

Planning for the United Arab Republic¹

By

Ragnar Frisch

University of Oslo

INTRODUCTION

I don't know very much about the conditions in the other countries of the Arab Nation, but I believe that, through my several stays in Egypt, I have come to know something about the conditions for economic and social development in the United Arab Republic. This knowledge has made me confident that the Republic has a great economic and social future *provided its economy is planned in a wise way*.

This love to and faith in the Republic gives me the privilege, or rather makes it my duty, to express my frank opinion on certain aspects of its planning system that can, in my opinion, be considerably improved. What I have particularly in mind is to base final decisions on a scientifically worked out global plan frame with *optimality computations*. I might even say that such an improvement is a *conditio sine qua non* for a speedy and safe economic development of the country. This improvement should by all means be put into effect and implemented as soon as possible.

If this is not done in the present situation characterized by a strong determination to do something to foster rapid economic progress, it is inevitable that one will run into *improvisations* that may create unforeseen difficulties of such dimensions as to seriously disturb economic stability. Unforeseen balance of payments problems is only one example of these difficulties.

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WORK THAT HAS BEEN DONE AND WORK THAT NEEDS TO BE DONE

The technique for the elaboration of a global and optimal plan frame has been the main concern of the Operations Research Center in the Cairo Institute of National Planning, and it is this work I would like to tell you something about.

The work stems from what the President explained to me in private conversations four years ago. His main theme was "I want to know how to plan". Our work since then has aimed at answering this question. And we believe that now we are in a fairly good position to produce an answer.

The general line of approach has been mapped out by me, but the implementation of the ideas is the work of several Egyptians. A list of them with my grateful acknowledgement is given in an earlier publication. Of the names in the earlier list I must in particular mention Dr. Ibrahim Abdel Rahman.

The work in its most recent stage is due to Dr. Salah Hamid, the powerful Director of the Operations Research Center, to Dr. Nazih Deif, Under-Secretary of State in the Ministry of National Planning,¹ who has provided us with the data, to Dr. Salib Roufael, Professor in Ain Shams University and to Mrs. Mary Naguib, who has been in charge of the electronic computer in the Operations Research Center. In a general way we have also profited by remarks made by Dr. Mahmoud Shafie.

Before embarking on a description of the technique for elaborating a global and optimal plan frame, I must state quite explicitly that this technique only aims at being an *aid* for decisions on the economic policy, just like the compass is an aid for the master of a ship when he decides what course to follow. The final decisions on economic policy must, of course, reside with the top level authorities. But the technique of a global and optimal plan frame is a necessary condition for making wise decisions. It is an indispensable compass for steering the economy.

A development plan contains a great number of different aspects. Even if we aggregate the details into broad categories, we are left with a considerable number. When the work is coded for an electronic computer (even a relatively small one as the IBM 1620 now available in the Cairo Operations Research Center), we are able to include a great number of different aspects, even several hundreds. It would only lead to confusion if I should try to speak here about all the aspects that have been included

¹ Subsequently minister of Economy and Treasury.

in our Cairo work, I will concentrate on the most basic aspects of the economy.

Foremost among these aspects are: the increase in national income seen in long perspective, the protection of the balance of payments and the level of private consumption¹ over the years in the immediate future. These three aspects gear into each other, and our first task has been to express in figures *how* they gear into each other.

First aspect:

The national income

When we speak of the increase in national income, the first thought that comes to your mind is probably the target of doubling the national income in ten years. I think that this target is excellent as a *stimulus to effort*. It is a whip that will force everybody concerned with the development of the economy to use his imagination and to do his utmost.

But the simple figure which will measure the national income in any specific year, such as 1970, can not be taken as the basis for the machinery of scientific planning. To focus all attention on the year 1970 and disregard what is happening after that date, will lead astray. The perspective must be much longer when one has to decide about what actions to take this year or in any specific year in the immediate future. I think it was a very wise decision to start the building of the High Dam. But this is not because of the contribution which the High Dam may make to the national income in the particular year 1970, but because the Dam will yield a great contribution to national income over a very long period, virtually an indefinite time into the future. Similarly for the decision to build a thermal power station. With normal maintenance the power station will yield good service for 50 or more years. So we must concentrate our attention on the *accumulated* income which an investment will create. We must take the *sum* of all the annual incomes which the investment will create in all the years of the whole life expectancy of the real capital goods that emerge from the investment.

