

the **OECD** **OBSERVER**

LATEST STATISTICS SHOWING THE ECONOMIC
PATTERN OF OECD COUNTRIES INCENTIVES TO
INVEST IN DEVELOPING COUNTRIES THE NEED
FOR INTERGOVERNMENTAL CO-OPERATION ON
THE ENVIRONMENT POLICY IMPLICATIONS OF
INCREASED GROWTH IN HIGHER EDUCATION



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Summary of a lecture to the International Conference on Goals and Strategy for Environmental Quality Improvement in the Seventies, Washington, organised by the Atlantic Council of the United States and the Battelle Memorial Institute, January 1971.

by
Gérard ELDIN,
Deputy
Secretary General
of OECD

THE NEED FOR INTERGOVERNMENTAL CO-OPERATION AND CO-ORDINATION REGARDING THE ENVIRONMENT

To speak of intergovernmental co-operation and coordination in the particular field which here concerns us in itself implies that environmental problems are recognised to be governmental problems.

Why the responsibility of governments should be involved is because :

- an age-old function of the public authority is to provide for the safety of its citizens; while in the meantime the notion of safety tends to become broader in scope, all modern States are, to differing degrees, "welfare states";
- in its role as mediator the State must intervene to protect minority groups and the community as a whole;
- in a market economy degradation of the environment for the most part occurs as a side effect of economic processes, that is to say as a form of damage inflicted on third parties, or on the economy as a whole, when goods and services are produced or consumed.

This is the angle from which the question of intergovernmental co-operation and coordination in the environment should be approached.

No hard and fast reply to this question is attempted here, but rather an outline of the problems involved. More particular emphasis will be laid on the economic aspects, for which various forms of international action will be described.

THE PROBLEMS AS THEY STAND

The intrusion of environmental concerns into government policy, owing to the impact of processes which are either altogether new due to technological change or simply marked by greater intensity, frequency and scope, is now an accomplished fact and to my mind a lasting one. Such phenomena must be ascribed to the growth of population, production, consumption and trade in a world of limited dimensions. We can now weigh the import of Paul Valéry's prophetic dictum of the Thirties : "le temps du monde fini commence".

Another cause, one which from a sociopolitical standpoint reflects the first, is the pressure of public opinion on governments — a recent development which could be described as a fashion if the stakes were not so high. In our advanced societies, men aspire to a type of well-being that is not entirely linked to wage increases.

These new developments have caught governments unprepared — most of the time they have no scientific data on which they can absolutely rely, no facilities for measuring and analysing the processes, and no adequate administrative organisation to deal with them.

This is the foundation for an initial type of co-operative action at international scale.

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Again, in a great many instances, the very *nature* of environmental problems places these in the international category :

- either because they concern mankind as a whole : in this group may be ranked such major ecological problems as the balance between population and the means for its subsistence, as well as genetic, meteorological and other hazards;
- or because the problems transcend national boundaries, such as the pollution of international waters, the subtle diffusion of bioactive chemicals through the food chain, and the airborne or waterborne transport of pollutants over long distances.

This is a second reason calling for international co-operation.

But I wish to concentrate here on the international problems which stem not from environmental problems in themselves but from measures taken at the national level to deal with them. These problems are mainly economic and may be said to belong to three possible areas of conflict.

Protection of the Environment and International Trade

In order to control pollution the public authorities may have recourse to a number of methods — by regulating products or production processes (even going so far as to forbid them outright), by establishing general standards of quality for the surroundings, by introducing incentives which may be positive (subsidies, financial benefits) or negative (taxes and fines), by resorting to public investment, or by setting up new public services.

These methods are likely to affect various components of production costs (investment amortisation, manufacturing costs, taxes, etc.). Distortions are hence apt to occur between industries located in different regions or countries, depending on the respective severity of the regulations. The international competitiveness of these industries may be affected.

Here an important distinction must be made :

- If the *product itself is subjected to regulation* some measure of neutrality will prevail. By this I do not merely mean qualitative improvements apparent in the product, such as safety devices on automobiles, for which a market exists, but improvements capable of reducing damaging side effects which do not directly benefit the user (such as anti-noise and anti-pollution devices on automobiles).

In this case the same rules will apply in a given area to goods which are domestically produced and to those imported from abroad.

The diversity of national regulations will, however, have some economic effect in that fragmentation of the

international market and possibly of production lines can ensue, and costs therefore be increased. In the final outcome, it is conceivable that the original design will be reconsidered; for instance the research undertaken to develop new types of motorcars.

- If instead the *production process is subjected to regulation while the product remains unchanged* the disadvantage from an international competitive standpoint will be more marked. While in producing a ton of steel, of paper pulp or of copper varying amounts of pollutant may be discharged into the water or atmosphere, the same ton of steel, pulp or copper will still be obtained, one which has a certain value on the international market. Hence, the regulation of production processes in order to limit pollution has a direct effect on profit margins.

Alongside distortions on the micro-economic level — that is to say on the level of business undertakings or industrial sectors — does not the risk exist of inequality between those countries which have an active environment policy and those less concerned on this score? Will not the latter, with less stringent taxation to face, in fact be employing a form of dumping detrimental to the others? This, I think, is a debatable question. It may indeed be argued that those willing to pay the price of a degraded environment (that is, of the side effects) end up by getting the worst of the bargain when costs are balanced against benefits. It must be recognised that, as between countries, scales of social values may vary, and that high priority accorded to the quality of the environment may bring in its train costs in other fields. Nobody would suggest that countries with the most modern hospitals, better schools or finer museums are penalised in terms of international competition.

As concerns trade, the risk to be guarded against is that import regulations in the form of *standards* based on considerations of public health, purity or safety may well in later years become a wide-spread form of *non-tariff barrier* to international trade. The problem here is not only one of standards but of control procedures. It would indeed be disastrous if environmental protection came to mean protectionism.

Protection of the Environment and the Location of Industries

The impact of environmental policy on the location of industries may well be as marked as that on international trade.

Protection of the environment is in fact apt to be a prime factor of land-use policy. Questions which must here be considered are the protection of natural resources, public health, safety and aesthetics. The problem is especially acute in such countries as Japan and the

Netherlands, left with little room for industrial expansion. This gives rise to the temptation in the case of the major pollution-producing industries to set themselves up where regulations are least strict.

In years to come may not a trend much like the use of flags of convenience in the shipping world develop in the field of international investment?

Evolution of this kind could especially affect the developing countries, which are less responsive to environmental problems than to the more urgent questions of employment and industrial development. The wealthy countries would thus export their pollutants along with their capital. This is a problem which well deserves consideration, particularly in the context of studies now being conducted by various bodies on "multinational" companies, and of work on the evolution of world industrial structures.

Protection of the Environment and Economic Growth

If we then shift to the macro-economic level, a major problem arises which some economists have presented in the form of a dilemma — the need to choose between economic growth and protection of the environment.

In this context, arguments of varying soundness are put forward :

- One of the most valid is based on the premise that environmental disorders, while linked to economic growth, increase more than proportionately (following a process of accumulation, concentration and thresholds). To check degradation, governments should try to limit growth.

While the basis for this argument, which supposes an accumulation of harmful waste in which a marginal increase would be intolerable, strikes me in a number of cases at least as relevant, the conclusion that is drawn does not. In fact, first, the advocates of zero growth apparently fail to recognise that present environmental problems result largely from past neglect which has allowed towns to deteriorate and waste to accumulate. To arrest growth, far from being a solution, would only make the application of remedies more difficult.

Secondly, the problem — that is whether to continue to produce under present conditions or fail to increase production — is not a real one. A third alternative exists, which is to meet the same needs or functions by means of new products or different processes of manufacture. No-one can doubt that modern technology is capable of facing this challenge.

- Another argument — one more largely based on accounting practice — is to challenge growth as now

measured by such economic indicators as GNP and to suggest that, if GNP were corrected for such negative factors as deterioration of the environment, growth would be nil or almost nil.

The same argument can be stated in another way. Assuming that the cost of steps taken to protect the environment were entirely accounted for in prices of goods, and were incorporated in a new type of "deflator", this would show real growth to be nil or virtually nil. In this case it is the notion of growth itself that is involved.

We in OECD do not believe there to be any fundamental conflict between economic growth and environmental protection (at any rate in the medium term and in the light of our present knowledge).

In fact just what is economic growth other than a reduction in the scarcity of goods and services? So long as goods such as pure air, unpolluted water and amenities derived from nature or a pleasant environment were regarded as "free" goods belonging outside the economic sphere, it was quite legitimate not to account for them. Today an altogether different situation has arisen — to make these goods less scarce is to add to the world's assets and to increase human satisfaction. It thus means contributing to economic growth taken in a broader sense than the mere expansion of production, which itself is but one means of better satisfying man's needs.

Extending the goals of economic policy to embrace a new "quality of existence" concept is apt to change the allocation of resources significantly (structure of consumption, needs met by private consumption as compared with the consumption of services made available to the entire community, reduction of working time regarded as an amenity, etc.).

Is production, in the conventional sense, likely to be negatively influenced by environmental policy? I do not think so either.

I need only mention the technological research spurred by this new challenge, the rapid advent and development of an anti-pollution industry or the multiplier effect produced by the enormous sums which the public authorities propose to spend on environmental projects.

In the extreme case it is true that governments will be faced with choices and compromises. The men and women of our time want quantity as well as quality, a better environment, higher incomes, full employment and price stability.

The search for balanced economic and social development calls for a twofold endeavour :

- First, an attempt must be made to reappraise the instruments used for measurement and analysis in order to explore new frontiers in economics.

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This could lead on the one hand to the widening and enrichment of the area covered by national accounts to include phenomena such as the free use of natural resources, negative side-effects and a more precise evaluation of services collectively organised by public authorities; and on the other the complementing of

economic indicators by social indicators designed to measure human performance in terms of well-being.

• Second, the policies pursued by the various countries of the Western community must be increasingly concerted and if possible harmonised.

FORMS OF INTERGOVERNMENTAL CO-OPERATION REGARDING THE ENVIRONMENT

Among the industrialised countries of the Western world — those roughly making up the membership of OECD — many lines of approach are used in dealing with environmental problems. This is of course due to the diversity of socio-economic and geographical structures, national traditions and the various stages of economic development these countries have attained. Yet they account for over two-thirds of world trade. They enjoy the highest standard of living. Traits they have in common are the market-economy system and a will to strive together for the greatest good of the international community. In this respect environmental policy is a highly suitable sphere for action. While appropriate forms of co-operation are here suggested, no attempt is made to show how responsibilities might be divided among international bodies, a subject beyond the scope of this paper.

First, governments need to learn the facts, that is, ascertain the true nature of the problems, their causes, effects and the answers that modern technology is able to provide. Such an analysis must of course have a long-term dimension since today's problems are not necessarily those of twenty years ahead. In this respect international co-operation should enable substantial amounts of time and money to be saved, by promoting exchanges of information and meetings of experts, by pooling research efforts and spreading knowledge. This is what OECD has been striving to do for the past ten years in its Committee for Research Co-operation.

A second stage of co-operation would consist in *confronting the various policies themselves*. Exchanges of experience among responsible national authorities whether at sectoral level (on water management, air pollution, urban management and planning policies, etc.) or at general level, can not only be a cross-fertilising process but can also yield information on national decisions likely to have international repercussions.

When measures decided upon or planned in one country are liable to affect others, they could be sys-

tematically notified for the purpose of international confrontation. This view was adopted by the OECD Environment Committee last November, when it discussed a United States proposal regarding pesticides and other bioactive chemical products.

In view of the effects on international trade and investment, further efforts should be made to *harmonise national decisions* concerning the objectives of environmental policy (general principles and guidelines) and measures affecting trade (standards, control regulations and procedures) so that discriminatory rules and practices can as far as possible be avoided. More or less compulsory international agreements may be considered appropriate. It may be noted that the force of such agreements appears to depend directly on the homogeneity of the set of countries concerned.

A fourth aspect of international co-operation concerns the integration of environment policies in activities dealing with economic growth and development so as to pinpoint and if possible quantify the effects of such a policy on official budgets, production, consumption, investment and prices. Not only is integration necessary from a forecasting standpoint in order to provide a realistic view of future prospects but also for decision-making purposes so that an educated choice of social measures can be made as objectively as possible; this presupposes new means of analysis and measurement.

Lastly, *we must hope that suitable international mechanisms can be set up, in the appropriate bodies, to deal with problems now lying outside the jurisdiction of individual countries*, such as the pollution of international waters, radioactivity, the large-scale transport of pollutants through the atmosphere, sonic boom, etc. The Conventions of 1954 and 1962 sponsored by IMCO (1) point in the right direction.

Environmental problems strike me finally as being a

(1) The UN Intergovernmental Maritime Consultative Organisation.



highly characteristic feature of contemporary society, not just because they have emerged at a particular stage of economic and social development, but also because they give shining proof of the interdependence between countries of the world today — an interdependence that is passive in the sense that all countries face together the risks involved and that is active as well in the search for constructive solutions.

To be realistic, such solutions must be of a concerted nature in a dual sense :

First, governments must get together to exchange

experience, to observe and measure phenomena, to agree on the objectives, to give mutual warning on difficulties encountered, to settle problems of common concern.

Second, it is also necessary that governments concert with industry on the problems of environmental protection so that incoherent measures whose social costs could exceed the benefits, or measures officially imposed without taking their economic consequences into account, are avoided and in their place are developed harmonised adjustments acceptable to the community as a whole.

OECD'S PROGRAMME ON THE ENVIRONMENT

The work programme of OECD's Environment Committee focusses on two main problem areas: natural resources and pollution control and improvement of the urban environment.

1. Natural Resources and Pollution Control

Two urgent issues are being taken up on a priority basis by *ad hoc* groups of the Committee:

- *Pollution from Fuel Combustion in Stationary Sources*

The group will work with OECD's Energy and Oil Committees to estimate pollution emission from stationary sources (sulphur oxides, nitrogen oxides and particulates which are quantitatively the main air pollutants) and make projections to 1980-85. Alternative policies for pollution abatement will be set out and the options evaluated from a broad cost-benefit point of view, taking account of their effects on trade, economic growth and environmental quality.

- *Pollution from the Pulp and Paper Industry*

This industry discharges very large quantities of harmful organic chemicals into water and some into the atmosphere. In co-operation with OECD's Industry Committee, this *ad hoc* group will make estimates and projections of emission levels, set forth policy options and evaluate the

implications of these alternative approaches.

Other environmental activities will be carried out by groups concerned with a sectoral approach.

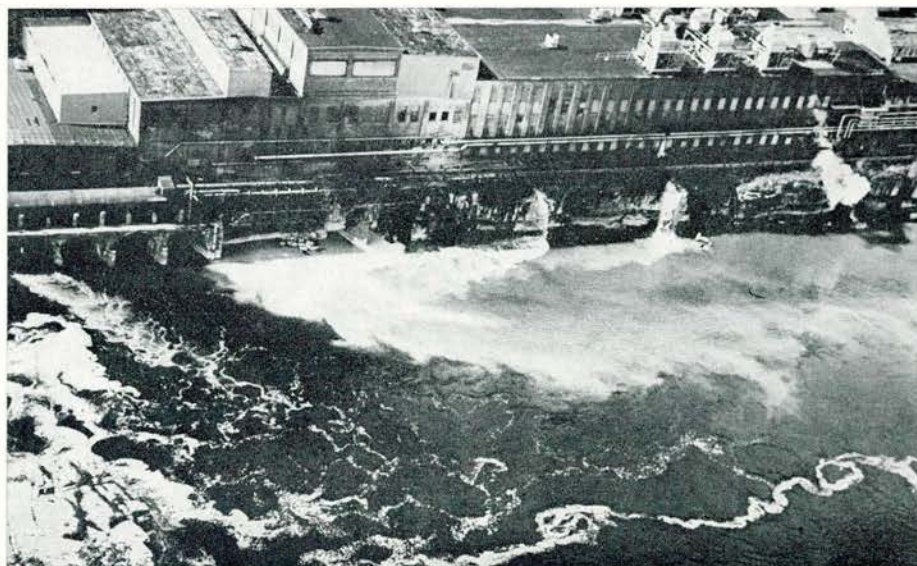
- As regards *air pollution*, a study is being carried out for one type of emission — fluorides — in one particular industry — aluminium smelting. After present emissions are assessed and growth projections made, today's abatement technologies will be examined from a cost-effectiveness point of view and alternative possibilities for abatement set forth.

- A plan has recently been drawn up

for a project to measure the transmission of air pollutants over long distances in Europe. If adopted by the Member countries concerned, the coordinating centre for the project to monitor such transmissions would probably be in Norway, where the authorities have agreed that the Norwegian Institute for Air Research could be host to the project's administration.

