territorial comprehensive plans of nature conservation in each union republic and its individual regions.

The territorial comprehensive plans of nature conservation will be drafted in conformity with the decree of the CPSU Central Committee and the USSR Council of Ministers "On Additional Measures to Step Up Nature Conservation and Improve the Use of Natural Resources." These plans are necessary for determining the measures on

nature conservation and preventing the pollution and breakdown of the natural environment, as well as for ensuring the most effective use of natural resources in the national economy. The drafting of such plans is called for with reference to large industrial centers and cities, territorial production complexes, the territories of the union and autonomous republics, krays and oblasts.

Thus, the proposals on nature conservation, which were elaborated by the academies of sciences, receive a practical solution in state plans.

We see that an extensive group of scientific problems and directions of their solution which govern the further improvement of the system of the organization of the territorial development of the economy on the basis of the combination of the sectorial and territorial principles of the management of the economy is forming. These scientific problems can be solved only by the close cooperation of the natural, technical and socio-economic fields of knowledge. The launching of the appropriate comprehensive scientific research at the academies of sciences of the union republics is therefore of the greatest importance for the further improvement of the economic mechanism of the country.

The scientific research and scientific coordinating activity of the councils for the study of productive forces (SOPS's) and the commissions for the study of productive forces and natural resources (KEPS's) attached to the presidiums of the academies of sciences of the union republics should play an important role in elaborating the enumerated regional scientific problems. These scientific organizations are focusing their attention on major regional problems of the development and distribution of productive forces, the comprehensive evaluation of the natural resources and their use, for this forecasts for the distant future are being made in the SOPS's and KEPS's of a number of republics, the status of the work on the problems being studied is being evaluated, the scientific and technical feasibility of the proprosals being elaborated and the means of implementing them are being ascertained. The research is being performed, as a rule, in cooperation not only with academic institutes, but also with the design organizations of ministries and departments.

The Council for the Study of Productive Forces, which is conducting important comprehensive scientific research and is coordinating the elaboration of the problems of the distribution of the productive forces of the Ukraine and scientific and technical problems of the efficient use of natural resources, is operating successfully at the Academy of Sciences of the Ukraine. This council has been entrusted with the functions of the chief organization for the comprehensive study of the distribution of productive forces in the basins of the Dnepr, Dnestr, Northern Donets and Southern Bug rivers.

The SOPS of the Academy of Sciences of Kazakhstan is the chief scientific organization for the comprehensive use of natural resources and the development of productive forces in the basin of Lake Balkhash. Along with other institutes of the republic academy of sciences the council is elaborating questions of the comprehensive use of the mineral raw material resources of Kazakhstan, the protection of the natural environment, as well as the formation and development of the Karatau-Dzhambul Territorial Production Complex.

The SOPS of the Academy of Sciences of Uzbekistan has prepared a plan of the distribution of production over the territory of the republic. Research is being conducted on the formation of a number of territorial production complexes--in the Fergana valley, the Angren mining and Bukhara-Navoi complexes, on the comprehensive development of the Karshinskiy, Golodnyy and Dzizhakskiy steppes and the lower courses of the Amudar'ya.

Much scientific and coordinating work has been done in the Tajik SOPS for the purpose of forming and developing the Southern Tajik Power Industry Complex.

The KEPS of the Georgian SSR Academy of Sciences is carrying out the coordination of research on the scientific principles of the comprehensive use of the natural resources of Georgia with the forecast up to 2000. The KEPS of the Kirghiz Academy of Sciences is coordinating the scientific research connected with the new Issyk-Kul'sko-Chu Territorial Production Complex.

The tasks which face the academies of sciences of the union republics in the area of the formulation and solution of major comprehensive regional problems of the further development of the productive forces are very diverse and extensive. Precise organization of the scientific research in this very important direction for the national economy of the country is necessary.

In our opinion, the creation of a system of such scientific organizations as the commissions for the study of productive forces and natural resources attached to the presidiums of the academies of sciencies of all the union republics, as well as attention to the scientific and scientific coordinating activity of each such republic organization will have a serious influence on the elaboration of regional problems of the union republics and on the solution of the tasks of the efficient and effective combination of the sectorial and territorial planning of the national economy in each union republic and for the country as a whole.

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