If increase in national income is what is wanted, the scientific planner who is to give an advice on how to shape a five year plan, must look for that particular pattern of action in the plan period which will produce the highest possible accumulated income creation over all the future years

¹ Government consumption is in most countries smaller in size, perhaps around 10 per cent of private consumption, and may, therefore, be disregarded when we concentrate on the three *most basic* aspects.

until the effects of the plan period action, particularly the effects of the plan period investment startings,¹ have tapered off and finally have been exhausted.

Only in this way can the national income aspect be rationally worked into a global and optimal plan frame.

Second aspect:

The balance of payments

The optimal action in a plan period is, of course, subject to a number of *conditions*. Foremost among them is the condition which stems from the concern about the balance of payments.

In all essentials the annual balance of payments is the total value of the goods and services that have left the country in a given year, minus the total value of the goods and services that have entered into the country in that same year. This difference is a clear cut concept that can be observed statistically with a fairly high degree of accuracy. When we speak of the annual balance of payments, it is the export-import difference we should concentrate on. If we begin to think in terms of financial concepts, such as the contraction of a loan abroad or the paying back of a loan, there is a great risk that we will be led astray and end up with confusion and mistakes. For instance, the mere contraction of a loan abroad has no effect on the balance of payments. Nothing at all will really happen to the balance of payments until we start to draw on this loan. What will happen when we start to do so? We may perhaps use part of the new loan to pay back an old indebtedness. If we do, this in itself has no effect on the balance of payments. It only means that we have, pound by pound, changed one kind of indebtedness into an other kind. It is only at the moment when we use part of the new loan to pay for imports of goods and services, that something really happens. And the thing that now happens can, pound by pound, be measured by the value of the goods imported. A similar argument can be made regarding the financial transactions involved in the export of goods from the country. Therefore, in the end,

¹ One must distinguish between investment starting and investment sinking. Investment *starting in any given year* is the total outlay which it is estimated that the projects started that year will have entailed when they are finally completed at some future date. Investment *sinking in any given year* is the value of goods and services that were actually used (that were "sunk") that particular year in order to carry towards completion projects which were started that year or some previous year. The distinction between investment starting and investment sinking is absolutely essential in an analysis that is to be truly dynamic.

the net effect on the annual balance of payments in any given year is essentially the total value of goods and services exported this year minus the total value of goods and services imported this year.

This difference may be positive, negative or zero. It is positive if the country has exported more than it has imported. It is negative in the opposite case. And it is zero if total exports equal total imports. If gifts to or from the country occurs, a correctional term must be entered to account for these unilateral transfers.¹

The annual balance of payments in a given year is the same as the *change* that has taken place this year in the country's net creditor position with the rest of the world. If the annual balance of payments in a given year is positive, the country's net creditor position with the rest of the world has improved this year. If the annual balance of payments is negative, the net creditor position has become worse.

If we consider the *accumulated* balance of payments, that is to say, if to the annual balance of payments in the first year of the plan we add the annual balance of payments in the second year of the plan and to this we add the annual balance of payments in the third year of the plan, and so on up to any given year where we want to stop, this accumulated sum is equal to the *total change*, i. e. the total improvement or worsening that has taken place in the country's net creditor position with the rest of the world since the beginning of the plan period up to the year where we stopped the accumulation. Since we may stop the accumulation in *any* year, we see that if the annual balance of payments in each year is given, it is an easy matter to compute what the accumulated balance of payments, and hence the country's net creditor position with the rest of the world, will be in any future year reckoned from the beginning of the plan period.

This accumulated balance of payments is an extremely important aspect of the national economy. In a country which is going through an economic development process, the accumulated balance of payments will to begin with be negative and will get worse and worse from year to year, that is to say it will become more and more negative because the country is heavily importing in order to build up its real capital equipment through investment. This will continue until a certain year when the *peak load* on the accumulated balance of payments, that is the peak load on foreign indebtedness, is reached. From this year on the accumulated balance of payments may go on improving because now the fruits of the investments start to emerge. The expected peak load on the accu-

¹ Interests and dividends to or from foreign countries are classified with the unilateral transfers.

mulated balance of payments which is *caused by action in the plan period*, is an extremely important figure, that the planners and the responsible politicians must study carefully and *correctly*.