- A specialised group has made a review of short and long-term priorities in research into the effects of air pollution, and the results have been communicated to Member countries. Proposals are being made as to those aspects of research which could best

One of the studies being undertaken by OECD's Environment Committee concerns the wastes discharged by the pulp and paper industry.



benefit from international co-operation within the framework of OECD.

- The administrative uses of modelling techniques to predict air pollution have been defined and the state of the art with respect to these techniques reviewed. Future needs for information on the transformation and removal of pollutants in the atmosphere have also been indicated.

- Having completed a review of administrative problems related to the formulation and implementation of policy for control of air pollution in Member countries, OECD will now increasingly be engaged in examining quantitatively the present scale of air pollution and its likely trends in order to be in a position to evaluate the consequences of air pollution and its control from an economic point of view.

In the field of *water pollution*, the programme will deal with methods of water management including the ecological consequences of decisions taken as well as pricing systems and the costs of combatting water pollution. Work on eutrophication (overstimulation of the growth of algae in lakes and reservoirs) will be continued (1) with the emphasis on the role of fertilisers and detergents as a cause, treatment techniques and systems of measuring and monitoring.

Future patterns of water use in one important industry — iron and steel — will be examined and possible economic incentives for decreasing pollution or changing demand patterns evaluated.

Procedures for comparative testing for the biodegradability of detergents have been established. In addition a study has been made of "micropollutants" — those which can be dangerous or unpleasant even in very small quantities.

Finally, the environmental, economic and trade consequences of use, and limitation of use, of *pesticides* and other related chemicals will be investigated. (A first report on the impli-

(1) A recent publication summarises OECD's work to date in this field: "Eutrophication in Large Lakes and Impoundments".



cations of unintended occurrence of pesticides in the environment has already been prepared). An *ad hoc* meeting permitting an exchange of views on the most urgent problems in this field was held recently.

In its first meeting held last November OECD's Environment Committee welcomed a proposal by the United States for setting up within OECD an advance notification system which could form the basis for mutual consultation. According to the procedure envisaged Member governments would notify the others of any measures they planned to take affecting pesticides and other bioactive substances if these are likely to affect the interests of other countries.

2. Improvement of the Urban Environment

With the continuing increase in the number of motor vehicles, their effect on the environment is considered as one of the most pressing problems in all Member countries. Therefore the Environment Committee has gone on record in favour of setting up an *ad hoc* group to undertake a comprehensive assessment of the impact of the motor vehicle on the environment and to examine in cost-benefit terms the implications for the economy, trade and other aspects of life of alternative measures to modify motor vehicles and control their use. This integrated approach will lead to examination of future consequences of motor vehicle use on the environment in terms of

effects such as air pollution, noise, traffic congestion, disposal of used vehicles, problems of land use, etc.

The programme dealing with the urban sector will also include consideration of the economics of alternative policies for the preservation and enhancement of environmental quality in the context of growing population and expanding urban areas. The immediate aim of the programme will be to identify the environmental costs of urban growth and to measure the investment required to maintain and improve the quality of the urban environment.

Thirdly, the programme will examine how improved urban management could ensure greater satisfaction of the growing demands of urban populations for better services and a higher standard in the quality of their life.

* * *

Central Analysis and Evaluation

To provide a comprehensive view of environmental problems and policies and to integrate the various parts of the work, a central analysis and evaluation unit has been set up within OECD's Environment Directorate.

This unit will undertake studies of environmental problems using various analytical tools such as systems analysis, statistical investigations and model building, to make these problems more comprehensible. It will also seek to identify principles and methods applicable to environmental problems as a whole. This work will not only contribute to improving methodology within the field of the environment but also to integrating environmental data into macro-economic studies of growth.

The present programme is by no means a rigid one. The *ad hoc* studies, in particular, are intended to be completed in a relatively short time. As experience accumulates and new needs appear, new programmes will be undertaken. Flexibility is considered essential in a field which involves as many elements, jurisdictions and interests as does that of the environment.

FOOD SURPLUSES, FARM INCOMES AND RISING COSTS AND PRICES

*problems of food and agriculture in highly
industrialised countries*

by A. Simantov
OECD Director of Agriculture

The thinking about agriculture in highly industrialised countries is evolving rapidly. In many cases governments, in consultation with all parties concerned, are considering far-reaching decisions about the future course of agricultural policies.

For a number of years the future of farming was viewed as a continuation of the past. But the sustained economic growth that industrialised countries have experienced over the last twenty years has accelerated the transformation of their economies and societies and is putting the agricultural problems into new perspective. In almost all countries official commissions have been set up to advise the government on the course to follow. Doubts have begun to be voiced about the adequacy of policies which - after thorough investigation and discussion - have been developed in recent years.

In a discussion of agricultural policies of today three problems come to the forefront. The *problem of supply/demand imbalance*, i.e. the problem of farm surpluses, can no longer be considered a temporary phenomenon of a national character in spite of the recent temporary improvement in international markets. It has become chronic, and its international repercussions are becoming increasingly marked. This raises the question of what kind of international trade the industrialised countries are seeking for agriculture.

The *farm income problem* was tackled in the past by means of price and income support policies, as if it could be solved in a few years' time, in a generation at the most. The result has been that the farm income problem has become even more acute in relative terms — a clear condemnation of the policies pursued so far.

Though not specifically an agricultural issue, the *problem of rising prices* is becoming a major concern for the economic policy of all industrialised countries. Agriculture is itself affected by inflationary pressures, but it may also contribute to inflation. Compared with the surplus or the income problems mentioned above the facts relating to these pressures are less well known, but this is likely to become a much debated issue in the months to come.

The Problem of Surpluses

Surpluses are the result of one of the paradoxes of a modern economy. When a country is at a lower level of economic development, food demand may grow rather rapidly on account of its high income elasticity. Total demand also grows relatively rapidly since population growth rates nowadays tend to be substantially greater in low income countries than in high income countries. At the same time, food production grows at a relatively slower rate, on account of the limited stimulus which the overall economic environment gives to agriculture.

On the other hand, when a country has reached a certain level of economic development, as in the case of all the industrialised countries with a market economy, total food demand grows relatively slowly because of the already high level of consumption and of the modest rates of population increase. Production, however, can grow relatively fast because it benefits from the vast amount of new technology available in the economic environment. In fact the agricultural revolution in developed countries is taking place at a time when there is less direct need for it. This situation results in the appearance of surpluses and especially of surplus capacity.

(Continued on page 10.)

Price support policies also have a direct effect on the level of supplies: had these policies never existed or had they never reached their present amplitude, it is likely that an adjustment in the production capacity would have already occurred.

Additional outlets for food in the industrialised countries will not be sufficient to make action on supply unnecessary. Nor will the food situation in developing countries warrant the maintenance in industrialised countries of excess production capacity.

The need to act on supply is also dictated by the growing financial commitments of governments in disposing of surpluses. Government costs in this field are in terms of several billion dollars a year, and they are growing very rapidly. Other forms of support to agriculture are also growing rapidly, but there is widespread recognition that expenditures to dispose of surpluses, including their dumping in international markets, do not provide a satisfactory and durable solution to the farm income problem of the developed countries. On the other hand these increasing expenditures are contributing towards a worsening of the situation in international markets and therefore give rise to growing friction among trading countries.

There seem to be two alternative approaches to the question of avoiding surpluses and of arriving at a satisfactory supply/demand balance, while at the same time ensuring that farmers receive an adequate income.

The first consists of letting prices fulfil their role in equating supply and demand without any other major form of government intervention; and of granting income payments to farmers, preferably payments which are not directly linked to production. In this respect a number of alternative schemes are possible which could guarantee at the same time the interests of farmers, of consumers and of taxpayers, and which could allow for a gradual solution of the income problem in the longer run.

The second alternative consists of maintaining farm prices at levels higher than those which would normally result from the confrontation of supply and demand, and even increasing these prices under certain circumstances; and of applying production and marketing limitations of one sort or another. The advocates of this approach consider that the "price" must compensate the farmer's effort and must constitute the basis of his income: and that if all the disadvantages of a production control or a supply management system cannot be overcome, economic efficiency may to some degree be sacrificed to welfare considerations.

What appears more likely under present circumstances is that governments may adopt a combination of these two alternatives. This may consist of a modest pressure on prices combined with voluntary or semi-voluntary removal of excess production capacity. Farmers will need to participate in the management of the various schemes, since it is generally recognised that farmers, both individually and collectively, are largely responsible for the present situation.

There are at least two reasons why action must be concerted at international level. The first is that in the absence of inter-governmental concurrence the pressures would be great on national governments to defer action on managing supply effectively as long as the country concerned continues to be an importer of a given commodity. Agricultural trade would tend to diminish and the national economies would be deprived of the stimulating effect that trade has on growth. The danger would also exist that food exporting countries facing a shrinking of their foreign outlets might have recourse to countervailing measures in other sectors. The adverse effect on trade as a positive growth factor would become even more pronounced.

The second reason for concerted action is that if a country acts independently to manage supply and to restrict its production capacity, it would inevitably give an advantage to its foreign competitors. Independent action of this nature has been taken with some success by smaller countries, such as Switzerland, Austria and Sweden, which are not in the world markets as large-scale exporters: their production, and in particular their trade, are marginal to world production and trade. But large producers need a guarantee that all major producing trading nations act in concert with each other.

The view was held for a long time that it would be appropriate to manage or to regulate trade as if it were an independent element. Now, however, there is growing recognition that trade is the consequence of the production/consumption balance of each country: failure to recognise that the production policy determines by and large what happens in international markets is believed to have a negative effect on the search for a solution to world trade problems, which are in effect primarily a problem of production/consumption balance at the world level.

The discussion at international level needs therefore to embrace a broader horizon, taking into account the dynamic changes which are occurring in the redistribution of economic activity among countries as a result of economic growth. There are encouraging signs that thinking is developing in this direction on both sides of the Atlantic.

The farm income problem

Reasons for the farm income problem are self-evident, but what is important to stress is that many farmers are not complaining nowadays about poverty but about insecurity. Moreover, the income disparities between agriculture and the rest of the economy have not diminished; within agriculture itself they have tended to grow both as between regions and as between types of farms. In general, income aspirations of farmers have increased faster than their real incomes.

For many years it was thought that the reduction of the farm population would, with increasing productivity, allow those remaining in farming to enjoy higher income levels. But in fact the disappearance of a large number of farmers throughout the industrialised countries has had only a marginal impact on



The dairy sector has encountered problems not only of marketing but also of structural adaptation.

the income situation of those continuing to farm. The price policy was intended to secure adequate incomes to the majority of small farms, but in fact it tends to give undue support to the large commercial operators without substantially changing the position of the small operators.

These developments have convinced governments, farm organisations and the public at large that a price policy, as applied in the past, was not the answer to the income problem of farmers. Price policy needed to be complemented by a structural policy, which all countries are now determined to develop, some reluctantly and without much imagination, others with vigour and foresight.

But here again the prevailing impression is that we are one generation behind, at least, in our thinking. Governments and farmers are investing large amounts in modernising agriculture and in restructuring the sector, but what governments are planning to obtain, through these investments, in ten or twenty years' time, are farms which today can barely provide an adequate income, with the present level of prices and of technology. In ten or twenty years' time, farm prices will continue to be under relative pressure and the technology then available would necessitate far larger units if it were to be applied economically. And in no circumstance is it possible to plan for a slowdown of technical innovations in agriculture if the technological gap between agriculture and the rest of the economy is not to widen, causing the income-producing capacity of agriculture to drop in relative terms.

Agricultural reconstruction costs a lot of money and somebody has to pay for it : the new generation of farmers, the taxpayer or the consumer. The improvement in technical standards and labour productivity does not seem in general to be sufficient to cover all the costs involved, at least not with the present level of interest rates or of rising costs, in particular for land and buildings. While a higher price level may stimulate uneconomic investments and unwanted production, desirable improvements in structures may be held up if returns are too low.

Nobody disputes the desirability of modernising agriculture, but the question as to how this should be done and financed remains for the time being without an adequate and convincing answer. Should governments inject increasing sums of money for modernising agriculture, thus perpetuating the need for a price level higher than that justified by the supply/demand situation; or should they gradually eliminate price supports and devote most of the money allocated to agriculture to social purposes, leaving the modernisation of the sector to take place more than in the past on the basis of market forces ?

There is also the question of what kind of agriculture is wanted for the future. Family farms or large scale operations; owner-operated farms or the extension of tenancy; units owned or operated by a single family or corporate farms ?

It must be borne in mind that the object of these preoccupations is the farmer, not only as a productive force but as an individual, and that in periods of scarce productive resources nothing should be done

to prevent these resources from being channelled to those sectors which are benefiting from an increasing demand. This is the only possibility for enabling the individuals concerned to share in the increasing well-being generated by the growing economy. Moreover, agriculture's role in the economy might need to be reassessed to take into account its influence on the environment.

Another reason for reassessing the structural policies pursued by agriculture, is the growing interdependence between agriculture and the food marketing sector, a highly dynamic sector growing at the same rate as the national economy. Greater attention should be paid to the integration of the entire food sector.

The aim of the price policy has been for a long time to secure adequate incomes to the majority of farmers and to guide production according to market requirements; the reality has shown that these two roles have not been achieved and that a number of myths have thus been created. It would now be wise to develop a structural policy in such a way as to avoid the appearance of myths.

The Problem of rising prices

This is a general phenomenon which has become common to all industrialised countries, but in varying degrees. In the analysis of this phenomenon particular attention is being paid to food prices, as food is a significant item in consumer expenditure, and housewives are immediately aware of any change in prices. Also, the share of food in total expenditure is relatively high in low-income groups, among whom pressure for increased wages may often originate.

In view of the declining income elasticities of demand for foodstuffs, together with the abundance of supplies of most major foods in the industrialised countries, it might have been expected that food prices would not have risen as fast as other prices. In fact in most countries food prices have risen approximately in line with prices in general, and in some cases even faster.

A distinction needs to be made between prices at different levels. Prices received by farmers have increased in practically all countries, though in many cases at a slower rate than food prices to consumers. The trends have varied between commodities, depending partly on the development of supply/demand relationships, partly on the influence of official price support policies.

Prices paid by farmers for agricultural requisites have also increased, sometimes more steeply than prices received by farmers. While prices of machinery, fuel, fertilisers, feeding-stuffs and other items have generally risen moderately, wages of hired labour have increased substantially. Building costs, being largely influenced by wages, have also increased considerably. Cost increases however do not necessarily always justify price increases, since they may be partly or wholly offset by improvements in productivity; and labour productivity increase in agriculture has been substantial.

The rising price of land also has far-reaching effects

on agriculture and tends to impede structural change. The increase in land values is partly due to forces within agriculture — competition between farmers for additional land — and partly to external demands for land, especially in periods of rapidly rising prices.

Farm-gate prices have increased almost everywhere in spite of surplus production or the existing surplus capacity. It is also true that agriculture, while subject to inflationary pressures, has passed back part at least of the inflationary pressure to other sectors. Particularly large farm price increases have taken place in those countries where there are procedures for farm prices determination involving a direct link with non-farm prices and/or wages.

The food marketing sector, both processing and distribution, is also playing an important role in the inflationary process, perhaps an even more important role than agriculture itself. In many cases there seem to be price increases at the retail level far greater than could be justified by the increase of farm-gate prices, especially if the increase in productivity in the marketing sector had been adequate. But how to judge if a price increase at retail level is "normal" or "abnormal" is a difficult undertaking; though efforts are being made in this direction.

Historically, several countries have shown a tendency for the share of national income going to food marketing to grow at the same rate as national income — i.e. to remain a constant percentage of national income, while the agricultural sector accounts for a constantly falling percentage. Thus the distribution and processing bill forms an important and growing component of the final cost of foodstuffs.

There are several reasons for this development. The rise in the share of consumer expenditure going to processing partly reflects increased demand for "convenience foods"; expenditure on eating-out also shows a high income elasticity. At the same time, higher costs of performing marketing operations largely explain the increase in the marketing spread; increased labour costs have generally been a major factor, together with other items such as transport costs, services (e.g. rents), interest rates, publicity, etc. It has also been frequently observed that while increases in farm prices have immediate repercussions throughout the marketing process, reductions in farm prices often do not lead to corresponding reductions in retail prices.

Agriculture can make a contribution towards slowing down the rise of prices. Nevertheless if price reductions are contemplated or if a more liberal import policy is pursued, it is necessary to ensure that the price reductions are passed on to consumers through the marketing process. Moreover, restraint in price support policy for agriculture would no doubt be easier if there were reasonable assurance that cost increases in the economy as a whole will be contained.

While a short-term analysis of the problem of inflation may concentrate on questions of prices and expenditures, in the longer term the growth of productivity and the efficient allocation of resources within the economy are the basic factors determining economic progress: this is true both for agriculture and for the food marketing sector.