The peak load on foreign indebtedness can be foreseen

To any given distribution of investments over the various sectors of the economy and over the various years in the plan period, and to any given pattern of private consumption and Government use of goods and services in the various years of the plan, will correspond a certain size of the peak load on the accumulated balance of payments, that is to say, a certain size of the highest foreign indebtedness reached as a *consequence* of the investment and consumption policy that was carried out in the plan period. It is possible to compute in figures with a fair degree of accuracy how high a peak load on foreign indebtedness that will follow from a given investment and consumption policy in the plan period. It is possible to do it, and we have done it. In performing these computations we have taken account of all effects, direct as well as indirect. We have equations that will tell us with a fair degree of accuracy what the peak load will be for any given size of investments and private consumption in the plan period. Once a given constellation of the five year plan is fixed, we can *foresee* with a fair degree of accuracy what the peak load on net foreign indebtedness will be, and we can foresee *when* this peak load will occur.

A lack of understanding of this has been a weak point in economic planning in many underdeveloped countries. I am seriously concerned about this, because this lack of understanding may lead to an investment and consumption policy that will cause *balance of payment surprises of a critical order of magnitude*.

It is as if in a military operation one should fail to evaluate correctly the enemy's strength. The reason for the too optimistic estimates often made, is, I believe, that there is a temptation to reckon only with *direct* effects that are immediately visible and attracts attention, while the *indirect* effects can only be estimated after a patient study of a global economic decision model for the country.

There is for example a popular belief that if goods and services needed for consumption or investment purpose can be provided by domestic sectors of production, these goods and services will *not* fall as a burden on the balance of payments. This is a fundamental mistake. If all indirect effects are taken account of, one will find that the burden on the balance

of payments is much higher than what appears *prima-facie*. This failure to consider indirect effects is *the* great danger.

The fact that we are able to compute the *total* effect on the size of the peak load on foreign indebtedness and the year when it will occur, when we have given the investment and consumption policy in the plan period, is important. But there is an other fact that is still more important from the viewpoint of rational planning. We are also able to perform the computation in the *reverse* direction. By this I mean the following.

A ceiling on the peak load of foreign indebtedness

Suppose that we put a *ceiling* on the peak load of foreign indebtedness. That is to say, we will allow the foreign indebtedness to go up to a certain point, but not beyond this point. We can express it by saying that we put a lower bound on the accumulated balance of payments. This lower bound will be a *condition* put on the kind of consumption and investment policy we are allowed to follow in the plan period. There are, of course, still a great variety of such policies that are open to us, but they must be chosen in such a way that they do not break the ceiling that has been imposed on the peak load of the foreign indebtedness.

When this ceiling on the peak load of foreign indebtedness is given, we are able to determine in figures an *optimum constellation* of the investment and consumption policy in the plan period. That is to say an investment and consumption policy which is such that it will – according to our estimate – produce the largest size of accumulated national income creation which it is possible to attain when the ceiling on the peak load of foreign indebtedness is given. The more liberal we have been when we put the ceiling on the foreign indebtedness, that is to say the deeper we have allowed the country to go in foreign indebtedness, the higher it will be possible to reach in accumulated national income creation, provided, of course, that the funds borrowed are wisely used. And the more stringent we have been when we put the ceiling on the peak load of foreign indebtedness, that is to say the smaller peak load we have allowed for the country's foreign indebtedness, the smaller will be the maximum size which we can reach in accumulated national income creation.

Third aspect:

The private consumption

The way in which our concern about the private consumption comes into the picture can be illustrated as follows. Take for example the curve marked 140 in the Basic Policy Chart (p. 39). I shall later have more to

say about these down-sloping curves, but for the moment take the particular curve marked 140 as an illustration.

Figures and curves for the Basic Policy Chart resulting from actual computations made for the Egyptian economy are available but have not been published. The figures given in the appended chart are different from the actual ones and are here given only for the purpose of illustration. Anyone familiar with the United Arab Republic economy will see that the figures here given are much smaller than those applicable in the realistic situation. The figures given in the chart will, however, give a good illustration of what can be achieved through a rational form of optimality in national planning.

The figures and curves in the Basic Policy Chart have been worked out by Dr. Salib Roufael who has done a most excellent job in this connection.

Let us start by reading off the point 60 on the horizontal axis (the upper row of figures immediately below the horizontal axis). This indicates a ceiling of 60 millions on that part of the Egyptian foreign indebtedness which will follow when we have decided on the *optimal* action to be taken in the plan period 1965/70, optimal in the sense of maximizing accumulated national income creation.

From the point 60 we move vertically up until we hit the down-sloping curve marked 140. And from this point we move horizontally to the right until we hit the first vertical axis. Here we read off the value¹ 1125. This reading means that if we impose the condition that the peak load on the part of foreign indebtedness due to action in the plan period, is not to be more than 60 millions and if the consumption policy in the plan period is to be such as to assure an annual private consumption of not less than 140 millions, then we can, if the investment policy in the plan period is determined in an optimal way, reach an accumulated national income creation of 1125. Note that 1125 is not the annual income in any single year, but the sum of national incomes over all the years covered by the life expectancy of the capital goods created through investment startings in the plan period.

Similarly we read off from the chart that, if the ceiling on the peak load of foreign indebtedness is as stringent as 40, and the consumption policy

¹ The figure 1125 is not printed in the chart, but 1000 is, and there is one horizontal line at the level 1100 and one at 1200. The vertical marked 60 is seen to intersect the down-sloping curve 140 between the horizontal at 1100 and that at 1200. We judge by the eye that the intersection takes place when we have moved about *one quarter of the way* between 1100 and 1200. Hence the result is 1125.

is still characterized by 140, we will only be able to reach an optimal accumulated income creation of about 850. And if the ceiling is as liberal as 80, we will be able to reach an optimal accumulated national income creation of about 1300.

Different alternatives for the consumption policy

All the explanations given so far refer to a situation where we have decided to follow a policy pattern with respect to private consumption characterized by the downsloping curve marked 140 in the Basic Policy Chart. This policy was defined by the condition that total annual private consumption in any year in the plan should never fall below 140 millions. If we had decided to follow a more drastic austerity policy by imposing a lower bound of only 130 millions on private consumption, we would have been able to *reduce* the burden on the foreign indebtedness. But still the situation would have been precisely the same as before. To any given ceiling on the peak load of the foreign indebtedness, will also now correspond a certain optimal value of the accumulated income creation. The only difference is that now we have to use the curve marked 130 in the Basic Policy Chart.

For instance, let us again start on the horizontal axis at the point indicating a ceiling of 60. Moving vertically up to the consumption curve 130, and then to the right, we read off an optimally attainable accumulated national income creation of 1325. This accumulated national income creation of 1325 is considerably *higher* than the one we were able to attain when we imposed the same ceiling 60 on the peak load of foreign indebtedness, but adopted the more liberal consumption policy of 140.

A fourth aspect:

Total investment startings in the plan period

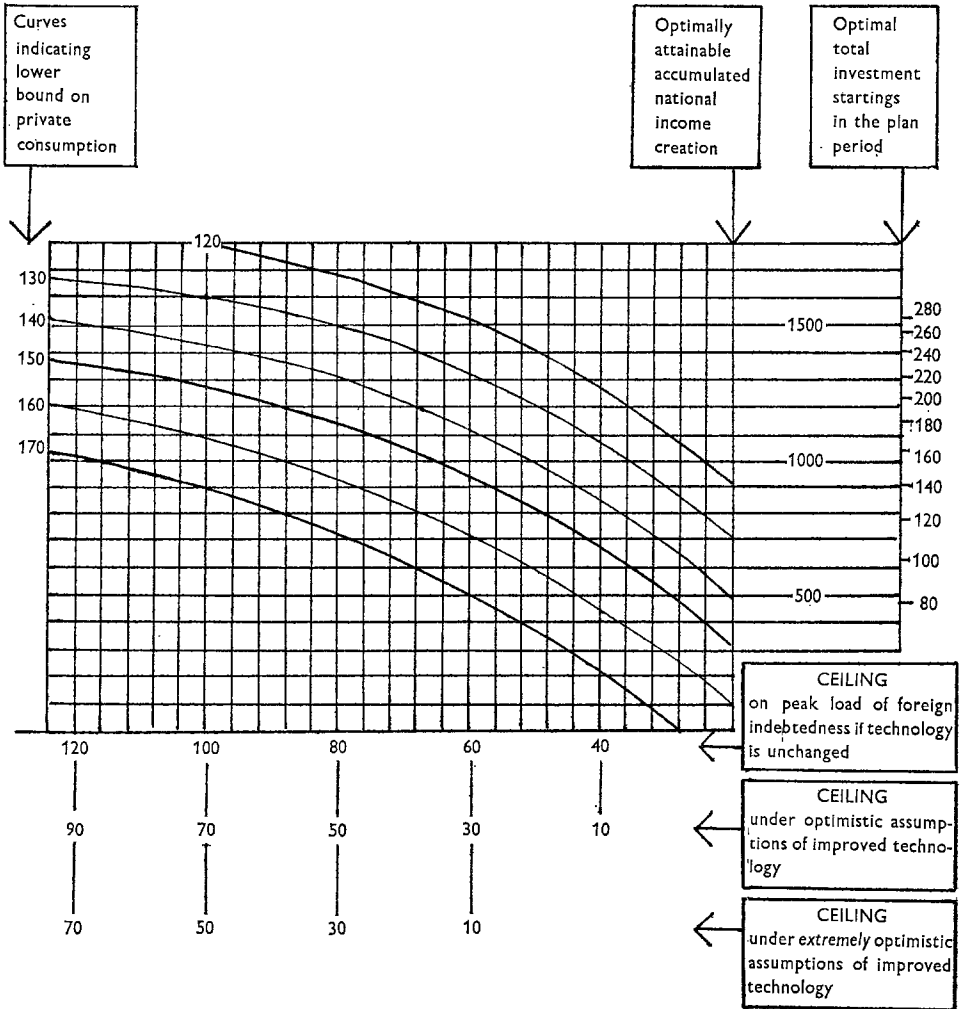
An optimal economic policy has, of course, many aspects to it other than national income creation, protection of the balance of payments and concern about private consumption. One of these other aspects is the total size of investment startings in the plan period.¹ This is a fourth of the basic aspects of the economy which we will now draw into the picture. This total size can be read off from the second vertical axis, in the Basic Policy Chart. We note for instance that to the peak load ceiling on the foreign indebtedness of 60 corresponds on the curve 140 an accumulated

¹ For the distinction between investment starting and investment sinking, see the footnote above.

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THE BASIC POLICY CHART
 Showing how five basic aspects of
 the economy gear into each other.

national income creation of 1125 and a total plan period investment starting of about 180.

This means that if the ceiling on the peak load of foreign indebtedness is given as 60 and the lower bound on private consumption is 140, and we determine the investment and consumption policy in the plan period in such a way as to maximize the accumulated national income creation under the conditions stated, we will find that we need to make a total investment starting in the plan period of some 180 mill. The *composition* of these 180 mill. is not arbitrary but must conform to an optimal pattern.

This figure, 180 millions, will, of course, depend on the nature of the investment projects that are *available* in the *list of projects* among which we are to make the optimal pick. All layers of the population should be encouraged to help extending in a useful way the list of projects from which the optimal pick is to be made. The mere inclusion of a project in this list is, of course, *not* tantamount to assuming that the project is to be accepted. Whether or not it is to be recommended for acceptance is precisely the purpose of the optimality analysis to bring out.

Similarly, if we put on a peak load ceiling of 80 and a consumption bound of 140, we read off from the chart that the optimal total investment starting will be about 220. Similarly if we had used the consumption curve 130 or some of the other consumption curves.

HOW SHOULD HIGH LEVEL PLANNING DISCUSSIONS BEGIN?

By a little exercise one will quickly learn to make readings in the chart and thereby see at a glance how four extremely important aspects of the planned economy gear into each other, namely: (1) Optimally attainable accumulated national income creation, (2) ceiling on the peak load of that part of the foreign indebtedness which is due to action in the plan period, (3) lower bound on annual private consumption in any year in the plan period, and (4) total investment startings in the plan period. When using the chart we have two "degrees of manoeuvrability" in the sense that when any two of the four aspects are assumed *given*, we can read off what the other two aspects are estimated to be in an economy whose structure is as that depicted by the numbers printed in the Basic Policy Chart.