POLICY IMPLICATIONS OF THE GROWTH IN HIGHER EDUCATION

New quantitative information on higher education has become available as a result of work carried out by OECD's Scientific Directorate. Comprehensive in nature and having a high degree of comparability from one country to another, the data cover a period of 17 years and 22 OECD Member countries (1). The following article, based on an analysis by OECD's Educational Investment and Development Division, highlights the changes revealed by the study and draws some implications for policy formulation.

(1) "Development of Higher Education 1950-1967 : Statistical Survey" has just appeared.

In view of the rapid expansion of post-secondary education during the 1950's, one of the major policy questions that arises is whether this, the most rapidly growing sector of education (along with pre-school), will continue its present rate of growth into the next decade and beyond.

A purely mechanical extrapolation of past trends, taking into account demographic projections, would indicate a doubling or tripling of student numbers by 1980 in most countries even though some of them have seen a levelling off in enrolments in recent years.

There are several, compelling reasons why the growth of enrolments seems likely to persist even if the rate slows down somewhat.

The Forces behind the Expansion

- In spite of the high growth rate of the late Fifties and early Sixties (some 10 per cent on average for the OECD area as a whole and 14 per cent or more for five countries) no OECD Member country, at least in Europe, has reached anything like the stage of "mass" higher education. In the United States more than a third of the relevant age group are enrolled in higher education while in Europe the corresponding enrolments are more likely to be in the five to eight per cent range; in no European country does the figure exceed 12 per cent (in 1965 no European country had reached the US figure for 1950). Thus the demographic potential is far from being exhausted, particularly in Europe.

- The analysis shows that so far the factor which has had the greatest impact on the quantitative expansion of higher education has been the increase in numbers of secondary school graduates. Here too there is considerable potential for future expansion, for although growth in secondary enrolments has been considerable everywhere the proportion of the age-group involved has remained well below 50 per cent in most countries. Furthermore, the school-leavers who entered university were almost exclusively the products of general (academic) secondary education.

To combat this tendency, many countries have introduced reforms designed to open up access to university for graduates from a wider range of secondary schools and to provide "second routes" to higher education for students who have dropped out or otherwise missed a first opportunity at post-secondary education.

These reforms have not had any major quantitative impact as yet, but as they become more widespread and as secondary education itself becomes generalised they will considerably increase the pressure of numbers on institutions of higher education. The same is true of the growing demand for adult education and for manpower retraining.

- Despite increasing participation of women in higher education — from 22 to 29 per cent of the total student population between 1950 and 1967 — their enrolment rates are still only one third to one half that of men — a wide gap, which authorities in most countries are trying to narrow. These efforts again indicate considerable growth potential.

- An even more powerful force for future growth will result from efforts to reduce existing disparities between different socio-economic groups. Students from the lower strata of society today represent at best not more than 26 per cent and in many European countries only 10 per cent — or even less — of university enrolments although these classes constitute up to 50 per cent of the total population.

The theoretical prediction of continuing high growth rates is corroborated by a number of projections recently published in several Member countries and by country replies to a recent OECD educational growth enquiry; these show a distinct trend towards expansion, though at a rhythm that is expected to be somewhat slower for the period 1965-1975 than for the preceding decade.

From these indications it can be reasonably assumed that the sheer problem of growth will continue to be a major preoccupation of the higher education policies in OECD countries, and that, consequently, such policies will increasingly be concerned with measures for exerting a greater element of control over the size, nature and actual direction of this growth. (*Continued on page 14.*)

The Patterns of Growth

The study of expansion patterns of higher education reveals no direct correlation with the factors traditionally thought to influence educational growth. There is, for example, no apparent relation between enrolments and the wealth of a country (or its rate of economic growth). Both Greece and Sweden have been among the countries having the highest rates of growth in post-secondary education while both Switzerland and Spain were long among those with relatively low rates. The same is true, as to the level of scientific and technological development of the country. Even the demographic factor played only a limited role; in the majority of countries it accounts for no more than 20 per cent of the growth in enrolments, and in some countries higher education expanded during a period in which the size of the age group was contracting.

This apparently arbitrary nature of the growth pattern may conceal more complex relationships which available figures and statistical or analytical techniques are not yet able to identify, but the picture which emerges is one in which OECD countries have clearly been faced with an expansion showing a high degree of "spontaneity" or "autonomy".

As to the variables which are "internal" to the educational system, it is not possible to discern any pattern here either. For example, the rate of growth in expenditure on higher education is on the whole independent of enrolment growth rates. Even measures introduced deliberately in order to bring about changes within the system cannot as yet be shown to have affected growth patterns. Thus, for example, measures taken with regard to selection in some higher education institutions will not, the evidence indicates, affect overall expansion, because restrictions in one part of the system will almost automatically be compensated by faster growth in others, and vice-versa.

An analysis of the comparative growth rates of universities on the one hand and non-university establishments on the other (2) shows that, on the whole, the two sectors have developed at roughly the same rate and had roughly the same weight in post-secondary education in 1965 as a decade earlier. Yet policies in many countries were directed to the rapid development of the non-university sectors to relieve the pressure on universities, to provide needed professional manpower and to encourage badly needed innovations in a sector that would be less resistant to change than the universities. In the actual evolution the universities remained as important a pole of attraction as in the past and there is no evidence of individual policy measures which influenced the balance of the different post-secondary components.

A similar observation can be made with regard to the level of student fees and the introduction of student grant schemes. These may be, and are in fact, used as an effective policy tool with which to pursue such major objectives as equalisation of educational opportunity, but such measures have not by themselves exerted a decisive influence on overall patterns of growth in higher education.

Taken together with other evidence this conclusion reinforces the view that a decisive impact on growth patterns of higher education can only come about through major and comprehensive reform measures. In this respect, the case of Yugoslavia provides a good illustration of a reform which had a radical influence on the growth

1. STUDENTS ENROLLED IN HIGHER EDUCATION

Country	Enrolment 1955-56	Enrolment 1966-67	Growth %
Austria	19,124	48,965	155
Belgium	38,367	91,059	137
Denmark	21,876	56,071	156
Finland	19,803	47,662 (1)	140
France	(207,700)	505,278 (1)	(143)
Germany	201,627	423,274 (1)	110
Greece	20,887	64,591	209
Iceland	762	1,221	60
Ireland	9,256	16,135 (2)	98
Italy	222,545	476,825	114
Luxembourg	691	1,558	125
Netherlands	57,535	134,661	134
Norway	(7,500)	31,413	(318)
Portugal	(18,500)	38,484	(108)
Spain	(94,000)	212,849	(126)
Sweden	27,229	90,076	231
Switzerland	19,123	41,784	118
Turkey	(37,000)	110,182	198
United Kingdom	(203,000)	478,721	(136)
Yugoslavia	69,650	195,454	(180)
Canada	100,000	326,800 (1)	227
Japan	609,685	1,239,293	103
United States	2,678,623	5,930,000	121

(1) 1965-66 (2) 1964-65

pattern of higher education (3). Between 1955 and 1960 the number of new entrants into universities in Yugoslavia was increasing at an annual rate of 17.7 per cent. In the period 1960 to 1965 this increase was reversed to an annual decrease of 1.9 per cent, while the rate of growth of the non-university sector was maintained at a very high level throughout the period. This exceptional and purposeful reversal of the trend took place after the introduction, in the late Fifties, of a major reform, the main characteristic of which was undoubtedly its global nature affecting simultaneously all the crucial aspects of the existing system.

(2) Though this division of the system into two distinct parts is by now becoming increasingly artificial, for the period 1950-1967 it nevertheless corresponded to the actual situation in the great majority of countries. The respective definitions are explained in the Statistical Survey and the Analytical Report and the whole problem of post-secondary structures is being investigated in detail within the framework of the current programme of the OECD Education Committee.

(3) A study entitled Innovation in Higher Education - Reforms in Yugoslavia has just been published by OECD as one of a series which has also covered reforms in France, Germany and the United Kingdom.

2. COMPARATIVE GROWTH OF EXPENDITURE ON AND ENROLMENTS IN HIGHER EDUCATION

(average annual growth rates)

Country	Period	Total expenditure	Current expenditure	Enrolments
Belgium	1958-67	12.5	18.3	8.6
Canada	1954-65	19.6	16.6	12.3 (1)
Denmark	1955-66	25	22	7.3
Finland	1950-67	12.5	11.1	7.3
France	1958-68	14.9	13.3	9.8 (1)
Germany	1957-66	17.1	16.3	5.0
Iceland	1950-57	••	2.4	••
	1957-67	••	16	••
Ireland	1951-63	8.9	••	4.8
Italy	1950-65	••	15	3.9
Japan	1950-65	12.5	11.1	6.9
Netherlands	1950-68	18	16.8	5.6
Norway	1950-67	9.8	10	7.2
Spain	1950-68	12.4	11.4	••
Turkey	1950-67	7.2	5	7.1
United Kingdom (England and Wales)	1950-66	11.4	9.8	5.1 (1)
United States	1955-67	11.7	11.4	7.5
Yugoslavia	1952-67	••	18.2	9.6

(1) Universities only.

Note : Current expenditures are deflated according to a cost of living index.

Science and the Humanities

It is instructive to look at how the rapid expansion of higher education has affected the general physiognomy of the system as represented by the distribution of students by field of study.

Five general trends can be observed :

- a substantial decrease in the percentage of students enrolled in law and in medicine;
- a slight decrease in the percentage of students in technology;
- a slight increase of students in pure science;
- an increase of students in social sciences;
- a heavy increase of students in the humanities.

The trends regarding law and medicine are not surprising : both represent traditional university disciplines and they could not, in relation to the total enrolments, but diminish in view of the development of new university subjects. (Moreover, some occupations which originally required law as a background now demand other fields of specialisation such as economics or business manage-

ment.) The reverse is true in respect to social sciences where, in fact, an even more substantial increase could have been expected.

The trends concerning pure science and technology deserve closer attention. When these sectors are considered together, the proportion of students enrolled in them remained, in the majority of countries, roughly the same in 1966 as it was in 1955 (from 20 to 50 per cent of total enrolments), the slight increase in pure science compensating for the decrease in technology. Thus, the much talked-about, and at times dramatised, "swing away from science" cannot be confirmed statistically for the period under consideration. (However more recent figures indicate a real decline in both science and technology.) Since most countries have been giving strong support to the development of science and technical education since the late Fifties, it might be expected that enrolments in science and technology would grow more rapidly than they actually did, and the fact that they remained more or less stable can only be considered as a "disappointing" result from the point of view of the policy maker. Indeed, while practically all of the projections of the late Fifties and early Sixties greatly underestimated total enrolments, most of them overestimated the proportion which would enrol in science and technology. The reverse is true of students in humanities : very few policy makers expected (and probably even fewer desired) the significant relative increase in humanities enrolments which actually took place.

In this respect, as in others, the system seems to have shown a degree of resistance to policy incentives. To a great extent the increase in the humanities can be attributed to the rise in female enrolments. Conversely, many countries, though officially supporting the development of technology, were forced, mainly for financial reasons, to introduce a *numerus clausus* in the engineering faculties, which traditionally were open to all. (This also applies to medicine.) The situation which thus arose was somewhat paradoxical : policy incentives were given for the "training-oriented" fields of study but these were accompanied by greater selectivity of students applying for these branches. At the same time, the "culture-oriented" fields remained open to absorb the large majority of the new population entering higher education — with a consequent increase in the "drop-out" rate.

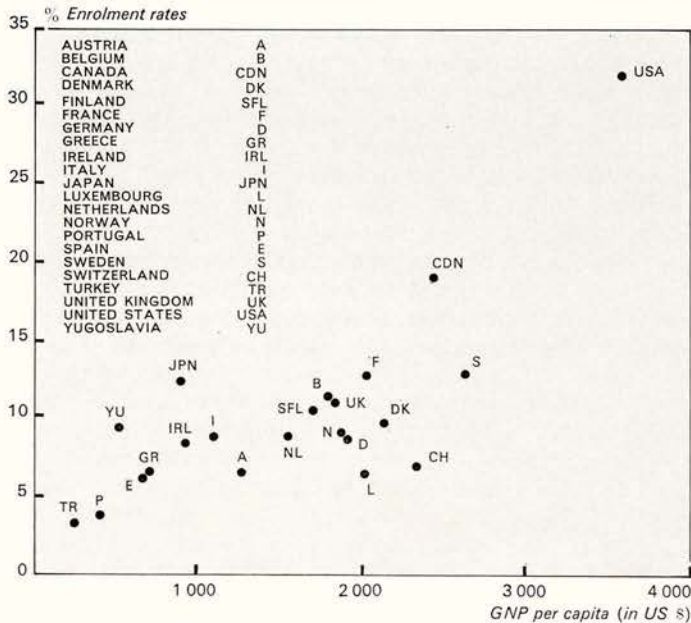
This, of course, is too crude an explanation for the complexity of factors which determine the students' choice of studies — an issue which deserves deeper investigation if individual demand for education is to be more closely aligned to social needs. It does, however, further illustrate the point that no single-dimension policy measure, such as the allocation of more funds to a particular field of study, can by itself exert any major influence on traditional growth patterns; behind these obviously lie deeper forces stemming from established educational structures and social attitudes and deficiencies.

The Products of Higher Education

Three main conclusions emerge from the analysis of students leaving higher education with a degree :

- Almost everywhere the number of higher degrees

A. ENROLMENT RATES IN HIGHER EDUCATION AND GROSS NATIONAL PRODUCT PER CAPITA (1965/1966)



awarded has increased far more rapidly than the total of first degrees. This trend is likely to continue in the future, and the growing demand for graduate education will thus present policy makers with problems similar to those already encountered at lower levels.

- The proportion of degrees awarded in science to total enrolments increased more rapidly between 1955 and 1965 than in any other branch, especially in Europe. The high "productivity" of the system in science is not, of course, unrelated to the selection process which controls access to this field of study.

- There are still marked disparities among OECD countries and regions, both in the total output of the higher education systems and in the nature of this output. Thus, the proportion of the age-group graduating in science and technology in 1965 was 3.97 per cent in the United States while the highest figure in Europe was 2.38 per cent (the United Kingdom) with the other countries ranging from less than 1 to 2 per cent. The corresponding figure for the USSR was 5.72 per cent. Similar differences are evident in the total number of graduates: in no European country were more than 6.2 per cent of the age-group awarded a first level university degree (the majority of countries falling between 2 and 4 per cent), while in Japan the figure was 10 per cent, in the United States 22 per cent and in the Soviet Union 14 per cent.

In considering the economic significance of these figures and their possible relationship to labour market requirements and job availability, it should be borne in mind that the United States, with a GNP per capita which is about twice or three times as high as that of the more advanced European countries, absorbs four to five times as many graduates. Japan, with a GNP per capita about half or two thirds the European one, provides employment to almost three times as many graduates.

This in itself would indicate that the notion of an "over-production" of graduates is a very dubious one; even if a temporary "overproduction" may in fact arise in certain branches, the very low figures quoted in Europe would provide a decisive argument against basing policy decisions on such a notion.

The problem of the output of graduates is necessarily linked to the question of the productivity of the system. Statistical evidence confirms the widely-held opinion that for the university sector "productivity" deteriorated in general over the past years: the relation between the numbers of new entrants and the number of degrees awarded has, in the majority of countries, noticeably worsened between 1950 and 1955. The present overall drop-out rates range from 10 to 60 per cent; the lowest rates are to be found in those countries with a highly selective university system (UK and Japan) and in fields of studies, institutions or faculties with relatively rigid limitation on access. It also appears that fields of study

The number of students in higher education has doubled or tripled in most during the



in which enrolments increased rapidly have had the highest drop-out rates. This might indicate a direct relation between increase in number and drop in the productivity of a system. However, such a conclusion is subject to certain qualifications.

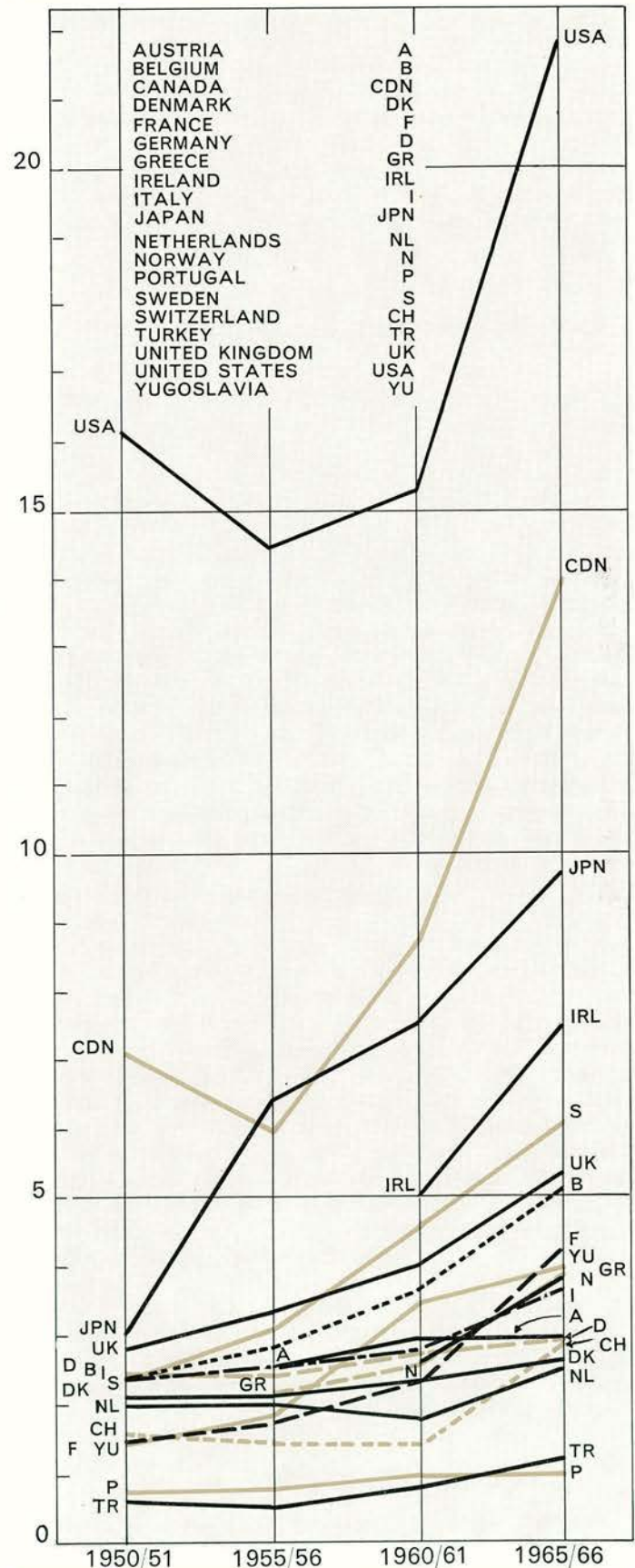
First, whenever one part of the system shows increased productivity, drop-outs tend to increase in another. Thus, for example, in many countries where overall university drop-outs have grown, the non-university sector maintained and even improved its productivity. While in general the number of drop-outs was higher in university than in non-university education the opposite is true for the United Kingdom, where around 90 per cent of students entering universities receive a degree but up to 40 per cent drop out in the non-university sectors.

Although from a cost point of view drop-outs can be assimilated to wastage, it is far from certain that this holds true if a wider economic and social point of view is taken of the matter. In a perspective of continuing or

OECD countries during the last decade and is expected to do so again 1970's.

B. FIRST-LEVEL UNIVERSITY DEGREES

as % of relevant age group



recurrent education, moreover, the concept of drop-out disappears altogether; there is no justification for considering those who do not finish college or university as "lost" to the educational system, and it can be argued that what actually happens to the individual "drop-outs" themselves represents the only criterion by which the whole problem can be analysed. Under what conditions do they enter the labour market? To what extent does leaving the university without a degree lead to frustration and alienation? Or, conversely, in spite of an "unfinished" education, what intellectual and other enrichment did nevertheless take place? No data are at present available for such an analysis, but at least the problem would have to be stated in these terms before more reliable policy conclusions can begin to be considered.

The Main Issues for Policy Makers

It is clear from OECD's quantitative survey that the pressure of numbers will continue to be the conditioning factor in the future development of higher education systems in Member countries. This pressure, reflecting rising social demand for education, will grow steadily with the growing democratisation and generalisation of secondary education. What happens at the secondary school level will, therefore, have a decisive influence on the future of higher education. It is this consideration which makes the reorganisation of upper secondary education a most crucial, and at the same time, sensitive policy issue in most countries; the dilemma derives essentially from the difficulty of integrating the two functions traditionally served by this level of education — the academic (preparation for university entry) and the technical/vocational (labour-market entry preparation) — which would be necessary in order to eliminate the socially biased selection which operates most dramatically at this level in the system.

The problem of selection, and that of admission policies which lies behind it, will thus be posed in increasingly acute form, in terms both of access to the higher education system and of choice of institution or discipline. As things stand at present, both access and choice are, in effect, largely determined by selection resulting from specialisation at the final stages, and often earlier, of secondary education. This results in educational paths which, except within groups of related disciplines, are irreversible, making for failure, frustration, and waste. It will be a major challenge to policy to devise ways and methods by which the discontinuities which characterise the present educational system at its higher levels, with its marked distinctions of institutional types and "channels" and of social, academic and professional status, be attenuated through a more "comprehensive" approach to the post-compulsory education sector as a whole. This concern is fully reflected in the current emphasis in OECD Member countries on the planning of future structures of post-secondary education, in their attempt to reconcile the apparently conflicting policy objectives of how to satisfy rising individual demand for further study, with limited resources and without depriving the economy of needed trained manpower.

The need for a comprehensive attack on the problem as the only way of exerting any significant influence on the evolution of the higher education system, in the face

of the system's autonomous dynamics rooted in deeper social and political attitudes and structures, is amply demonstrated by the relative ineffectuality of partial measures directed to this end, as documented in the study. Partial measures — such as expanding, spasmodically and at times under crisis conditions, existing institutional facilities to accommodate increasing numbers of students, or even supporting the development of the short-cycle professional sector as an economical way (costs per student being cheaper there) of relieving enrolment pressure on universities — represented in effect "defensive" responses on the part of the authorities in facing the problem of demand in view of scarce resources and steadily rising costs, both absolute and relative. It is in fact in the post-secondary sector that the increase in expenditure has been the greatest, the growth rate exceeding 12 per cent a year in three-quarters of the Member countries and over 14 per cent in five of them — i.e. on the average faster than the growth of enrolment rates.

The concern with the additional resources needed to match the inevitable increase of enrolments will dominate the policy debate on higher education in the years immediately ahead. There are already signs in a few Member countries that higher education cannot be allowed to continue to absorb an increasing proportion of the GNP and of the public budget. Greater efficiency is being demanded of the system through better management in the use of available resources. While policy measures in this direction are obviously highly desirable, the situation need not be over-dramatised. As far as teaching resources are concerned, there no longer seems to be a bottleneck, at least in quantitative terms; the number of teachers in the higher education sector increased faster than student enrolments in most Member countries so that many of them are beginning to witness a surplus of candidates over teaching jobs available.

With regard to financial resources, assuming a 6 per cent average annual increase in the GNP, which is within the targets set for 1980 by the OECD Ministerial Council last year, and a continuation of the trend toward a somewhat higher growth rate of public expenditure, there should be no major problem in providing for a continuation of a 10 per cent average enrolment growth rate. Difficulties will arise, however, if the trend in the rise of unit costs continues, and, above all, because of the need to introduce qualitative changes in the system. These are made necessary by the new and heterogeneous clientele of higher education with its variegated aptitudes, motivations and expectations which calls for diversification of content and of methods of teaching, of patterns of study and of institutional and organisational structures to match the increasing heterogeneity of the student body itself.

The pressure of numbers thus provides a unique opportunity for experimentation and innovation in the higher education system which would have been impossible under its former traditionally elitist character. Whether the resources needed to bring about the necessary transformation will be made available, and what share of the public budget this will absorb, is, in the last analysis, a question of political choice and priorities. The one fact which is certain is that the demand for higher education will continue to grow. The challenge for the policy-maker is to assess the costs of how such demand can be effectively met through making education relevant, but, also to weigh up the costs that may result if the necessary investment to this end is not made in time.

THE OECD MEMBER COUNTRIES (7th year)



The OECD OBSERVER presents in this issue a set of tables showing the diversity of the economies of the twenty-two Member countries of the Organisation. These tables, which were drawn up at the end of 1970, set forth the final statistics for the year 1969. They are not intended to provide all the comparative data needed for an understanding of each country's economic situation in relation to the OECD group as a whole: they give some idea, however, of the economic pattern in the individual countries.

The figures have been supplied by the Statistics and National Accounts Branch of OECD. For further information, readers are referred to other statistical publications of the Organisation: Main Economic Indicators, Statistical Bulletins of Foreign Trade, Manpower Statistics, and Statistics of National Accounts.



SYMBOLS EMPLOYED:

- () OECD Secretariat Estimate;
- Nil;
- .. Not available.

Unless otherwise stated, all the figures are for 1969.

	AREA (1,000 sq. km)	AGRICUL- TURAL AREA (1,000 sq. km)	TILLAGE and temporary grassland (1,000 sq. km)	POPULATION (thousands)	INHAB- ITANTS per sq. km
AUSTRIA	83.8	39.0	16.8	7,373	88
BELGIUM	30.5	16.2	8.9	9,646	316
CANADA	9,976.1	643.6 1966	434.0 1966	21,089	2
DENMARK	43.1	30.0	26.9	4,893	114
FINLAND	337.0	28.3	26.8	4,706	14
FRANCE	551.0	331.2	192.5	50,325	91
GERMANY	248.5	136.4	80.7	60,848	245
GREECE	131.9	90.9 1967	38.5 1967	8,866	67
ICELAND	103.0	22.8	—	203	2
IRELAND	70.3	48.0	11.6	2,921	42
ITALY	301.2	194.1	143.2	54,120	180
JAPAN	369.7	66.3	56.8	102,380	277
LUXEMBOURG	2.6	1.4	0.7	338	130
NETHERLANDS	36.6	22.4	9.3	12,873	352
NORWAY	323.9	9.9	8.4	3,851	12
PORTUGAL	91.6	49.4 1967	41.3 1967	9,583	105
SPAIN	504.8	342.6	204.8 1967	32,949	65
SWEDEN	449.8	34.5	30.6	7,969	18
SWITZERLAND	41.3	21.8	3.9	6,224	151
TURKEY	780.6	523.9 1967	266.0	34,375	44
UNITED KINGDOM	244.0	194.1	73.8	55,643	228
UNITED STATES	9,363.4	4,356.1 1967	1,764.4 1967	203,213	22

TOTAL INCREASE IN POPULATION percentage (annual average 1959-1969)	NET IMMIGRATION (+) OR NET EMIGRATION (-) 1969 (thousands)	TOTAL CIVILIAN EMPLOYMENT (thousands)	of which :		
			AGRICULTURE, FORESTRY AND FISHING (%)	INDUSTRY (%)	OTHER (%)
0.50	- 1	3,017	19.1	39.9	41.0
0.60	+ 7	3,683	5.2	44.8	50.0
1.85	+ 103	7,780	8.2	32.3	59.5
0.75	+ 4	2,294	11.9	38.5	49.6
0.70	- 13	2,116	24.5	34.6	40.9
1.05	+ 151	19,967	15.1	40.6	44.3
1.05	+ 572	26,337	9.6	49.1	41.3
0.70	- 29	(3,662)	(48.2)	(22.5)	(29.3)
1.65	- 1	78 1968	18.8	37.3	43.9
0.25	- 17	1,061	28.4	29.7	41.9
0.85	- 57	18,678	21.5	43.1	35.4
1.05	+ 7	50,400	18.8	35.0	46.2
0.80	+ 2	140	11.6	45.7	42.7
1.25	+ 20	4,510	7.5	41.3	51.2
0.80	+ 2	1,474	14.7	36.8	48.5
0.90	- 11	3,109	31.5	35.5	33.0
0.95	- 39	12,243	30.7	37.1	32.2
0.70	+ 44	3,821	8.8	40.4	50.8
1.70	+ 24	(2,740)	(7.3)	(51.9)	(40.8)
2.55	. .	(13,519)	(72.1)	(11.6)	(16.3)
0.65	- 26 1968	24,904	2.9	46.8	50.3
1.35	+ 406	77,902	4.6	(33.7)	(61.7)

Notes : a) Gross Domestic Product at market prices.
b) Includes stock appreciation.
c) Net Domestic Product.
d) Electricity, gas and water included in "other activities".

BLEU : Belgium-Luxembourg Economic Union.

★ Since Sweden was the first country to take into use the new UN-OECD national accounts system for the presentation of information regarding 1969, the results arrived at are not comparable with those of other countries; for this reason 1968 GNP figures are provided for reference.

		AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND	IRELAND	ITALY	JAPAN	LUXEMBOURG	NETHERLANDS	NORWAY	PORTUGAL	SPAIN	★ SWEDEN	SWITZERLAND	TURKEY	UNITED KINGDOM	UNITED STATES
GROSS NATIONAL PRODUCT at market prices	at current prices and exchange rates (million US \$)	12,470	22,810	72,930	13,990	9,140	139,610	153,280	8,400	380	3,040 1968	82,020	167,200	710 1967	28,240	9,730	5,750	28,740	25,570 1968	18,820	13,020	109,400	947,810
	at 1963 prices and exchange rates (million US \$)	10,250	18,240	58,590	10,640	8,340	117,390	128,700	7,200	380	2,800 1968	67,520	128,050	610 1967	20,500	7,610	4,500	23,440	20,590 1968	14,690	10,230	100,990	781,800
	per capita at current prices and exchange rates (US \$)	1,690	2,360	3,460	2,860	1,940	2,770	2,520	950	1,890	1,040 1968	1,520	1,630	2,130 1967	2,190	2,530	600	870	3,230 1968	3,020	380	1,970	4,660
STRUCTURE OF GROSS DOMESTIC PRODUCT (%) at factor cost	agriculture	7.0	5.3	5.9 1967	8.9	14.7	6.0 ^(a)	3.6 ^(a)	20.3	• •	19.7 1968	11.3	8.7 ^(c)	6.2 1967	7.0	6.5	17.7	15.0	5.9 1967	• •	32.2 ^(c)	3.0 ^(b)	2.9 ^(a)
	mining and quarrying, manufacturing industry, construction, electricity, gas and water	46.8	41.6	38.5 1967	40.1	41.3	48.1 ^(a)	53.9 ^(a)	28.2	• •	34.0 1968	38.9	39.1 ^{(c) (d)}	50.9 1967	41.6	38.6	42.8	35.3	45.2 ^(a) 1967	• •	27.4 ^(c)	45.7 ^(b)	35.8 ^(a)
	other activities	46.2	53.2	55.6 1967	51.0	44.0	45.9 ^(a)	42.5 ^(a)	51.5	• •	46.3 1968	49.8	52.2 ^{(c) (d)}	42.9 1967	51.4	54.9	39.7	49.6	48.9 ^(a) 1967	• •	40.5 ^(c)	51.3 ^(b)	61.3 ^(a)
GROSS FIXED ASSET FORMATION	percentage of GNP at current prices	23.2	21.2	21.7	22.0	23.8	25.4	24.4	29.7	25.4	19.9 1968	20.5	35.2	25.1 1967	25.5	25.3	18.4	22.0	23.6 1968	25.6	• •	17.3	16.7
	US \$ per capita at current prices and exchange rates	390	500	750	630	460	700	620	280	480	210 1968	310	570	530 1967	560	640	110	190	760 1968	770	• •	340	780
PRIVATE CONSUMPTION EXPENSES	percentage of GNP at current prices	57.2	62.2	59.2	62.0	54.3	60.4	55.3	67.1	63.2	68.7 1968	63.4	51.3	61.1 1967	55.8	55.7	71.7	68.6	55.3 1968	57.6	• •	62.4	61.2
	US \$ per capita at current prices and exchange rates	970	1,470	2,050	1,770	1,060	1,680	1,390	640	1,190	720 1968	960	840	1,300 1967	1,220	1,410	430	600	1,790 1968	1,740	• •	1,230	2,850
CURRENT GOVERNMENT EXPENDITURE AND REVENUE (% of GNP)	current expenditure	31.7 1968	33.0	30.3 1968	31.6	28.3	33.5	32.0	24.0	25.4 1968	29.4 1968	32.9	14.1	33.8 1967	37.1	37.0	• •	17.9	37.4 1968	23.4	• •	32.8	28.9
	current revenue	37.5 1968	34.2	35.2 1968	37.1	35.9	38.1	37.9	26.9	33.9 1968	30.7 1968	33.3	21.2	36.0 1967	41.9	43.4	• •	22.4	48.1 1968	28.1	• •	39.0	31.5
OFFICIAL HOLDINGS of gold and foreign exchange 31st October 1970 (million US \$)		1,563	2,406 BLEU	3,846	384	379	4,617	10,940	290	59	694	4,642	3,072	2,406 BLEU	2,621	607	(1,442)	1,518	506	3,616	313	2,469	12,306
OFFICIAL DISCOUNT RATE 30th November 1970 (with date of last change)		5.00 22-1-70	7.00 22-10-70	6.00 12-11-70	9.00 12-5-69	6.00 28-4-62	7.50 27-8-70	6.50 18-11-70	6.50 15-9-69	5.25 1-1-66	7.31 31-7-70	5.50 9-3-70	6.00 28-10-70	7.00 22-10-70	6.00 4-8-69	4.50 27-9-69	3.50 25-4-70	6.50 23-3-70	7.00 10-7-69	3.75 15-9-69	7.50 1-7-61	7.00 15-4-70	5.75 11-11-70