The planning procedure at the high political level ought to begin by asking: *What point in the Basic Policy Chart should we aim at?*

This is a much more rational approach than to let the authorities – low level or high level authorities – procede directly to deciding on specific measures, *one by one*, say deciding on whether or not some

specific investment projects are to be accepted. Such detailed decisions must, of course, finally be made, but they should only come at a *much later stage*, after the Basic Policy Chart has been thoroughly discussed at the high political level.

The chart is like a *budget-frame* for the total economic policy. If one does not begin by studying this budget-frame, but start by ad hoc decisions on a number of details, it is practically certain that one will sooner or later run into very serious unexpected difficulties.

Since any point in the Basic Policy Chart will simultaneously define four of the most basic aspects of the five year plan, any responsible politician will be able to say which one of the points (i.e. small square cells) in the chart he *prefers the most*. He will even be able to rank the points in a preference order.

The recording of the preferences can be done as follows: One will give each voter a total sum of, say, 100 points and ask him to distribute these points in any way he prefers over the small square cells of the chart. These votes will be collected and processed by adding the votes distributed in the cells. And this summarized view of the voters will be presented for top level decision on which specific point is to be aimed at. This procedure is both rational and democratic.

A fifth aspect:

Improved technology

In the ceiling figures indicated along the heavy horizontal axis is not included the effect of an improved technology. This represents a fifth aspect. Under an *optimistic* assumption about the possibility of realizing a gain through improved technology, the ceiling figures may perhaps be reduced by 30, that is to say, instead of the figure 60 one may use the figure 30, and so on. These optimistically amended figures are printed in the horizontal row *below* the figures that belong to the heavy horizontal axis. If we can make this optimistic amendment, we find that a ceiling of 30 on the peak load of foreign indebtedness and an austerity policy corresponding to the consumption curve 130 will make room for a total plan period investment starting of about 225.

If one wants to be *extremely* optimistic about the possibility of an improved technology, one may perhaps reduce the ceiling figures by a further 20 as indicated in the bottom row under the horizontal axis. Using these figures one finds that a ceiling of 30 on the peak load of foreign indebtedness and the strong, but not excessive austerity policy

of 135 will make room for a total plan period investment starting of about 240. It must be emphasized that this is a highly optimistic view.

The technology factor has in the present analysis only been treated by a very rough estimate. It is possible to study this factor in a much more precise way by including into the optimality analysis what I call *infra* investments, i.e. investments which aim at changing the coefficients that express the needs for inputs into production sectors or aim at changing other coefficients in the decision model used. I have discussed this in greater detail in other papers. It will make the programming analysis at least quadratic and can only be handled by the use of a bigger electronic computer.

Further aspects :

It is possible to add still more aspects in the Basic Policy Chart, for instance the accumulated *employment creation* due to action in the plan period. This can be done by adding another vertical axis parallel to the axis of the accumulated national income creation. One might even add more aspects to be represented in the chart by more vertical axes. The number of "degrees of manoeuvrability" in the chart would remain the same, namely two.

THE SECOND AND THIRD PHASES OF THE DECISION PROCESS

When the first phase of the decision process is completed by using the Basic Policy Chart, we can proceed to the second phase. We can now make several new specific runs on the computer and present more details, all of which pertain to the situation where the ceiling on the peak load of the foreign indebtedness and the lower bound on private consumption are fixed at the levels that were decided upon through the decision technique of the Basic Policy Chart. We can make what we call a stochastic sensitivity analysis by changing at random some of the data to test the precision of the analysis. In this way we can determine a number of different solutions that are *equally optimal* from the practical point of view. We can work out, say, 10 different alternatives regarding the phasing of the investments in the various sectors over the plan period. In the Operations Research Center we have worked out a tentative voting chart intended for voting on 10 such alternatives.

Again we may let each voter be allotted a sum of 100 points to be distributed over the 10 alternatives in the way which best suits his prefer-

ences. And again a final top level decision will fix the alternative to be chosen.

In a third phase of the decision process one will study tables that show how a much larger number of aspects of the economy – perhaps 100 or 200 aspects – gear into each other. The study of such tables will lead up to the final stage where decisions are made about *individual* investment projects and about other *detailed* planning questions.

CONCLUSION

To conclude I would like to say that a rational plan frame work of the kind here suggested will mean millions and millions to the Republic and will do away with a large part of the balance of payment hazards now experienced. It will also activate a close cooperation between top level authorities and the analytical experts. In the end this will be a decisive factor in the economic and social development of the country.