BLEU : Belgium
Luxembourg
Economic Union

AUSTRIA

BELGIUM

CANADA

DENMARK

FINLAND

FRANCE

GERMANY

GREECE

ICELAND

CURRENCY

monetary unit

Schilling

Belgian Franc

Canadian Dollar

Krone

Finnish Mark

French Franc

Deutsche Mark

Drachma

Krona

currency units
per US \$
30th October 1970
market rates

25.870

49.630

1.021

7.504

4.176

5.521

3.631

30.000

88.100

IMPORTS
(goods only)

total (CIF)
(million US \$)

2,825

9,984
(BLEU)

13,137

3,800

2,023

17,392

24,926

1,594

123

from other OECD
countries
(million US \$)

2,296

8,064
(BLEU)

11,796

3,255

1,503

12,849

18,855

1,247

99

from rest of world
(million US \$)
(excl. unspecified)

529

1,917
(BLEU)

1,341

545

520

4,536

6,045

347

24

total imports
as percentage of GNP
at current prices

22.6

42.3
(BLEU)

18.0

27.2

22.1

12.5

16.3

19.0

32.1

increase in volume of
total imports from 1964
to 1969
(percentage per year)

9.4

10.7
(BLEU)

12.0

7.4

6.1

11.0

10.1

10.4

• •

EXPORTS
(goods only)

total (FOB)
(million US \$)

2,412

10,069
(BLEU)

13,754

2,958

1,985

15,020

29,052

554

108

to other OECD countries
(million US \$)

1,809

8,983
(BLEU)

12,495

2,508

1,479

10,833

22,966

375

89

to rest of world
(million US \$)
(excl. unspecified)

603

1,021
(BLEU)

1,259

432

505

4,187

6,021

178

19

total exports
as percentage of GNP
at current prices

19.3

42.6
(BLEU)

18.9

21.1

21.7

10.8

19.0

6.6

28.2

increase in volume
of total exports
from 1964 to 1969
(percentage per year)

11.5

11.3
(BLEU)

8.9

6.9

9.0

9.8

11.4

13.1

• •

FOREIGN
TOURISM

In thousands :
(a) nights in all types of lodgings
(b) arrivals of foreign tourists at frontiers
(c) estimate of the number of nights spent in the country
(d) nights in hotels only

(a)

(a)

(b)

• •

• •

(c)

(a)

(b)

(b)

52,390

6,565

12,800

• •

• •

112,500

18,883

1,139

44

percentage of change
over 1968

+ 7

+ 5

+ 6

• •

• •

+ 9

+ 9

+ 30

+ 9

IRELAND	ITALY	JAPAN	LUXEMBOURG	NETHERLANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZERLAND	TURKEY	UNITED KINGDOM	UNITED STATES
Pound	Lira	Yen	Luxem- bourger Franc	Guilder	Krone	Escudo	Peseta	Krona	Swiss Franc	Lira	Pound	Dollar
0.418	622.400	357.610	49.630	3.598	7.150	28.790	69.590	5.188	4.334	14.850	0.418	1.000
1,413	12,450	15,024	9,984 (BLEU)	10,991	2,943	1,231	4,233	5,899	5,272	754	19,956	(FOB) 36,052
1,221	8,180	6,257	8,064 (BLEU)	8,952	2,560	886	3,013	4,943	4,678	583	12,097	(FOB) 25,323
176	4,254	8,766	1,917 (BLEU)	2,037	383	339	1,219	957	594	171	7,860	(FOB) 10,717
41.5	15.2	9.0	42.3 (BLEU)	38.9	30.2	21.4	14.7	• •	28.0	5.8	18.2	3.8
8.0	10.6	13.4	10.7 (BLEU)	8.9	9.8	• •	14.4	7.6	7.7	• •	4.6	11.9
891	11,729	15,990	10,069 (BLEU)	9,965	2,203	823	1,900	5,688	4,640	537	17,515	37,988
817	8,543	7,550	8,983 (BLEU)	8,458	1,866	554	1,299	4,668	3,532	387	10,811	24,924
44	3,075	8,434	1,021 (BLEU)	1,384	337	266	588	1,021	1,109	150	6,704	13,052
26.2	14.3	9.6	42.6 (BLEU)	35.3	22.6	14.3	6.6	• •	24.7	4.1	16.0	4.0
7.4	14.5	17.6	11.3 (BLEU)	11.1	8.8	• •	14.2	7.3	10.9	• •	6.3	4.9
(c) 20,892	(a) 66,283	(d) 3,806	(a) 1,629	(d) 5,655	(c) 24,290	(c) 10,548	(a) 45,323	• •	(a) 29,699	(b) 435	(c) 89,500	(b) 12,347
- 1	+ 8	+ 10	+ 7	+ 5	+ 11	+ 9	+ 17	• •	+ 4	+ 13	+ 11	+ 15

CALORIES per inhabitant and per day 1968-1969 or 1968				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				2,990	1967-68 3,150 (BLEU)	1967 3,160	3,180	2,900	3,160	2,990	1967 2,910	• •
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
3,450	2,940	2,460	1967-68 3,150 (BLEU)	1967-68 3,240	2,910	2,930	2,750	2,750	3,060	• •	3,180	3,210

DWELLINGS COMPLETED (number per 1,000 inhabitants) 1968				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				6.6	5.0 (BLEU)	8.2	9.0	7.9	8.2	8.6	10.1	1967 9.0
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
4.0	5.1	11.9	5.0 (BLEU)	9.7	8.8	4.3	6.4	13.4	8.6	3.3	7.7	7.7

NET CONSUMPTION OF ELECTRICITY kWh per head and per year (excluding losses)				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				2,647	2,671	8,199	2,413	3,836	2,407	3,322	823	3,695
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
1,577	1,810	2,734	6,888	2,565	12,976	607	1,245	6,803	3,886	194	3,680	7,013

PUBLIC EDUCATION EXPENDITURE as a percentage of GNP at market price				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				1967 4.4	1967 5.6	1965 5.7	1968 6.0	1969 6.3	1967 4.8	1966 3.0	1968 2.4	1967 4.8
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
1967 4.2	1968 5.8	1965 4.5	1969 5.0	1967 6.7	1967 5.8	1965 1.4	1968 2.1	1966 7.4	1967 6.3	1967 3.7	1965 4.2	1967 5.1

TELEPHONES (number per 1,000 inhabitants) 1968				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				159	181	408	292	204	141	172	76	330
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
1967 87	135	204	281	216	284	65	105	478	417	12	218	523

PASSENGER CARS (number per 1,000 inhabitants)				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				144	187	298	209	124	240	199	18	185
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
123	151	52	235	165	166	37	50	253	206	4	186	410

TELEVISION SETS (number per 1,000 inhabitants) 1968				AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	ICELAND
				134	186	279	244	193	185	231	9	160
IRELAND	ITALY	JAPAN	LUXEM- BOURG	NETHER- LANDS	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZER- LAND	TURKEY	UNITED KINGDOM	UNITED STATES
1966 111	146	190	131	197	175	29	84	288	143	—	263	392

NORWEGIAN SCIENCE POLICY

A new science policy is being forged in Norway. The limited size of the country's research centres and of its industries and the strict partitioning of higher education have proved to be handicaps. Now the necessary measures have been introduced to eliminate Norway's lag behind other industrialised countries. OECD's Committee for Science Policy has taken stock of existing problems and future prospects, and two eminent scientists — one from the United States, the other from the Netherlands — have likewise contributed their views as Examiners for OECD. The two reports are to be published shortly (1) and the following article reviews some of their findings.

(1) In the series : "Reviews of National Science Policies" : Norway. The following countries have already been reviewed in this series : Belgium, Canada, France, Germany, Italy, Japan, Sweden, the United Kingdom and the United States.

Norway allocated 4.5 per cent of its national budget to scientific activities in 1967, compared with 3.17 per cent in 1962. The volume of resources devoted to science has increased steadily since 1945, when the country started off with a serious handicap; it possessed neither the research facilities nor the scientific and technical personnel needed to move into the new age of technology. The public authorities, however, promptly came to grips with the problem.

In 1946 the Norwegian Council for Scientific and Industrial Research (NTNF) was set up, to be followed in 1949 by the Norwegian Research Council for Science and the Humanities (NAVF) and the Agricultural Research Council of Norway (NLVF). In the same year, the Government established a body to co-ordinate the country's R & D activities : the Joint Committee of the Research Councils. This was replaced in 1965 by the Central Committee for Norwegian Research.

A new phase was thus initiated. This Committee is responsible for defining national objectives and setting up the necessary machinery. Shortly after its establishment, the Committee published its first basic report under the title : "Recommendations for a Norwegian Research Policy", formulating principles and defining future requirements.

Ministries, Government and Parliament

No changes have so far been made in organisation (Chart 1). The Ministries are directly responsible for the public universities and major State colleges, in addition to some 50 research institutes attached to them, 24 separate research institutes and a large number of other research establishments including, in particular, some 15 State agricultural experiment stations. Several Ministries, including those with the heaviest research responsibilities

— Education, Industry and Agriculture — have set up R & D departments.

The initiative with respect to research programmes normally comes from the research institutes themselves. The Ministries formulate general guidelines for R & D in their respective fields, and proposals for guidelines and priorities are submitted to Parliament to be examined in the context of the Government's ordinary four-year programmes, which include a special chapter on R & D policy.

In some cases, the Ministries themselves take an active part in fulfilling the R & D policy. For example, the Ministry of Industry has laid down guidelines for various bodies : the Fund for Promoting R & D in Industry and the Fund for Promoting Branch Research.

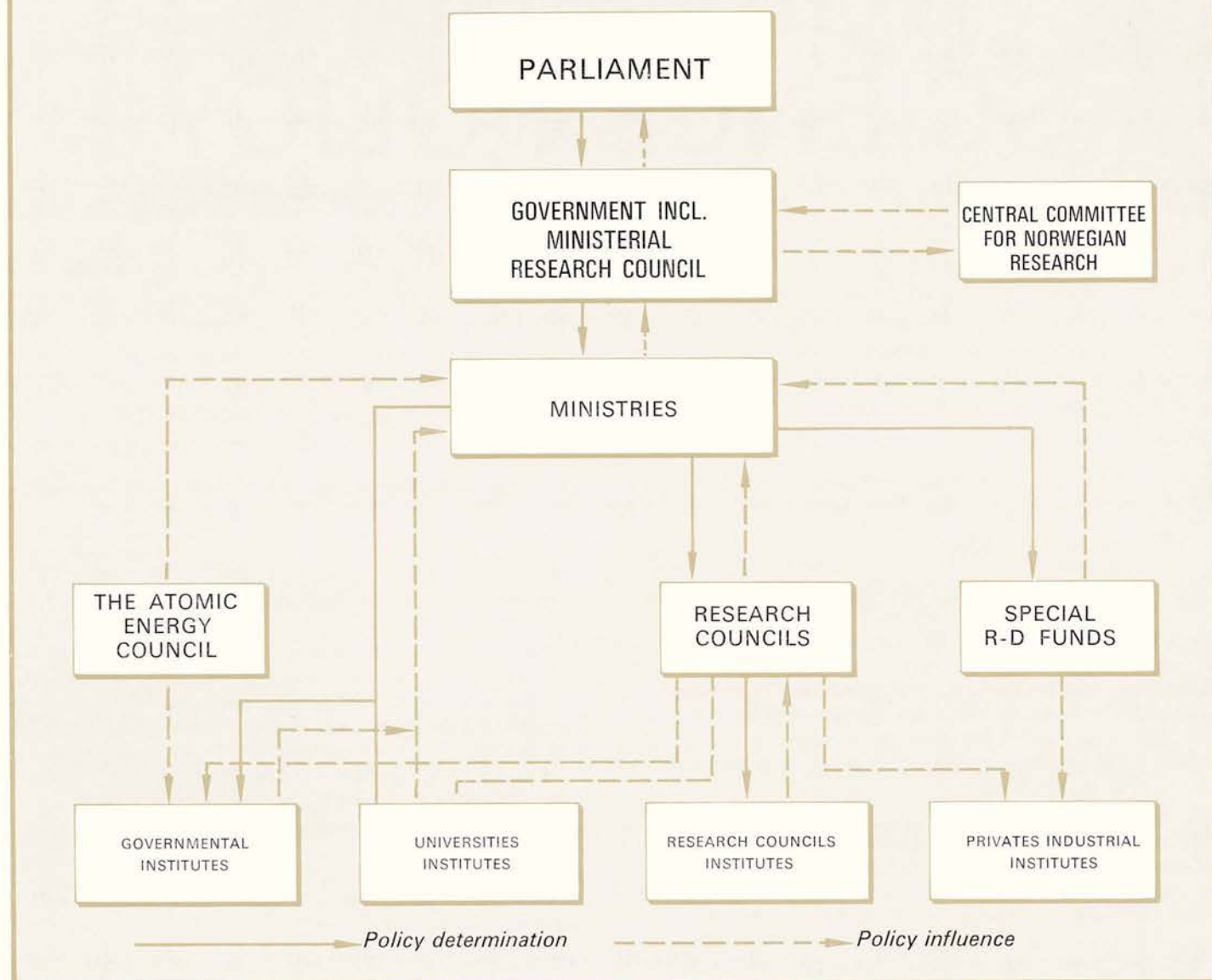
Specific R & D proposals sometimes have to be reconciled with overall Ministerial objectives, and this is normally done by the Ministerial planning section, the final decision resting with the Minister. At government level, decisions relating to conflicting demands on limited resources are taken by the Prime Minister or the Minister of Finance. This also applies when Ministerial proposals are incompatible with the broad lines of government policy.

The form taken by government and university research is determined by the research institutes themselves rather than by broad objectives set at policy level, although the Research Councils play an important part in co-ordinating such research.

The Three Research Councils

The three Research Councils are central to the present structure and have one feature in common : they are financed by funds from Football Pools, only partly in the case of the Council for Scientific and Industrial Research, and the other two almost exclusively. As long ago as 1946 it was decided that a share of the profits from these

1. SCIENCE POLICY MAKING BODIES AND THEIR RELATIONSHIPS



Pools should be devoted to scientific activities. The amount allocated to Research Councils has increased from Norw. kr. 29 million in 1965 to 40.5 million in 1967, thus accounting for three-quarters of the total profits made by the State-operated pools agency.

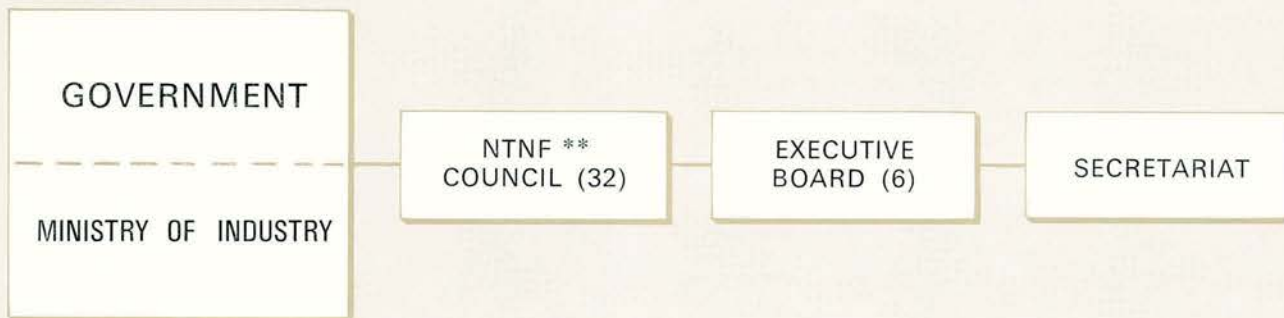
The three Councils together cover almost all research fields, excluding national defence research, and they bring together representatives of the public authorities, research institutes and economic bodies concerned. They have many functions, such as advising Ministries in their respective fields, directly controlling the activities of some research institutes, setting up new institutes when research is deemed necessary in fields previously neglected, financing a whole range of research projects, awarding fellowships and grants, and participating financially in the construction of buildings and purchase of scientific equipment. They are also responsible for studying supply of and demand for highly-qualified scientific personnel; they subsequently make recommendations for the education, training and recruitment of such personnel.

Scientific and Industrial Research

The Royal Norwegian Council for Scientific and Industrial Research (NTNF) consists of thirty-two members appointed by Royal decree: 11 from industry, 10 from Ministries and 11 from research institutes. Its budget amounted to Norw. kr. 140 million in 1967. Some of the institutes depending on it are affiliated, while others are simply allocated grants. It is assisted by several Advisory Committees (Chart 2).

The Council makes an important contribution to the formulation of recruitment policy, since its studies on the supply of researchers, engineers and technicians and its estimates of future demand provide one of the bases on which the expansion of the education system is planned. It has set up fellowship programmes to foster recruitment of research workers, and the stage has now been reached where approximately 50 per cent of all students choosing a research career can obtain a postgraduate fellowship for at least one year's study at institutes abroad (since the

2. THE ORGANISATION OF THE ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH*



ADVISORY COMMITTEES

Building and Construction
 Shipping and Shipbuilding
 Chemistry
 Metallurgy
 Production Engineering
 Electronics
 Electricity Development
 Automation and data processing
 Space Activity
 North Sea, Continental Shelf
 Scientific Personnel Fellowships
 Technical Information
 CERN-Committee

Industrial Sector
 Central Institute for Industrial Research (300)
 (Engineering Research Foundation at NTH) (300)***
 Association for Testing and Research on Technical Materials (50)
 Norwegian Institute of Seaweed Research (14)
 Research and Information Institute of Norwegian Stone Industry (2)
 (Research Associations)***

AFFILIATED INSTITUTES

Building and Construction
 Norwegian Building Research Institute (120)
 Norwegian Geotechnical Institute (70)
 Rock Blasting Institute (15)
 Norwegian Institute of Urban and Regional Research (25)
 Paint and Varnish Research Laboratory (8)
Shipping and Shipbuilding :
 Ship Research Institute of Norway (90)

Transportation
 Transport Economy Institute (80)
Electric Power
 Norwegian Research Institute for Electricity Supply (45)
Miscellaneous
 Atomic Energy Research Institute (490)
 Norwegian Computing Centre (110)
 Norwegian Institute for Water Research (70)
 Norwegian Institute for Air Research
 Norwegian Industries Development Association (30)

AD HOC PANELS

Furniture and Fittings
 Fishing Products
 Nuclear Physics
 Engineers Abroad
 Pedagogical Education of Engineers
 Course Activities

* Figures in brackets indicate the total number of personnel or members of the Council.

** Ministries : 10 representatives; research institutes : 11 representatives; industry : 11 representatives.

*** Not affiliated with NTNF but receive general appropriations from NTNF

introduction of this programme twenty years ago, fewer than 5 per cent of some 600 students selected have decided to stay abroad).

Reciprocally, the NTNF has set up a fellowship programme for foreign scientists holding a doctor's degree, thus enabling Norwegian research institutes to secure the collaboration of many able young scientists from other countries. It also awards research grants to institutes or individual scientists after their applications have been vetted in committees appointed by the Council. In some cases, the Council may take the initiative and encourage the competent institutes to undertake projects of national interest. The Council supervises the overall budget for fellowships and grants. The size of these grants varies considerably, and they may also be provided for long-term, interdisciplinary projects on a large scale.

In 1968 the NTNF initiated a programme of financial aid for industrial research. The aim was twofold : to orient research activities more towards industry's needs and to increase the participation of industry in research. The

projects can be carried out either by an individual firm in its own laboratories or by a research institute on behalf of one or several firms.

In fields of national interest, the Council has set up new research institutes. They total 18 at present and employ some 1,500 people, approximately one-third of whom are qualified research workers. The Atomic Energy Research Institute is the largest of these and concentrates its activity on boiling water reactors and on the production of radioisotopes. It also runs the Halden Reactor, which is a Joint Undertaking of the European Nuclear Energy Agency (ENEA) of OECD. The Council has set up the Central Institute for Industrial Research and also contributes to the financing of two other sponsored research institutes.

The Council supervises these institutes and their programmes and budgets. They receive a grant ranging between 30 and 80 per cent of their overall budget, and the balance is covered by research contracts concluded with trade and industry, government agencies, etc.

(Continued on page 30.)

Science and the Humanities

The Norwegian Research Council for Science and the Humanities (NAVF) has 32 members appointed by the Government and representing the Ministries and higher education establishments. Its activities range over five broad fields : the humanities, social sciences, psychology and education, exact and natural sciences, and medicine. The annual allocation of funds to these different fields has varied over the years. Throughout the period 1949-1967, the exact and natural sciences received 37 per cent of the grants, the humanities 24 per cent, medicine 20 per cent and the social sciences 14 per cent, while about 5 per cent was allocated to interdisciplinary research projects.

The NAVF has established an institute for studies in research and higher education which investigates questions relating to the supply of and demand for university-trained personnel, in particular the recruitment of scientists to the universities. In co-operation with the two other Research Councils, the Institute compiles annual statistics, which can form an important basis for science policy decisions. These figures are also used in connection with similar statistical surveys conducted by OECD and other international organisations. The main task of the NAVF is to decide which research projects should be given priority within the various sectors and to ensure that the results obtained are put to the best possible use.

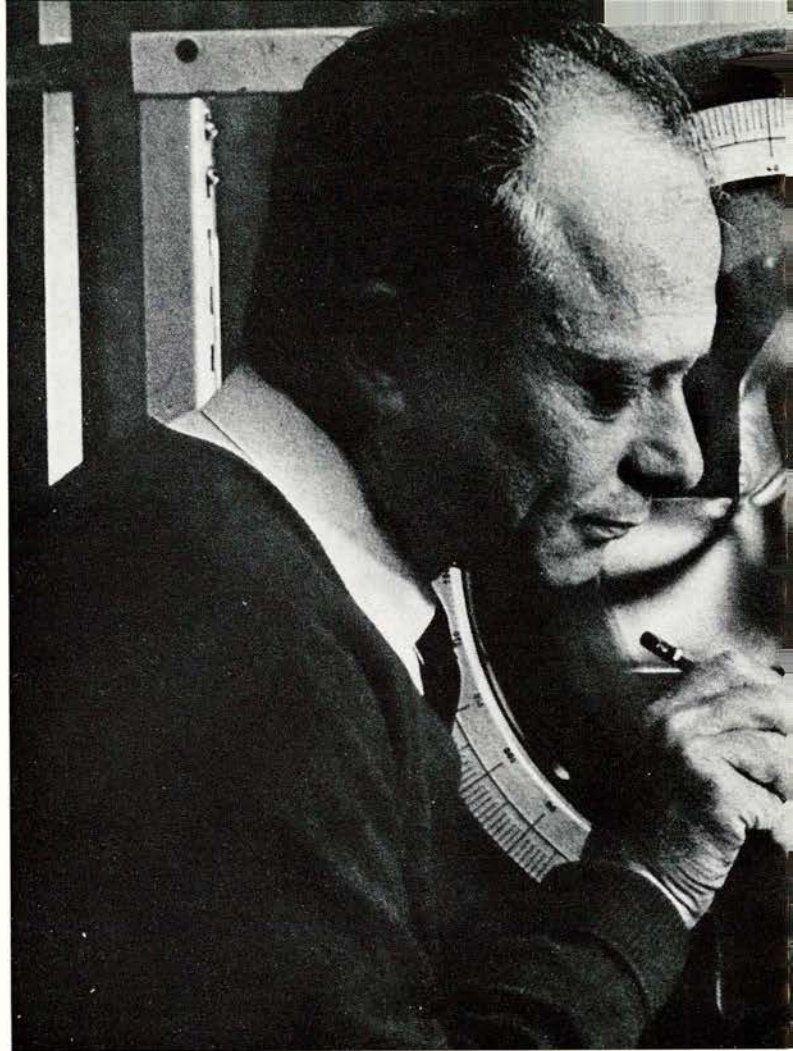
From the outset, NAVF concentrated its activities on the improvement of university institutes. Originally the main intention was to develop a reasonable overall standard. However, as the general situation improved, the role of NAVF has changed. Today its main function in this connection is the handling of a "Budget No. 2" from which the university institutes can receive supplementary funds in addition to their regular budget. "Budget No. 2" is of great importance since it enables NAVF to influence the priorities set for fundamental research.

Up to 1960 the recruitment programme accounted for nearly half of the total budget of the Council. On a proposal from the Council, the Government recently approved a recruitment programme financed from the budget of the Ministry of Education. NAVF is both the advisory and the executive body for the implementation of this programme. At present this programme provides 200 full-time fellowships. In addition, NAVF finances from its own resources about 100 additional scholarships, fellowships or salaries, all with the aim of furthering the recruitment of research workers.

Agriculture

The Agricultural Research Council of Norway (NLVF) co-ordinates agricultural research activities as a whole and ensures satisfactory co-operation among scientists and the existing institutes (the earliest dates from 1914). It must also ensure that research projects are distributed appropriately and that technical equipment, personnel and facilities are utilised rationally. About 90 per cent of agricultural research expenditure in Norway is financed from public funds, and this includes 16 per cent covered by the NLVF.

The Council's purpose is to foster research in agriculture, horticulture, forestry, veterinary science, food science, home economics, wild life, fresh water fisheries, land re-allocation and other spheres of research activity falling under the Ministry of Agriculture.



A Norwegian scientist uses a polariscope in a photo-elasticity

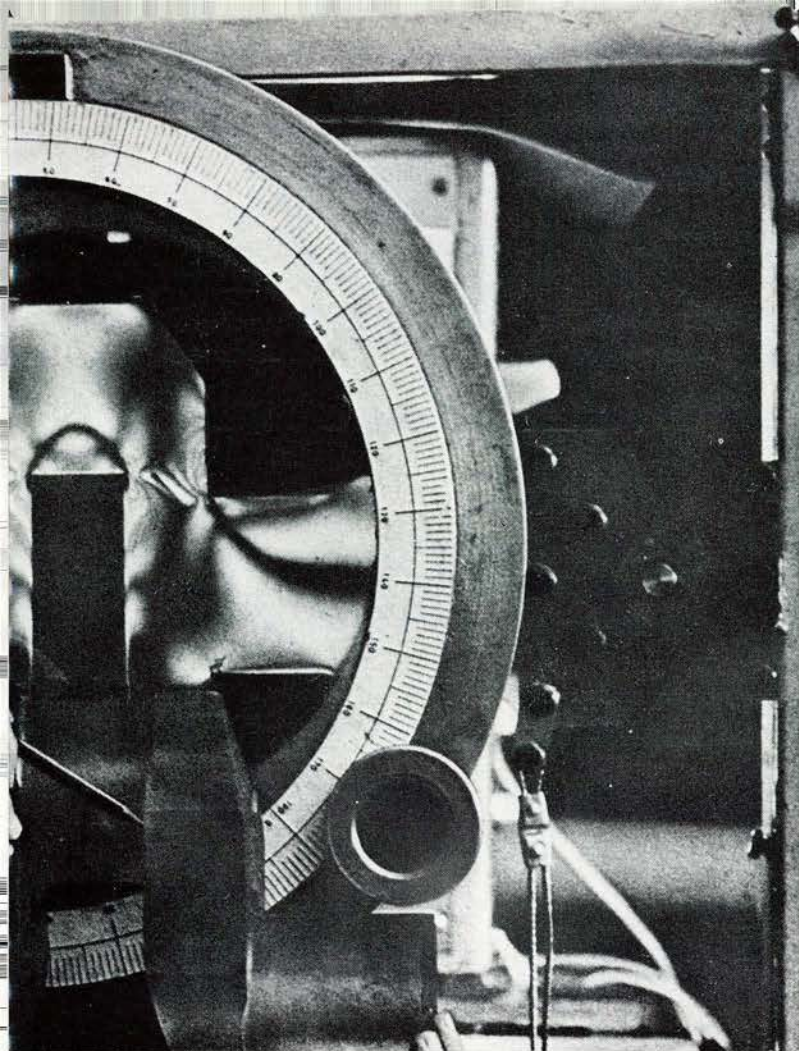
The Council initiates new tasks, prepares projects and supervises their implementation. With a few exceptions, it has not established its own research institutes. At the time it started its activities, institutes covering most branches of agricultural research were already in existence, so there was no need for new institutes. The Council's policy is to support ill-equipped institutes and to initiate research in previously neglected fields.

The NLVF has also tried to establish co-operation between a number of institutes in different fields in the conduct of more extensive interdisciplinary research projects. Grants for this purpose are often made to special committees, which are responsible for allocating the funds and carrying out the projects.

The Council has made substantial grants for the purchase of scientific equipment by the institutes. In addition to annual grants, it has mapped out the demand for and supply of equipment at a number of research institutes. Special purpose equipment is also constructed and tested at the institutes.

Several new research laboratories have been built in Norway since the war. The NLVF has helped to finance some of this building. It has done a great deal to clarify the requirements for new research laboratories and to make suggestions for layout, and in many cases it has actually administered the building work itself.

To facilitate recruitment and training of scientists, the Research Council annually grants the salaries for about 90 scientists. The Council's scholarship scheme is extensive and enables young qualified graduates and researchers to specialise and older scientists to study newer methods at foreign research institutes. A scholarship scheme was introduced in 1949 for short-term education and travel.



laboratory to test one component of a ship's crankshaft.

Education and Research

Higher education in Norway has expanded considerably over the last few years. The number of qualified scientists and engineers employed in R & D activities increased from 4,600 in 1963 to about 5,700 in 1966. According to the OECD Examiners, however, the number of students enrolled in higher education establishments should continue to increase, particularly in science faculties and schools of engineering. This increase should be accompanied by similar expansion in technical education and in the training of technicians (the ratio of technicians to university-level personnel is lower in Norway than in most industrialised countries).

A typical feature of Norwegian universities is the "numerus clausus" in several faculties such as engineering, medicine, dentistry, veterinary medicine and agriculture. The OECD Examiners note that the real rate of expansion seems to be determined by material and financial limits rather than by rational criteria. Although the "numerus clausus" system has a favourable influence both on the level of training and the enrolment/graduate ratio, it obliges a large number of students to go abroad to study.

Norway is handicapped in the use of science and technology to attain national goals; the OECD Examiners attribute this to the fact that science teaching and university research is fragmented into a host of narrow and highly specialised disciplines.

Similarly, most of the research institutes are very small and highly specialised, and they are further handicapped by the lack of modern research management. The Examiners point out, however, that it is just as important to stop projects when they are clearly no longer promising

from the standpoint of technical or economic feasibility as it is to select new projects of greater promise.

Industrial Research

In 1945 it was materially impossible for Norwegian industry to set up its own research infrastructure, and the task of equipping industry for high level research therefore fell to the Government. According to the Norwegian authorities themselves, the very success of this government enterprise led industry to rely too heavily on the network of national research institutes and even, in some respects, to adopt a far too passive attitude towards innovation.

The OECD Examiners consider it a safe assumption that there are very few research groups of "critical size" in Norway which are capable of undertaking large interdisciplinary research programmes (this applies to Ministry and Council research institutes, the universities and industry itself). Norwegian industry suffers from smallness of size just like the research institutes, and both the Government and Federation of Norwegian Industries encourage mergers between firms.

Towards an even greater effort

A general goal has been fixed for Norwegian science policy : to use the natural and social sciences (basic and applied) to create better living standards for people both individually and collectively. Increased productivity is not the only aim : improvement of the physical and cultural environment is also involved. In other words, this policy goes beyond purely materialistic goals to embrace the efforts to combat pollution of the air, water and land, and it also aims to preserve the existing balance of population in small towns and rural areas, especially in northern and coastal regions.

In evaluating Norway's progress in several spheres, the OECD Examiners come to certain conclusions. They consider that the Central Committee for Norwegian Research has made a promising start. In particular, it has begun to formulate a science policy that can make effective use of the social and natural sciences and technology to attain national goals. The Committee recognises the need for a steady expansion of support for education and training at various levels. It also recognises the handicaps created by the present small size of firms and their markets.

The Committee recognises the importance of making realistic decisions about Norwegian participation in "big" science : high-energy physics, space research, atomic energy, etc. Such participation is envisaged both at national level and in co-operation with other countries. The Committee also stresses the need to choose the number and nature of the fields in which Norway should finance basic research and study. In its view, the resources made available to applied research and development should be channelled into a limited number of fields in which Norway has some natural advantages.

The Committee is currently attempting to reorganise higher education in Norway to bring it more into line with the country's needs. Similarly, it fully recognises that if Norway is to attain its goals in scientific fields, it must expect to allocate steadily higher percentages of its gross national product to education, research, and development in the coming years.

FOREIGN INVESTMENT IN DEVELOPING COUNTRIES:

SUPPORTING INSTITUTIONS AND OTHER GOVERNMENT INCENTIVES FROM THE CAPITAL-EXPORTING COUNTRIES

The second of two articles by Michael Emerson, of the OECD Development Assistance Directorate, on the increasing support being given by the Member countries of the OECD Development Assistance Committee (DAC) for private foreign investment in developing countries (1). It deals with the main sets of institutions and measures, other than investment guarantee schemes, notably with public development corporations, pre-investment assistance, exchange control and fiscal preferences.

(1) A first article on Foreign Investment in Developing Countries dealing with the general evolution in this field, and in particular with investment guarantee schemes appeared in the OECD Observer No. 47, August 1970. A new OECD publication « Investing in Developing Countries : Facilities for the Promotion of Foreign Private Investments in Developing Countries » deals with the subject in greater detail.

A principal development in the area of incentives for foreign investment in developing countries has been the emergence of a group of institutions which may be called “public development corporations”. The expression is intended to cover :

- the British Commonwealth Development Corporation (CDC);
- the Deutsche Entwicklungsgesellschaft (DEG);
- the Dutch Financierings Maatschappij Voor Ontwikkelingslanden NV (FMO);
- the Danish Industrialisation Fund (IFU);
- the World Bank’s International Finance Corporation (IFC) and to some extent the activities of :
- the French Caisse Centrale de Coopération Economique (Caisse Centrale);
- the US Overseas Private Investment Corporation (OPIC).

While there are important differences between the corporations, they share the following distinctive characteristics. They are financed by governments in the framework of development assistance efforts. They operate much on the basis of private sector investment banks, but with the difference that they

work under the twin criteria of commercial soundness and developmental effectiveness. Their objectives are to help promote and finance private enterprise or mixed projects in developing countries. They pursue their objective firstly by providing equity and loan finance mainly to joint enterprises and local development finance companies in developing countries. Perhaps more important however, is their role as catalyst and promoter of projects and expert intermediary between the foreign investors and bankers and the local public and private sectors in developing countries.

The oldest institution is the British CDC, founded in 1948 as the Colonial Development Corporation. By the end of 1969 the CDC had committed a total of \$376 million (2) to 169 projects all in Commonwealth developing countries. The CDC is heavily engaged in basic infrastructure (36 per cent of total commitments), agriculture (19 per cent), and industry (16 per cent), with significant activities also in the financing of housing and development finance companies.

Compared to the other public development corpo-

(2) At the then current exchange rate.

rations, the CDC has several distinguishing characteristics. Its management is decentralised to an important degree through the operation of a network of Regional Controllers and representative offices in the countries and areas of investment. Based on the experience of the overseas representatives, the CDC is able to play a particularly active role on the spot in developing countries in identifying and promoting new investment opportunities, and in supervising and aiding the management of the existing portfolio of investments. While it is common for the CDC to be represented on the board of directors of joint ventures in which it participates, it also runs a number of directly owned projects which it has created in the absence of suitable investment partners (for example a complex of irrigation and agriculture projects in Swaziland). The powers of the CDC have recently been extended to permit operations in developing countries outside the Commonwealth.

The French Caisse Centrale, which also dates from the immediate post-war period, operates as a public development corporation only to a relatively small degree. The Caisse Centrale's major role is as executive agent for a large part of France's capital aid to francophone countries. The Caisse Centrale has in this capacity provided finance and management to many of the national development finance companies in francophone Africa. It also participated in

300 private investment projects by the end of 1968. Seven major projects, however, have received more than half the total in value, notably the MIFERMA iron-ore mine in Mauritania, phosphate mines in Senegal and Togo, the FRIA bauxite mine in Guinea, the COMUF uranium project and COMILOG manganese projects in Gabon and the ALUCAM aluminium enterprise in the Cameroons.

The World Bank's International Finance Corporation (IFC), founded in 1950, is currently undergoing a period of very considerable expansion, (see Table), with commitments in 1969 at \$93 million, almost doubling the 1968 figure of \$50 million, which was in itself a record volume. The IFC has as a result now become the largest of the public development corporations in terms of the volume of new commitments. The particular characteristics of the IFC are the strength of its working relations with the international investment banking community and its membership in the World Bank Group. The IFC has tended to specialise in participating in very large industrial projects in partnership with leading international investors, and sometimes other public development corporations.

The Deutsche Entwicklungsgesellschaft (DEG) was created in 1962 with the particular objective of helping to encourage small and medium-sized German firms to invest in developing countries. The DEG

The Samburu Game Lodge is part of a 6.7 million project to develop and expand the tourist industry in Kenya. It is financed jointly by the World Bank's International Finance Corporation, the U.K. Commonwealth Development Corporation, the German Deutsche Entwicklungsgesellschaft and U.S. and Kenyan investors.



Annual Commitments of Public Investment Corporations 1960 and 1965-9 (financial years) \$ US million

	1960	1965	1966	1967	1968	1969
World Bank's International Finance Corporation (IFC) (1)	6.2	26.0	35.6	49.0	50.4	92.9
British Commonwealth Development Corporation (CDC)	30.0	38.0	6.8	32.8	17.5	31.2
Caisse Centrale (2)	..	8.0	15.5	13.0	46.0	..
Deutsche Entwicklungsgesellschaft (DEG)	—	2.9	2.8	3.2	6.5	6.5
Danish Industrialisation Fund (IFU) (3)	—	—	—	—	—	4.0
TOTAL	..	74.9	60.7	98.0	120.4	..

(1) Including standby and underwriting commitments.

(2) Estimated direct assistance to the private sector, excluding assistance through local development finance companies.

(3) Estimated commitments.

thus serves not only as a source of finance for joint ventures, but also of expertise and experience in the problems of investing in developing countries for the benefit of German firms with no experience in this field. The volume of the DEG's annual commitments, while small, is expanding and reached \$6.5 million in 1969. The bulk of DEG's commitments has gone to industrial projects, with significant contributions to development finance companies and tourism.

The Danish Industrialisation Fund (IFU), established in 1967, is designed to operate very much along the lines of the DEG, with the particularity that its capital is being provided from the proceeds of customs duties on coffee imported into Denmark. The IFU is in the course of becoming operational and entered into its first commitments, totalling an estimated \$4 million, in 1969.

The latest born institution in the family is the Netherlands Financierings Maatschappij Voor Ontwikkelingslanden NV (FMO), which again resembles in many respects the DEG, especially to the extent that it is intended to stimulate the interest in developing countries of small and medium-sized Dutch firms. The FMO, for which legislation was passed in 1970, is to be owned half by private industry and half by the Netherlands Government, and will have access to soft official aid funds as well as its own capital and market borrowing possibilities.

Another very important development in 1970 has been the creation of the US Overseas Private Investment Corporation (OPIC), although its functions are so wide compared to those of the CDC, DEG or other corporations mentioned that it really stands in a category of its own. Like most of the other corporations however, OPIC has a share capital subscribed by the Government. Its mode of operation will be more that of a private business than of a government department. Its purpose will be to promote private investments which "are sensitive and responsive to the special needs and requirements of their economies, and which contribute to the social and economic development of their people" (3). Its

creation in part reflects the successful example of the other specialised corporations already described.

OPIC'S capacity to invest out of its own funds will, strictly speaking, be limited initially to its corporate capitalisation of \$20m. per year for each of the first two years of operation. Its capital will be used as a revolving direct investment fund to extend loans, including convertible debentures but (unlike the other corporations) excluding equity investments. Other more important sources of finance however will be available directly or indirectly to OPIC. The net earnings of OPIC's investment insurance and loan guarantee operations (4) may in the future be partly appropriated for OPIC's investment activities. US Government-owned local currencies of developing countries will be made available to OPIC in amounts to be determined annually. Finally, and perhaps most important, OPIC will, by guaranteeing financial loans from US institutional investors to selected priority investment projects, be able to give indirect access to very large sources of capital on commercial terms. The above range of financial and guarantee facilities, coupled to the pre-investment assistance described below, together amount to a powerful array of instruments for aid to private investment. OPIC is so far a unique institution in combining them all under one roof.

It seems clear that the idea of the public development corporation, as an instrument of development assistance operating in the midst of the private sector, has established itself as a practicable proposition. While applied in different variations, the role and number of the corporations are increasing on the basis of hard-won experience and proven utility. From the view point of the developing countries, the participation of the corporations in joint ventures is

(3) *Foreign Assistance Act of 1969 (PL91-175, Part I, Title IV).*

(4) See the earlier article "Foreign Investment in Developing Countries", *OECD OBSERVER*, No. 47, August, 1970.

an assurance that developmental considerations will be duly taken into account in the operation of the investments. While private foreign investments are not expected to become philanthropic, the expectation is that the enterprises concerned will operate according to the best standards of corporate behaviour from the point of view of the host economy and community. In addition, the special expertise of the corporations is proving valuable in identifying project opportunities, in bringing them to the attention of potential investors and financiers, and to varying degrees helping in the negotiation of the terms and conditions of the investment agreements, and in the continuing provision of financial and managerial advice for established enterprises.

Pre-Investment Assistance

A useful facility offered to private investors by many bilateral and multilateral donors is the financing of feasibility studies and pre-investment surveys. The largest and most specialised sponsor of pre-investment surveys is the United Nations Development Programme (UNDP), which provides grants for projects organised in co-operation with recipient countries. The UNDP finances projects which may lead to either public or private investment. Of particular interest to private investors is the UNDP's special concentration on natural resource surveys.

Among the bilateral donors, Austria, Belgium, Canada, France, Germany, Italy, Netherlands and the United States have made budgetary provisions for the financing of pre-investment surveys. The most usual formula is for the cost of surveys to be borne 50/50 by the donor and prospective investor, on the understanding that the investor will refund to the donor agency the latter's contribution in the event that the project materialises. The largest programme is that of the United States, which has participated in 340 surveys since 1962 at a cost to the US Government of \$1.1 million, resulting in 46 positive decisions to invest approximately \$98 million.

Exchange Control and the Balance of Payments

A balanced perspective requires the indication of what restraints in some cases apply to the outflow of private capital to developing countries.

As regards direct investment, many DAC Member countries impose no effective restraint on bona fide capital outflows, although systems of control remain in operation partly so that restraint can be reactivated at short notice in the event of balance of payments difficulties. In the application of balance of payments protection measures an interesting development has appeared in recent years, notably the exemption in whole or in part of developing countries from measures to restrict capital outflow. This reflects the philosophy that direct investment is useful as an instrument of development, and also that the balance of payments adjustment process of developed countries

ought to be achieved basically within the OECD area and should to the maximum degree possible avoid affecting the economic prospects of the developing countries.

Thus the United States Overseas Foreign Direct Investment (OFDI) programme applies quotas to groups of countries, and the developing countries are on the whole placed in the groups which are least severely affected by the restrictive measures. France, Sweden and the UK have also exempted developing countries from restrictive measures (in the French case only those in the franc zone and in the UK case only those belonging to the Sterling area).

The above sets of measures have on the whole been designed not so much to restrict the volume of overseas investment undertaken, but to change the structure of its financing in favour of overseas borrowing. In practice this policy has been greatly facilitated by the growth of the international Euro-bond and Euro-dollar capital markets, one of whose prime functions has been to service the capital requirements of the multinational corporation. This is a further illustration of how the developing countries are to some extent being insulated from the hazards of short-term economic developments in the OECD area.

As regards portfolio investment, which, so far as the developing countries are concerned, consists mainly of bond issues by a number of the richer developing countries and by the international development banks, the controls applied are on the whole more severe than for direct investment. The United States, German and Euro-bond markets have in recent years been the main sources of bilateral portfolio investment, with a small volume of issues placed on the French, Netherlands and United Kingdom capital markets. The World Bank and Inter-American Development Bank have however succeeded in placing issues in a wider group of countries.

Fiscal Incentives

The large and complicated subject of fiscal incentives for investment in developing countries has been covered in detail in other studies (5). It should be noted in passing however that the number of double-tax avoidance conventions between developed and developing countries is increasing steadily. The majority of new conventions follow the structure and a number of the substantive provisions of the OECD Draft Double Taxation Convention. As was envisaged by the OECD Fiscal Committee, in the majority of such conventions greater taxing rights are allocated to the developing country for dividends, interest, royalties and technical services. In addition a number of these conventions contain tax-sparing provisions.

(5) "Fiscal Incentives for Private Investment in Developing Countries", OECD, 1965.

"Tax Treaties between Developed and Developing Countries", United Nations, 1969, and "United States Income Taxation of Private Investments in Developing Countries", United Nations, 1970.

IONISING RADIATION

a new method of food preservation

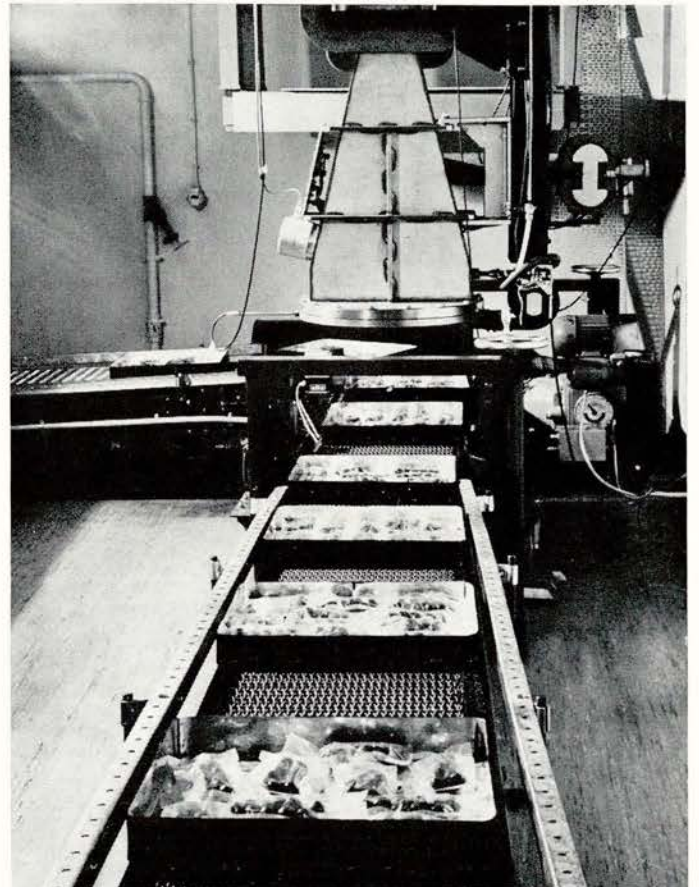
The ability of ionising radiation to kill insects, bacteria, yeast and moulds, to devitalise parasites and even to change the rate of maturing of fruits and vegetables has created a great interest in the food industry in applying this new technique to the preservation of food products. Extensive research work has demonstrated that the market life of fish, fruits, vegetables and meat can be markedly extended by this method, insects can be killed in grain or other stored food products, sprouting of potatoes and onions can be inhibited, and the maturity rate regulated in different fruits.

Moreover, radiation treatment opens up certain possibilities that cannot be achieved by any other known method. Some examples of these are : the killing of insects or bacterial pathogens inside a sealed container ; the elimination of bacterial pathogens in a solidly frozen block of meat, without melting or changing the characteristics of the product ; the killing of parasites inside a piece of fresh meat, or seed weevil in certain fruits, without damage to the quality of the product. Applications such as these also offer great advantages for a quarantine control by preventing the spread of harmful organisms or certain types of pests through food or feed.

Thus, the concern of health authorities about the growing use of chemicals for preservation purposes can in many cases be relieved by the adoption of irradiation techniques ; and already public health authorities in six countries (Canada, Israel, the Netherlands, Spain, USA and USSR) have cleared some irradiated foods for human consumption.

While irradiation does not induce any radioactivity in foodstuffs, it may lead to chemical or physical changes which may be unacceptable. Therefore most countries require, as for all new methods of food preservation, that the wholesomeness of the irradiated food products should be determined before approval is given for human consumption. The continuing public sensitivity whenever questions of radiation are involved is also, of course, a significant factor for the acceptance of irradiated food.

The problem of establishing the acceptability of foodstuffs subjected to preservation techniques is not a new one. In relation to irradiation, in 1964 an Export Committee established jointly by FAO, IAEA and the World Health Organisation (WHO) made recommendations which have achieved widespread international recognition for wholesomeness testing procedures involving systematic animal feeding trials spread over a period of two years. These, in general, are the procedures at present required to secure clearances from health authorities, and they are evidently quite costly. Since commercial interests are only indirectly involved, and the essential need is to provide authoritative



Large quantities of perishable foodstuffs are lost each year because of poor preservation or distribution facilities. There is, therefore, a strong incentive to the adoption of improved preservation methods and one particularly promising approach involves the application of irradiation techniques. An important contribution to the development of such techniques is the wholesomeness testing of irradiated foods and this work is particularly suitable for international co-operation. Accordingly, on 14th October, 1970, an Agreement was signed at OECD Headquarters by organisations in 19 countries to provide wholesomeness testing of irradiated foodstuffs and a programme of investigations into the methodology of wholesomeness testing. The Agreement was sponsored by OECD's European Nuclear Energy Agency (ENEA) in collaboration with the Food and Agricultural Organisation of the United Nations (FAO) and the International Atomic Energy Agency (IAEA). In the following article Ian Williams, Deputy Director General of ENEA, and Maurice Fried, Director of the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, describe the background and objectives of the new Project, which came into being on January 1st.

◀ *Irradiation of packaged food in an electron linear accelerator. A conveyor belt moves the samples under the electron scanner.*

evidence for national and international health authorities, the subject is particularly suitable for intergovernmental co-operation. Evidence assembled collectively enables countries, for a relatively modest outlay, to achieve far more than would be possible acting alone.

With these considerations in mind, ENEA, working in close collaboration with the joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, initiated a round of informal consultations in interested countries to determine the form of internal collaboration which would be most likely to succeed. There had earlier been a Project, sponsored jointly by ENEA, IAEA and the Austrian Studiengesellschaft für Atomenergie, at the Austrian Nuclear Research Centre at Seibersdorf near Vienna, for collaboration in an international programme on irradiation of fruit and fruit juices. However, when it became apparent that there would be no commercial advantage in adopting irradiation for the preservation of fruit juices, it was concluded that a different approach would be required as the basis for international co-operation. Nevertheless, the Seibersdorf Project, which was brought to an end in June 1968, had laid a valuable foundation for continued work in this field and had demonstrated that there was a general wish for this to be promoted at the international level.

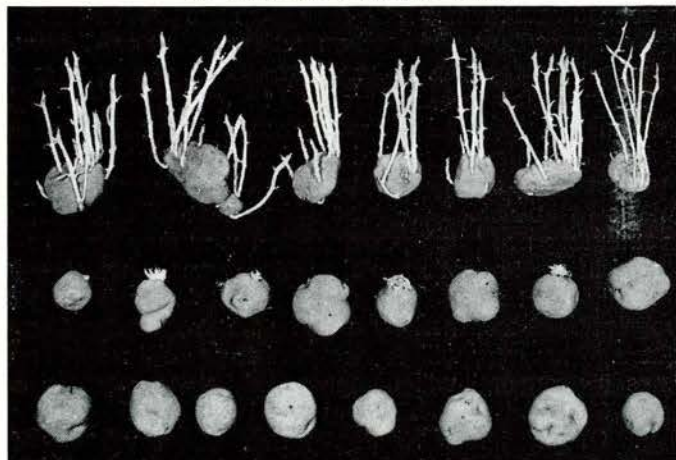
The consultations which succeeded the winding up of the Seibersdorf Project led to general recognition that wholesomeness investigations should be the essential theme of any new Project. While, in the present state of knowledge and in the opinion of the public health authorities, these would have to be based on long-term animal feeding trials, a secondary objective should be investigations into the methodology of wholesomeness testing, with the particular objective of evolving more sophisticated techniques which would be less costly both in time and money. These investigations would include, for example, consideration of the extent to which it should continue to be necessary to subject further food items to the full range of animal feeding tests, after a substantial body of evidence had been accumulated concerning foods with similar components. Such questions are clearly for the health authorities to decide, but a disinterested international investigation would provide evidence of an objectivity facilitating their task.

Although the objectives were clear, the form of Project to be adopted was the subject of lengthy discussions from which emerged the firm conclusion that creation of a new international centre for wholesomeness testing equipped with the necessary animal facilities was neither necessary nor justified. Instead the concept evolved of having the wholesomeness testing carried out under contract in specialised institutions already existing in Member countries. The various contracts would be expected to take up two-thirds to three-quarters of the annual budget and should be co-ordinated by a small central mechanism under the direction of a full-time Project Leader, who would be located at a suitable Host Centre and would himself engage in a modest programme of research and investigations into the methodology of wholesomeness testing. The central mechanism would also be concerned with the dissemination of information resulting from the programme, and with assisting national and international health authorities in their consideration of the acceptance of irradiated foods for human consumption.

An Agreement based on these principles was reached in the summer of 1970 and signed in October. It provides that first priority in the allocation of the project's resources shall be given to obtaining the additional information requested by the Joint FAO/IAEA/WHO Expert Committee on Irradiated Food in order to recommend unconditional clearance of irradiated wheat, wheat products and potatoes. Since the Joint Committee had not found any evidence to suggest that these irradiated products might be harmful, it recommended temporary acceptance by national authorities (for a period of five years) of these products for human consumption, and asked for corroborative evidence of the absence of adverse effects on the reproductive function of rats and mice fed with irradiated potatoes or on mice fed with irradiated wheat flour as part of their diet. An assessment was also sought of the carcinogenicity in mice fed with irradiated potatoes as part of their diet and of the nutrient value of bread prepared from irradiated wheat, utilising flour stored for varying periods after irradiation.

The remaining resources of the new Project are to be devoted to wholesomeness testing of other products, selected to reflect their international interest as staple foods entering significantly into international trade, and their interest to developing countries. Consideration is also to be given to the extent to which the products lend themselves to preservation or processing by irradiation, and to

Effect of irradiation on sprouting of potatoes ; top row : unirradiated; centre row : irradiated with a dose of 5 krad; bottom row : irradiated with a dose of 10 krad. The picture was taken after seven months of storage at room temperature.



Taste panel evaluation of irradiated potatoes at the Karlsruhe Institute. All irradiated foods are graded by appearance, taste, odour, and consistency.





A view of the Institute of Radiation Technology at the Karlsruhe Nuclear Research Centre.

the desirability of giving precedence to those requiring low or medium dose irradiation. Lastly, it is provided that methodology studies, under the direction of the Leader of the new Project, may be carried out either at the Host Centre or under contract.

Particularly careful consideration has been given to the financing of the Project. It was recognised that the relative interests in the subject could not necessarily be correlated with relative sizes of national income, and that a scale of contributions based on such criteria would therefore be inappropriate. Instead, the conclusion emerged that Signatories should be asked to commit themselves for a minimum period of three years and that the size of their contribution should determine the extent of their involvement in the direction of the Project's programme. This is to be achieved by providing that all Signatories contributing not less than \$5,000 a year may be represented in the Project's Board of Management, which will normally meet annually to adopt the budget reflecting a programme established by a Scientific Programme Committee. The latter will be expected to meet three or four times a year, and will comprise only representatives of those Signatories contributing not less than \$25,000 a year. Of the initial 19 Signatories, all of whom will qualify for membership of the Board of Management, six will be represented, and a further three will share a single representation, in the Scientific Programme Committee. The total contributions of the initial Signatories amount to \$225,000 a year.

Recognising the difficulty facing some countries, particularly developing countries, concerning cash contributions, provision has also been made exceptionally for contributions in kind to be accepted. This may apply, for example, to offers to undertake — below real cost — wholesomeness testing contracts included in the approved programme. The valuation to be attributed to such approved contributions in kind will be determined by the Scientific Programme Committee, and a Protocol to the Project Agreement provides that they shall not determine qualification for membership of the Board of Management or the Scientific Programme Committee before they have been so assessed.

A particularly important contribution in kind is the

facilities and services generously made available, without charge to Project funds, by the Federal German authorities at their Institute for Radiation Technology in the Federal Research Institute for Food Preservation at Karlsruhe. The facilities include offices and laboratories, two full-time staff and the services and facilities required to permit the Project Leader, who is located there, to establish an effective central mechanism for co-ordinating the overall work and progress of the Project. This support, and the provision by IAEA of the Project Leader, also without charge to Project funds, means that the initial programme is worth some \$300,000 a year. An even higher figure may result if contracts are undertaken below real cost, as have already been offered by at least two countries.

As already noted, the new Project came into being on 1st January, 1971. The number of countries and organisations initially participating is an eloquent indication of the widespread interest in the investigation and development of irradiation as a food preservation technique. At least six organisations have also indicated that they will be observing the progress of the Project with interest, and will study carefully the possibility of acceding later to the Agreement.

Thus the new Project starts from a position of considerable promise. It offers the hope of greatly accelerating the introduction on a large scale of an entirely new food preservation method and this, in turn, is potentially a major new factor in the attack on the world food problem. If it succeeds it will indeed be money well spent.

(1) The following countries and organisations signed the Project Agreement: *Austria*, Atomic Energy Study Company; *Belgium*, Ministère de la Santé Publique et le Centre d'Etude Nucléaire; *Canada*, Atomic Energy of Canada Ltd; *Denmark*, Danish Atomic Energy Commission; *France*, Commissariat à l'Energie Atomique; *Germany*, Federal Ministry for Education and Science; *Israel*, Atomic Energy Commission; *Italy*, Comitato Nazionale per l'Energia Nucleare (CNEN); *Japan*, Atomic Energy Bureau, Science and Technology Agency; *Netherlands*, Ministry of Social Affairs and Public Health; *Norway*, Directorate of Health Services and Directorate of Fisheries; *Portugal*, Junta de Energia Nuclear; *South Africa*, Department of Agriculture - Technical Services; *Spain*, Junta de Energia Nuclear; *Sweden*, Board for Technical Development; *Switzerland*, Département Fédéral de l'Economie Publique, Division du Commerce; *Turkey*, Atomic Energy Commission; *U.K.*, UK Atomic Energy Authority; *USA*, US Atomic Energy Commission.

THE MORTGAGE BOND MARKET IN DENMARK

«There are lessons to be learned by other countries from the institutional set-up of Denmark's mortgage bond market», notes OECD's Committee for Invisible Transactions in a study of that country's financial markets which has just been published (1). Some features noted by the Committee are described in the following article.

(1) "The Capital Market, International Capital Movements and Restrictions on Capital Operations in Denmark". Third in a series. Studies on Austria and Germany have already appeared, and one on Norway will be published shortly.

The most striking feature of the Danish capital market is the predominant position of mortgage bonds in financing private investment. As a source of finance these issues have become as important in terms of volume as commercial and savings bank loans taken together and in some years substantially more so. There are virtually no other private bonds, only limited activity on the share market and no new central government bonds: the government budget has consistently run a surplus since the late 50's, and government issues are being retired while local authorities finance their needs to only a limited extent by their own domestic issues. Thus to all intents and purposes the mortgage bond market is the securities market in Denmark.

In the judgment of OECD's experts the market for mortgage bonds is a highly efficient one. One of its main advantages is that it enables private persons and small businesses to have direct access to a highly organised capital market which in most countries is reserved for large firms and governments.

Home Owners and Other Borrowers

Originally the bond market was reserved for agriculture and the financing of new residential construction, and the latter still accounts for a major portion of the lending. When an individual wishes to build a house, he addresses himself to a mortgage society of which there are several types, the largest group having the legal form of a co-operative.

The society draws up a mortgage deed but, instead of giving the borrower cash in exchange, issues him a bond to the value of his mortgage; it is up to the borrower to sell this bond on the open market, generally through the intermediary of a bank or broker. The bond bears the name of and is guaranteed by the mortgage society so that the individual in effect has the society's backing for his venture into the financial markets. Until recently the maximum nominal interest rate on such bonds was fixed by law, but the effective yield can vary, and the actual sum realised by the borrower on the open market depends on prevailing market conditions. When a mortgage is repaid, the society calls back an equivalent amount of bonds from the open market, making the choice by drawing lots, and redeems them at full value.

Individual home owners are not the only ones to

use this means of finance, and one of the sources of strength of the system as seen by OECD's experts is the fact that the market is open to a wide range of borrowers including small and medium-sized businesses (providing they have real estate assets as security) and also many larger firms as well, particularly since the early 1960's. These companies use mortgage bonds in preference to floating their own issues because it is convenient and costs less. The bonds of mortgage societies are exempt from stamp tax which must be paid in the case of private corporate issues, and the costs of "intermediation" are low: if the bonds are sold through a bank, the commission amounts to only about 0.5 per cent of the bond's nominal value, the expense being shared by borrower and investor. This compares with the 2 to 3 per cent charged by banking syndicates in many countries and on the Euro-issue market. Overall, the spread between the mortgage bond's yield to the investor and the cost to the borrower is estimated by OECD's experts at about 0.2 per cent a year for a 30 year bond and at a third of one per cent for a ten year issue, excluding the cost of contributions to the reserve and administration fund of the mortgage society (which are eventually redistributed to the borrowers if the mortgage society is a co-operative). Finally the interest cost paid on this type of debt — as on any other — is deductible from income tax for individuals and businesses alike. Local authorities also use the mortgage bond market.

The Lenders: Households and Others

There is a ready market for these bonds for a number of reasons: first, they are guaranteed by the

mortgage society in case of default by the borrowers; secondly, their yield is greater than the return available on savings deposits; and finally they are highly liquid, being readily transferable on what has come to be a very well organised secondary market which functions smoothly and has a high turnover.

Mortgage bonds are a popular and traditional form of savings for private individuals who also know them as borrowers and hence find them a familiar type of financial instrument. Thirty-five to forty per cent of personal financial savings have been estimated to take this form, and net purchases in 1967 were \$40 a year per capita which is double the value of bonds purchased by households in France and four times that of Germany. Although direct government lending for housing was prevalent until the late 1950's, now the market has grown to such an extent that the major part of home-building activity is financed through it.

The authorities can, however, contribute indirectly to providing finance for mortgages (2) through Central Bank purchases of mortgage bonds on the open market; and indeed in recent years the Central Bank has become a very large investor with 20-30 per cent of total purchases. This intervention, which has now ceased, is one aspect of liquidity management and interest rate policy.

(Continued on page 41.)

(2) The Government directly subsidises "social" housing by providing the interest payments to those who qualify, but this form of assistance is less than in other countries such as the Netherlands and the United Kingdom; the fact that interest payments can be deducted from taxable income also constitutes a kind of subsidy.

FINANCING OF BUSINESS AND HOUSING IN DENMARK (excluding public enterprises)

(in billion Danish kroner and in percentages)

	1960		1964		1966		1967		1968 P	1969 P
	10 ⁹ DK	%	10 ⁹ DK	%	10 ⁹ DK	%	10 ⁹ DK	%	10 ⁹ DK	10 ⁹ DK
<i>Identified borrowing</i>										
Bank credit	2.07	48.57	3.20	38.09	4.04	42.40	2.91	31.36	3.00	5.58
Mortgage bond issues	1.30	30.50	3.26	38.80	3.36	35.20	3.98	42.90	6.11	7.31
Share issues	0.07	1.70	0.15	1.79	0.04	0.44	0.13	1.40	0.01	0.10
Government loans	0.29	6.77	0.13	1.55	0.21	2.20	0.31	3.34	0.36	..
Loans from special credit institutions	0.04	0.96	0.06	0.72	0.17	1.80	0.14	1.50	0.27	0.05
Capital imports (1)	0.49	11.50	1.60	19.05	1.71	17.96	1.81	19.50
Total	4.26	100.00	8.40	100.00	9.53	100.00	9.28	100.00

(1) Increase in gross private non-bank liabilities to foreigners, including direct investment, but excluding transactions in outstanding securities. P = Preliminary.

Source: Danish National Account Statistics and Monetary Statistics.

Other buyers include savings banks, insurance companies and pension funds, and the latter are expected to become more important as a new compulsory pension scheme comes into operation.

Problems and Modifications

In recent years operation of the bond market has not been without difficulties: in 1965 the demand for funds was such that the Government wished to limit the volume of mortgage society issues, and a quota system was set up for this purpose by accord between the Central Bank and the mortgage societies. When in 1968 it was decided to abolish this quantitative control, the Central Bank was obliged to step in to satisfy the pent-up demand for funds and to keep the level of interest rates down.

Moreover bond prices have fluctuated considerably which has meant losses for investors in some periods and gains in others (3). But OECD's experts note that, despite these fluctuations, the bonds are generally considered very attractive.

In general, the OECD report concludes, the financial market of which the mortgage bond market is such an important element "has adapted itself to the handling of a rapidly rising volume of transactions on the capital market and to the changing requirements of the various groups of customers. The problems it was confronted with in the past mainly resulted from the conduct of economic and financial policies rather than from institutional deficiencies... The present institutional set-up is less sophisticated than in most countries but it does not seem to be lacking flexibility or competition... The organisation of the market however may face new challenges in the future."

"If anything" the experts add, "the financial system may have a bias in making access to very long term credit for housing and local-government financing too easy". The Danish Government itself has in recent years considered this to be the case. Last July in an effort to increase savings, which are considered too low in relation to investment needs (causing a strain on the balance of payments and necessitating net capital imports) the maximum maturity for mortgage bonds was lowered from 60 to 40 years, maximum borrowing limits were reduced, and borrowing on existing residences was greatly restricted.

At the same time the central government has tried to limit the borrowing of local authorities on the mortgage bond market which in recent years had risen steeply and to encourage them to use taxation to a greater extent.

(3) When investors realise a capital gain, either through selling higher than they buy or redeeming at par after having bought at a lower price, their gains are tax free.

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